

SUSTAINABILITY **REPORT** 2019



National Refinery Limited

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Executive Summary

NRL Documents all its initiatives towards sustainable environmental performance for annual reporting. The scope of this reporting is to provide information about the Occupational Health, Safety, Environment and Quality within the sustainable operational performance of National Refinery Limited for the year 2019 for all its stakeholders for strengthening their trust and to promote better relationship. The benchmark and guidelines refer for the development of this report is from ACCA-WWF Environmental Reporting Assessment Criteria, Global reporting initiative guidelines for Sustainable reporting GRI:G3.1.

- This report describes the key elements of the updated sustainable approach towards continual improvement and reduction in negative environmental impacts of NRL operational activities and developing the sustainable business strategies.
- We ensure that our manufacturing activities are in line with the government environmental laws and Company's standard operating procedures & safe work practices to support towards environment protection through sustainable development.
- This report gives a brief over view of National Refinery Limited (NRL) operations, manufacturing processes and their associated direct / indirect impact on environment and sustainable initiative introduced.
- We closely monitor hazardous and non hazardous wastes, energy and water consumption for best sustainable practices development.
- NRL sustainable environmental development action plan is focused on optimization of utilities & energy consumption, stack emissions & Effluent water monitoring.
- Response to the Global environmental initiatives, produce environment friendly clean High Speed Diesel De-Sulphurization (HSD) project to meet Euro-II /IV.
- Emergency response plans (ERP) & procedures have been established & implemented, periodic drills are conducted in order to train the manpower and removed weaknesses in the system, accordingly for sustainable development.
- Corrective and preventive actions are taken for continual improvement as per commitment in NRL HSEQ policy statement. The whole mechanism is authenticated by the periodic review by the Management review meeting.
- For sustainable objectives achievement Monitoring & measurements are carried out at specified intervals for the key characteristics of NRL operations that can have a significant environmental impact.
- Periodic evaluation of legal, regulatory and others requirement is carried out for sustainable requirements compliance. Corrective actions are taken in case of any deviation based on root cause analysis. Results are recorded and reviewed for the effectiveness of corrective actions.
- NRL has achieved 32.86 million Safe Man-Hours without Lost Time Injury (LTI) as on December 31, 2019. Continuous efforts to ensure the effective application of sustainable operational controls for minimizing Occupational Health & Safety risks and its environmental impacts.
- On the sustainable environmental measure we have addressed critical environmental concerns such as NOx's / SOx's emissions, green house gases, waste and effluent disposal through friendly manner for continual improvement.
- Sustainable Environmental performance is reviewed at planned intervals to ensure its continuing suitability, adequacy and effectiveness. Opportunities of improvement and need for changes where required are discussed in Management Review, HSE Committees and Steering Committee meetings, Decisions are taken and strategies developed.
- Management un-deterred commitment towards acquiring excellence in overall performance specially for the conversation of environment.
- Implementation of IMS (Integrated Management System) based on ISO 9001:2015, ISO 14001:2015 & OHSAS 18001:2007 standard 1st Surveillance Audited by M/s. ANM Transformational Solution through NQA certification limited during July 2019.
- A well-defined and implemented mechanism to evaluate the Contractors and Suppliers to ensure that their activities & performance in accordance with in sustainable requirement fulfillment.
- NRL is continuously expanding its diversified oil refining business, which ranges from crude oil refining, lube base oil production. As a market leader in petroleum refining sector, NRL carries out its environmental care activities to become an environment friendly energy enterprise in the country with an approach & guidelines for sustainability.
- In order to make the report more realistic & reliable, statements from the reports of our third party assessors like ISO 14001:2015, OHSAS 18001:2007 and ISO 9001:2015 have been in the last chapter.
- The report is being assured externally from M/s ANM Transformation Solution.



CEO Message

National Refinery Limited

With the blessing of Almighty Allah, as a part of our ongoing commitment to disseminate information to our stakeholders. I am pleased to present the 17th Sustainability (Corporate Environmental) Report for the year 2019.

Globally petroleum refining sector has special responsibilities for the preservation and protection of environment to minimize their negative impact through the implementation of good energy and environmental conservation practices. The outcomes of this report are to demonstrate openness with which the company operates regarding the effect if its commercial activities on the environmental geomorphology.

We develop our Company on ethical and professional basis and be a responsible corporate entity with respect to Environment, Health and Safety. Our leaders from top management to frontline supervisors, are responsible and accountable for Environment, Health and Safety, its compliance and for managing such risks of their areas. Their active participation includes collaborating across organizational line to integrate risk management. One of the main responsibility of NRL employee's is to Adopt best in class practices that protect the environment, including reducing the quantity of emissions, developing opportunities for recycling, pollution prevention, and efficient use of recyclable materials.

Our dedication towards protecting the Environment is evident through production of Euro standard fuel. We strive to conserve resources, reduce waste generations and emphasize on energy efficiency. Efforts are being made at NRL for continual improvement in the field of Occupational Health, Safety, Environment and Quality. The company has international certification of ISO 9001:2015 (Quality Management System),

ISO 14001:2015 (Environmental Management System) & BS-OHSAS 18001:2007 (Occupational Health & Safety Management System). We have achieved **32.86 million safe man-hours without Loss Time Injury (LTI) as on 31st December – 2019** and believe that there is much more to do.

We hope our efforts towards protection of the environment will bear fruit in achieving excellence. Our responsibilities include acceptance of the fact that we should continue our efforts not only to preserve but to improve the environmental condition of the earth and hope that other follow our foot steps to preserve the nature around the globe.

May God enlighten us to make our way towards an even better future!

Jamil Ahmed Khan
Chief Executive Officer (CEO)

Our Environmental Mission and Guiding Principles

National Refinery limited dedicated to continuous efforts to improve the compatibility of our operations with the environment while economically developing energy resources and supplying high-quality products and services to consumers.

As a corporate entity we recognize the importance of efficiently meeting society's needs and our responsibility to work with the public, the government, and others to develop and to use natural resources in an environmentally sound manner while protecting the health and safety of our employees and the public.

To meet these responsibilities, NRL pledge to manage our businesses according to these principles.

- To recognize and to respond to community concerns about our raw materials, products, and Operations.
- To operate our plants and facilities and to handle our raw materials and products in a manner that protects the environment and the safety and health of our employees and the public.
- To make safety, health and environment consideration a priority in our planning and our development of new products and process.
- To advise promptly the appropriate officials employees, customers and the public of information on significant industry-related safety, health and environmental hazards, and to recommend protective measures.
- To counsel customers, transporters, and others in the safe use, transportation, and disposal of our raw materials, products and waste materials.
- To economically develop and produce natural resources and to conserve those resource by using energy efficiently.
- To extend knowledge by conducting or supporting research on the safety, health, and environmental effects of our raw materials, products processes and waste materials.
- To commit to reduce overall emissions and waste generation.
- To work with others to resolve problems created by handling and disposal of hazardous substances from our operations.
- To participate with government and other creating responsible laws regulations, and standards to safeguard the community, workplace and environment.
- To promote these principles and practices by sharing experiences and offering assistance to others who produce, handle, use, transport, or dispose of similar raw materials, petroleum products and wastes.

Strategies for Today's Environmental Partnership (STEP):

One of the most significant long –term trends affecting the future vitality of the petroleum industry is the public's concerns about the environment. Recognizing this trend, NRL have developed a positive, forward looking strategy called STEP.

This program aims to address public concerns by improving industry's environmental, health, and safety performance documenting performance improvements;

and communicating them to the public.

The foundation of STEP is the API and other Standard Environmental Mission and Guiding Environmental Principles.

API standards, by promoting the use of sound engineering and operational practices are an important means of implementing API's STEP program.

NRL Signatory **UNGLOBAL Compact**

The Ten Principles of UNGlobal Compact's

The UN Global Compact's ten principles in the areas of human rights, labour, the environment and anti-corruption.

Human Rights

- Principle 1: Businesses should support and respect the protection of internationally proclaimed human rights; and
- Principle 2: make sure that they are not complicit in human rights abuses.

Labour

- Principle 3: Businesses should uphold the freedom of association and the effective recognition of the right to collective bargaining;

- Principle 4: the elimination of all forms of forced and compulsory labour;
- Principle 5: the effective abolition of child labour; and
- Principle 6: the elimination of discrimination in respect of employment and occupation.

Environment

- Principle 7: Businesses should support a precautionary approach to environmental challenges;
- Principle 8: undertake initiatives to promote greater environmental responsibility; and
- Principle 9: encourage the development and diffusion of environmentally friendly technologies.

Anti-Corruption

- Principle 10: Businesses should work against corruption in all its forms, including extortion and bribery.

Corporate Objectives & **Development Strategy**

National Refinery Limited is a petroleum refining and petrochemical complex engaged in manufacturing and supplying a wide range of fuel products, lubes, BTX, asphalts and specialty products for domestic consumption and export.

NRL objectives and development strategy are aimed at achieving sustainable productivity and profitability and high standards of safety, occupational health and environmental care. This entails human resource re-engineering & development, enhancing value addition, implementing conservation measures and continuing growth through up-gradation of existing as well as addition of new facilities. In the changing global environment, corporate objective and development strategy have been defined to meet the challenges of 21st Century.

Corporate Objectives

- Ensure that business policies and targets are in conformity with the national goals.
- Contribute in meeting the country's demand of petroleum and petrochemical products.
- Customer's satisfaction by providing best value and quality products.
- Optimization of the value of barrel of crude oil and cost reduction through conservation measures.
- Achieving and maintaining a high standard of Occupational Health, Safety and Environmental care.
- Ensure reasonable return on the shareholders' existing and projected investments.
- Maintain modern management systems conforming to international standards needed for an efficient organization.

Development Strategy

- Contribute in national efforts towards attaining sustainable self-efficiency in petroleum products.
- Human resource development by upgrading training facilities and exposure to modern technologies/management techniques.
- Balancing and Modernization for energy conservation and enhanced yield of value added products as well as revamping for environment friendly products.
- Expansion of refining capacity by de-bottlenecking and adding new facilities.
- Acquire newer generation technologies for the efficient refinery operations as well as for attaining highest standards of Occupational Health, Safety and Environmental care.
- Acquiring self-sufficiency in re-engineering, design and fabrication of equipments.



Vision

Our passion is to attain distinctive leadership amongst the corporate success stories of tomorrow.

We at NRL recognize that realization of this passion needs superior professional competencies, continuous value addition and improving, development of human capital and complete commitment to safety, occupational health and environment.

Mission

- To remain the premium and preferred supply source for various petroleum products and petrochemicals.
- Offer products that are not only viable in terms of desirability and price but most importantly give value to our customers.
- Deliver strong returns on existing and projected investments of our stakeholders by use of specialized and high quality corporate capabilities.
- Business development by adoption of emerging technologies, growth in professional competence, support to innovation, enrichment of human resource and performance recognition.
- Be a responsible corporate citizen by serving the community through a variety of socio-economic acts and maintaining a high level of safety, occupational health and environmental care.



Core Values

Following concepts and ideas guide the Management and staff of National Refinery Limited in conducting its business practices in most ethical ways.

1. Ethical Conduct & Integrity

We value lifestyle in our organization where ethics like truth, honesty, integrity and fair play are basic ingredients while interacting within the organization or dealing with the outside world.

2. Teamwork and Responsibility

We share information and resources and step in to help out other team members. Conflicts are worked out in spite of obstacles and difficulties. We accept responsibility with “can do” attitude.

3. Customer Satisfaction

We endeavor to provide quality products to our customers at competitive prices. We value their satisfaction essential for continued growth of our business.

4. Continuous Improvement

We generate new ideas and creative approaches to upgrade and update our refinery to best available technology and processes so that our products are at the level of internationally accepted standards.

5. Profitability

We believe in enhancing our profitability to the maximum so that Employees, Shareholders and Government all benefits from it.

6. Corporate Citizenship

As a good Corporate Citizen, we are more than willing and happy to meet our social responsibilities towards the community around us. We are also committed to meet requirements of health, safety and environment.



Corporate **Information**



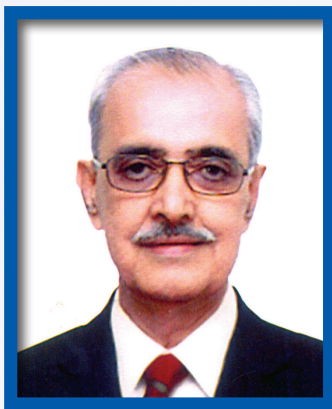
Mr. Wael G. Pharaon
Non-Executive Director



Mr. Laith G. Pharaon
Non-Executive Director
Chairman Attock Group Companies



Mr. Shuaib Anwer Malik
Chairman/Non-Executive Director
Alternate Director to Mr Laith G. Pharaon



Mr. Tariq Iqbal Khan
Independent Director



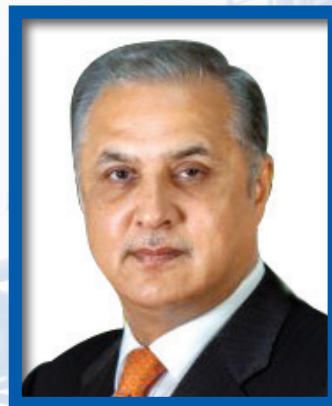
Mr. Zaki Mohamad Mansoor
Independent Director



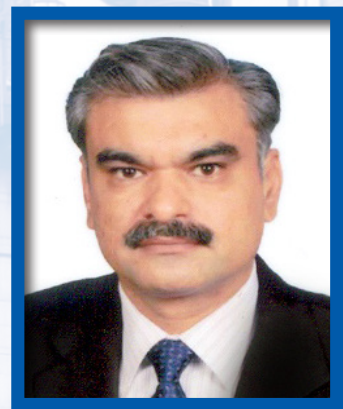
Mr. AbdusSattar
Non-Executive Director



Mr. Sajid Nawaz
Non - Executive Director



Mr. Babar Bashir Nawaz
Alternate Director
for Mr. Wael G. Pharaon
Non - Executive Director



Mr. Jamil A. Khan
Chief Executive Officer
Executive Director

Corporate Information

Board of Directors

Laith G. Pharaon
Alternate Director: Shuaib A. Malik
Wael G. Pharaon
Alternate Director: Babar Bashir Nawaz
Shuaib A. Malik : Chairman
Tariq Iqbal Khan
Abdus Sattar
Sajid Nawaz
Zaki Mohamad Mansoor

Chief Executive Officer

Jamil A. Khan

Company Secretary / CFO

Nouman Ahmed Usmani

Audit Committee

Tariq Iqbal Khan	Chairman
Abdus Sattar	Member
Babar Bashir Nawaz	Member
Alternate Director for Mr. Wael G. Pharaon	
Shaikh Ather Ahmed	Secretary

Human Resource and Remuneration (HR&R) Committee

Tariq Iqbal Khan	Chairman
Abdus Sattar	Member
Babar Bashir Nawaz	Member
Alternate Director for Mr. Wael G. Pharaon	
Jamil A. Khan	Member
Nouman Ahmed Usmani	Secretary

Auditors

A. F. Ferguson & Co.
Chartered Accountants

Bankers

Bank AL-Habib Limited	National Bank of Pakistan
United Bank Limited	MCB Bank Limited
Allied Bank Limited	Askari Bank Limited
Bank Alfalah Limited	Faysal Bank Limited
Habib Bank Limited	Meezan Bank Limited
Habib Metropolitan Bank Limited	Samba Bank Limited

Registered Office

7-B, Korangi Industrial Area,
P.O. Box 8228, Karachi-74900
UAN: +92-21-111-675-675
PABX: +92-21-35064981-86
+92-21-35064977-79
Website: www.nrlpak.com
E-mail: info@nrlpak.com

Share Registrar

Central Depository Company
of Pakistan Limited
Share Registrar Service Limited
CDC House, 99-B, Block 'B', S.M.C.H.S.,
Main Shahra-e-Faisal, Karachi – 74400.
Tel: (Toll Free) 0800-23275
Fax: +92-21-34326053
Email: info@cdcpak.com
Website: www.cdcpakistan.com

Chairman's **Review**



, on behalf of the Board of Directors, welcome you all in the 56th Annual General Meeting of your Company and present an annual review of results and audited financial statements for the year ended June 30, 2019.

Pakistan's economy has been facing continuous problems for the last few years. The country's economy is unable to achieve sustained and rapid growth due to structural issues which requires effective monetary and fiscal measures to achieve macroeconomic stability. The persistence of large fiscal and current account deficits and associated build-up of public and external debt became the major source of macroeconomic imbalance. The outgoing fiscal year 2018-19 witnessed a growth of 3.29 percent against the ambitious target of 6.2 percent. Due to elevated current account deficit, Pak Rupee devaluation has resulted in substantial increase in inflation.

Volatility in the international crude oil prices, asymmetrical increase in product prices and sharp devaluation of Pak Rupee remained key challenges for your Company. The international political dynamics particularly sanctions on Iran has further affected the prices of petroleum products in the International Market. The overall economic situation alongwith deteriorating macro-economic factors of Pakistan negatively impacted your company's performance. Under these difficult circumstances, your Company incurred a loss after tax of Rs. 8.69 billion compared to profit after tax of Rs. 1.77 billion in the last year.

Fuel segment of your company incurred loss of Rs. 9.59 billion as compared to Rs. 2.21 billion in the previous year. Profitability was affected by huge exchange loss due to de-valuation of Pak-Rupee against US Dollar, last month's average basis for product prices especially in the period when product and crude oil prices remained highly inconsistent, custom duty paid on imported crude oil attributable to de-regulated products and markup cost incurred on short term finance to meet the working capital requirements of the company. Overall segment's sales also remained under pressure especially furnace oil sales declined due to lower demand from power plants owing to availability of alternate energy of RLNG under long term international agreements. Sales of HSD also witnessed decreasing trend mainly due to overall decline in consumption at country level.

Lube segment's after tax profits declined to Rs. 0.90 billion as compared to Rs. 3.98 billion in the last year. This is due to increase in feed cost, asymmetrical increase in lube base oil prices and decline in Bitumen sales volume by 54% due to curtailment of development expenditure by the Government that also resulted in blockage of funds due to high inventory build-up.

Considering prevailing products' demand and prices being not directly in company's control, the management has taken up various matters with the Government including consistent upliftment of furnace oil and fortnightly pricing mechanism, so that refineries can earn a reasonable return. We believe that the Government would take reasonable steps to support existing refineries as well as to encourage new investments in refining sector.

I believe that the steps taken by the management are good enough in the given circumstances especially when factors beyond management's control predominantly had negative impacts as well as to initiate a positive beginning ahead and that the Board on the whole fairly played its role in enabling the Company to curtail unending losses by providing appropriate guidance.

On behalf of the Board of Directors, I would like to thank all the shareholders for their trust, confidence and continuous support for the company in these difficult times. I am hopeful that country's economic situation would improve which alongwith some positive measures by the Government to support refining industry would result in improvement in company's performance.



Shuaib A. Malik
Chairman

July 29, 2019
Dubai

NRL at a Glance

FIRST LUBE REFINERY

Design capacity	3,976,500 barrels per year of Crude Oil processing
Design capacity	533,400 barrels per year of Lube Base Oils
Date Commissioned	June 1966
Project Cost	Rs. 103.9 million

FUEL REFINERY BEFORE RE-VAMP

Design capacity	11,385,000 barrels per year of Crude Oil processing
Date Commissioned	April 1977
Project Cost	Rs. 607.5 million

AFTER FIRST RE-VAMP

Design capacity	16,500,000 barrels per year of Crude Oil processing
Date Commissioned	February 1990
Project Cost of Revamping	Rs. 125.0 million

AFTER SECOND RE-VAMP

Design capacity	17,490,000 barrels per year of Crude Oil processing
Date Commissioned	March 2017
Project Cost of Revamping	Rs. 548.0 million

HSD DESULPHURIZATION AND ASSOCIATED UNITS

Date Commissioned	June 2017
Project Cost	Rs.26.82 billion

NAPHTHA BLOCK (ISOMERIZATION UNIT)

Date Commissioned	October 10, 2017
Project Cost	Rs.6.54 billion

BTX UNIT

Design capacity	180,000 barrels per year of BTX
Date Commissioned	April 1979
Project Cost	Rs. 66.7 million

SECOND LUBE REFINERY BEFORE RE-VAMP

Design capacity	700,000 barrels per year of Lube Base Oils
Date Commissioned	January 1985
Project Cost	Rs. 2,082.4 million

AFTER RE-VAMP

Design capacity	805,000 barrels per year of Lube Base Oils
Date Commissioned	June 2007
Project Cost of Revamping	Rs. 585.0 million

SHAREHOLDERS' EQUITY

June 1966	Rs. 20.0 million
June 2019	Rs. 33,873.5 million

Refinery Upgradation **Projects**

FUTURE PROJECTS

Refinery projects are capital intensive and under the prevailing circumstances a very careful approach is needed to start with a new project. However, NRL is continuing to study the possibility of installing the following:

- **Hydrocracker**

The project of installing a hydrocracker to convert Furnace Oil into valuable products is under review. A basic engineering design package was prepared by M/s UoP of USA in the year 2012. However, further work was not undertaken due to insistence of Government of Pakistan for installing a DHDS and Isomerization units to produce Euro-II standard products. The Company is reviewing all aspects of the project and will decide the best course according to the changing economic situation of the country.

- **Turnaround of Lube – I Refinery**

Company would be undertaking the turnaround of its Lube-I Refinery by the end of year 2019 as a mandatory activity so as to keep the refinery operating. This will result in continuous production at optimum level without frequent maintenance requirements. The turnaround is tied with the revamp of two stage unit of Lube - I Refinery.

ONGOING PROJECTS

Following projects are currently being executed by the company:

- **Two stage unit at Lube-I refinery**

The project has been planned to enhance the installed crude oil processing capacity of Lube - I Refinery from 12,050 Barrel per stream day (bpsd) to 17,000 bpsd and vacuum fractionation capacity from 5,200 bpsd to 6,600 bpsd. The contract has been awarded

to M/s. HUALU and M/s. China National Chemical Engineering No. 6 Construction Company of China and is expected to be completed by January 2020.

- **Replacement of Fuel refinery and Utilities Control System with centralized Distributed Control Systems**

Replacement of existing control system of fuel refinery and Utilities with Distributed Control System (DCS) will ensure precise quality production, high-integrity process controls, process safeguarding and emergency shutdown. It will also improve process control and monitoring of plant parameters, availability of customized reports and log sheets, and optimum Human resource utilization. The project has already been awarded to M/s Yokogawa and is likely to be completed by January 2020.

- **New Sea Water Reverse Osmosis Plant**

New sea Water Reverse Osmosis plant with capacity of 250,000 US gallons per day is planned to be procured and installed following the completion of Phase-I projects to meet the increased water requirement. Project has been awarded to M/s Aquamatch of Turkey and is expected to be completed by December 2019.

COMPLETED PROJECTS – 2018-19

Despite financial constraints your company successfully completed the following project during the year 2018-19.

- **101-F-1 Air Pre-Heater Project**

Installation of Air Pre-Heater at fuel refinery is an energy saving and environmental friendly project. Furthermore, Greenhouse gases emissions and carbon foot prints are significantly reduced. The project has been completed and commissioned in August 2018 at a cost of Rs. 425 million.



Our **Products**

FUEL PRODUCTS

Motor Gasoline (MOGAS)
Kerosene (SKO)
Jet A-1
JP-8
High Speed diesel Oil (HSD)
Light diesel oil (LDO)
Furnace Oil (F.O)
Liquefied Petroleum Gas (LPG)
Naphtha (For Export)

LUBE BASE OILS

65N-HVI
100N-HVI
150N-HVI
400N-HVI
500N-HVI
BS-HVI
650N-MVI
BS MVI
SPINDLE OIL

ASPHALT

Paving Grade 40/50
Paving Grade 60/70
Paving Grade 70/80
Paving Grade 80/100

SPECIALITY PRODUCTS

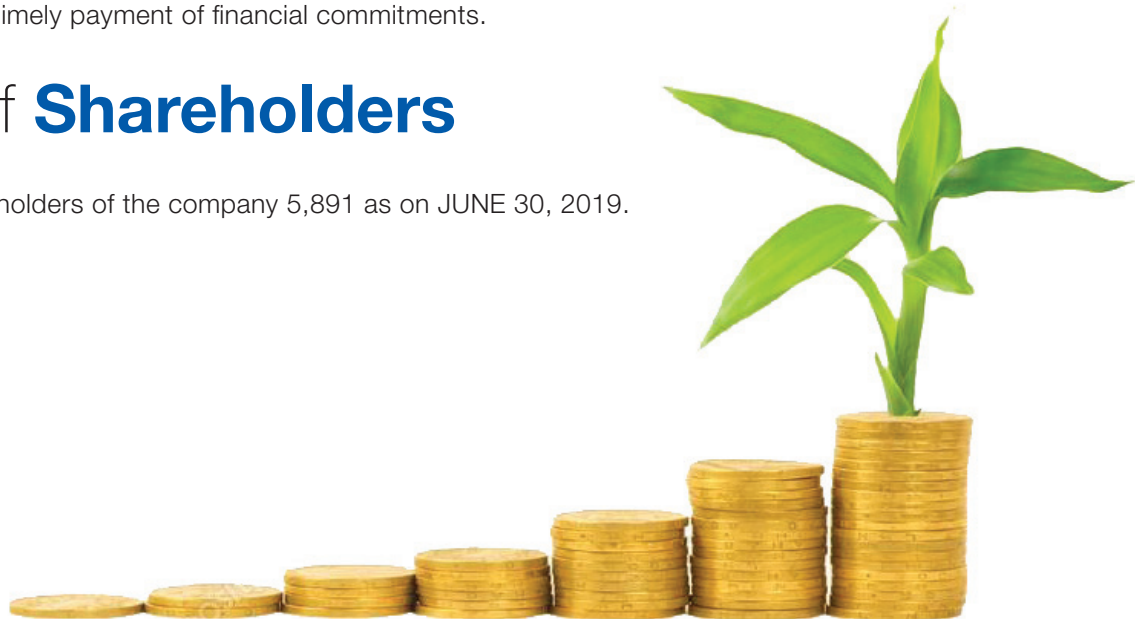
Benzene
Toluene
Xylene
Wax
Slack Wax
Rubber Process Oil
Extract Oil
Sulphur (Pellets)

Credit **Rating**

The long term entity rating of the Company is “AA+” (Previous: “AA+”). The short-term entity rating has been maintained at “A1+”. These ratings denote a very low expectation of credit risk emanating from a very strong capacity for timely payment of financial commitments.

No. of **Shareholders**

No. of Shareholders of the company 5,891 as on JUNE 30, 2019.



Code of Conduct

National Refinery Limited (the Company) is engaged in the manufacturing of wide range of petroleum products with the objective to achieve sustainable productivity, profitability and high standards of safety, occupational health and environmental care. This entails human resource development, enhancing value addition, implementing conservation measures and growth by up-gradation and addition of newer generation technologies.

The Company requires all its Board Members and Employees to act within the authority conferred upon them and in the best interests of the Company and observe all the Company's policies and procedures as well as relevant laws and regulations, as are applicable in individual capacity or otherwise, including but not limited to the corporate values, business principles and the acceptable and unacceptable behaviour (hereinafter called the Company's Code of Conduct) embodied in this document.

The Company believes that the credibility, goodwill and repute earned over the years can be maintained through continued conviction in our corporate values of honesty, justice, integrity and respect for people. The Company strongly promotes trust, openness, teamwork and professionalism in its entire business activities.

- The business principles are derived from the above stated corporate values and are applied to all facets of business through well-established procedures. These procedures define behavior expected from each employee in the discharge of his/her responsibility.
- NRL recognizes following obligations, which need to be discharged with best efforts, commitment and efficiency:
 - Safeguarding of shareholders' interest and a suitable return on equity.
 - Service customers by providing products, which offer value in terms of price, quality, safety and environmental impact.
 - Respect human rights, provide congenial working environment, offer competitive terms of employment, develop human resource and be an equal opportunity employer.
 - Seek mutually beneficial business relationship with contractors, suppliers and investment partners.

- The Company believes that profit is essential for business survival. It is a measure of efficiency and the value that the customer places on products and services produced by the Company.
- The Company requires honesty and fairness in all aspect of its business and in its relationships with all those with whom it does business. The direct or indirect offer, payment, soliciting and accepting of bribe in any form is undesirable.
- The Company is fully committed to reliability and accuracy of financial statements and transparency of transactions in accordance with established procedures and practices.
- The Company does not support any political party or contributes funds to groups having political interests. The Company will however, promote its legitimate business interests through trade associations.
- The Company, consistent with its commitments to sustainable developments, has a systematic approach to the management of health, safety and environment.
- The Company is committed to observe laws of Pakistan and is fully aware of its social responsibility. It would assist the community in activities such as education, sports, environment preservation, training programs, skills development and employment within the parameters of its commercial objectives.
- The Company supports free market system. It seeks to compete fairly and ethically within the framework of applicable competition laws in the country. The Company will not stop others from competing freely with it.
- In view of the critical importance of its business and impact on national economy, the Company provides all relevant information about its activities to legitimate interested parties, subject to any overriding constraints of confidentiality and cost.
- The Company requires all its board members and employees to essentially avoid conflict of interest between private financial and/or other activities and their professional role in the conduct of Company business.



- No board member or employee shall in any manner disclose to any person or cause disclosure of any information or documents, official or otherwise, relating to the Company, except those published, and unless he/she is authorised by the management.
- All papers, books, drawings, sketches, photographs, documents and similar papers containing analysis, formulas, notes or information relating to the Company's business affairs or operations shall always be treated as the Company property, whether prepared by the employee or otherwise and no employee shall be permitted to carry any of these outside business premises unless specifically authorised to do so by the management.
- The Company's property, funds, facilities and services must be used only for authorised purposes.
- The board members or employees of the Company specifically those coming in direct contact with the vendors doing or seeking to do business with the Company shall not receive favours or incur obligations. In case any contractor/supplier to have business relations with the Company happen to be a relative of an official who is entrusted the responsibility of opening/evaluation/award of supply/contract job or with execution or certification of material/services, he/she shall immediately bring the fact to the notice of Managing Director who may entrust the responsibility to another.
- Each employee shall devote his/her full time and energy exclusively to the business and interests of the Company. In particular, no employee (including those on leave) unless otherwise permitted by the Company, shall directly or indirectly engage in any other profession or business or enter the services of or be employed in

any capacity for any purpose whatsoever and for any part of his/her time by any other person, government department, firm or company and/or shall not have any private financial dealings with any other persons of firms having business relations with the company for sale or purchase of any materials or equipments or supply of labour or for any other purpose. Every employee shall hold himself in readiness to perform any duties required of him by his/her superiors to the best of his/her ability.

- No board member or employee of the Company shall, directly or indirectly, deal in the shares of the Company in any manner during the closed period, as determined and informed by the Company.
- No board member or employee of the Company shall practice insider trading.

Without prejudice to any penal action defined in any statute, as applicable, against any kind of non-compliances/ violations, non-compliance with the Company's Code of Conduct may expose the person involved to disciplinary action as per Company's rules and/or as determined by the management or the Board of Directors of the Company, as the case may be, on case to case basis.

On behalf of the Board



SHUAIB A. MALIK

Deputy Chairman &
Chief Executive Officer
June 18, 2012



Statement of Compliance with The Code of Corporate Governance

The company has complied with the requirements of the Regulations in the following manner:

- The composition of board is as follows:

	Category	Names
a)	Independent Directors	Mr. Tariq Iqbal Khan Mr. Zaki Mohamad Mansoer
b)	Non-Executive Directors	Mr. Laith G. Pharaon Alternate Director: Mr. Shuaib A. Malik Mr. Wael G. Pharaon Alternate Director: Mr. Babar Bashir Nawaz Mr. Shuaib A. Malik Mr. Abdus Sattar Mr. Sajid Nawaz
c)	Executive Director	Mr. Jamil A. Khan Chief Executive Officer

- The directors have confirmed that none of them is serving as a director on more than five listed companies, including this company.
- The company has prepared a Code of Conduct and has ensured that appropriate steps have been taken to disseminate it throughout the company along with its supporting policies and procedures.
- The board has developed a vision/mission statement, overall corporate strategy and significant policies of the company. A complete record of particulars of significant policies along with the dates on which they were approved or amended has been maintained.
- All the powers of the board have been duly exercised and decisions on relevant matters have been taken by board/ shareholders as empowered by the relevant provisions of the Act and these Regulations.
- The meetings of the board were presided over by the Chairman and, in his absence, by a director elected by the board for this purpose. The board has complied with the requirements of Act and the Regulations with respect to frequency, recording and circulating minutes of meeting of board.
- The board of directors have a formal policy and transparent procedures for remuneration of directors in accordance with the Act and these Regulations.
- The Directors were apprised of their duties and responsibilities from time to time. The directors either have already attended the directors' training as required in previous years or meet the exemption criteria as contained in the Listed Companies (Code of Corporate Governance) Regulations, 2017.
- The board has approved appointment of CFO, Company Secretary and Head of Internal Audit, including their remuneration and terms and conditions of employment and complied with relevant requirements of the Regulations. However, the CFO and the Company Secretary of the Company is the same person for which relaxation has been granted by the Securities and Exchange Commission of Pakistan till October 2019.



- CFO and CEO duly endorsed the financial statements before approval of the board.
- The board has formed committees comprising of members given below:
 - a) Audit Committee

Mr. Tariq Iqbal Khan - Chairman
Mr. Abdus Sattar
Mr. Babar Bashir Nawaz (Alternate Director for Mr. Wael G. Pharaon)

- b) HR and Remuneration Committee

Mr. Tariq Iqbal Khan - Chairman
Mr. Abdus Sattar
Mr. Babar Bashir Nawaz (Alternate Director for Mr. Wael G. Pharaon)
Mr. Jamil A. Khan

- The terms of reference of the aforesaid committees have been formed, documented and advised to the committee for compliance.
- The frequency of meetings of the committee were as per following:
 - a) Audit Committee: Quarterly
 - b) HR and Remuneration Committee: Yearly
- The board has set up an effective internal audit function and that is involved in the Internal Audit on full time basis relating to the business and other affairs of the Company.
- The statutory auditors of the company have confirmed that they have been given a satisfactory rating under the quality control review program of the ICAP and registered with Audit Oversight Board of Pakistan, that they or any of the partners of the firm, their spouses and minor children do not hold shares of the company and that the firm and all its partners are in compliance with International Federation of Accountants (IFAC) guidelines on code of ethics as adopted by the ICAP.
- The statutory auditors or the persons associated with them have not been appointed to provide other services except in accordance with the Act, these regulations or any other regulatory requirement and the auditors have confirmed that they have observed IFAC guidelines in this regard.
- We confirm that all other requirements of the Regulations have been complied with.

On behalf of the Board



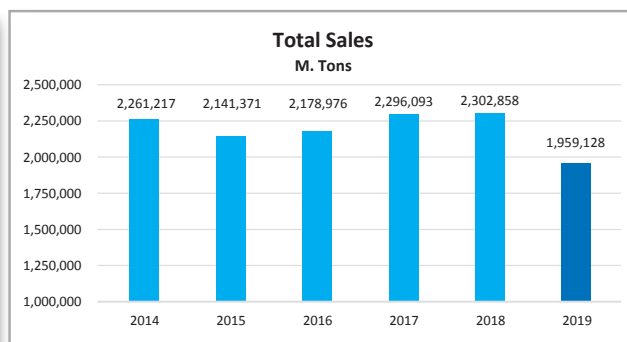
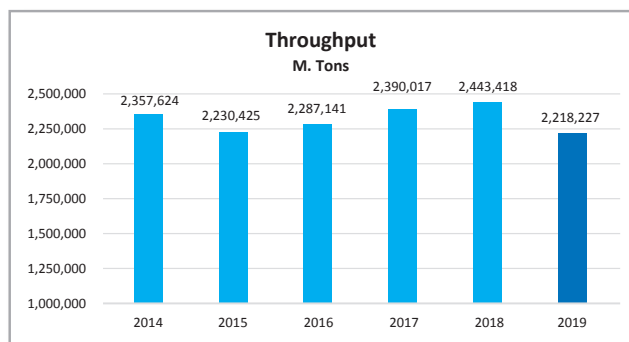
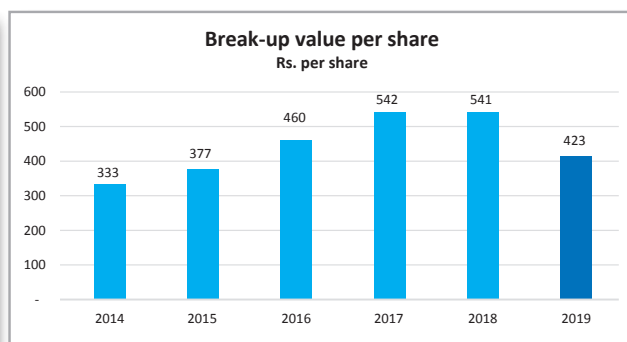
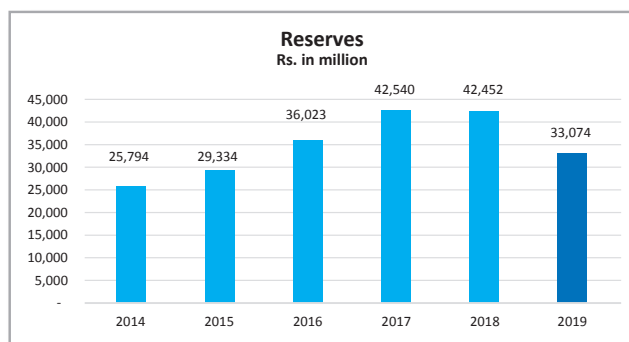
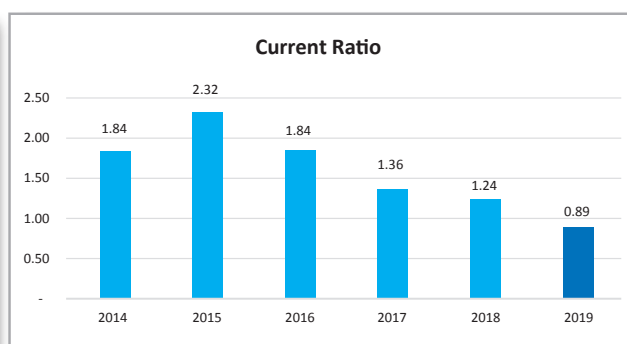
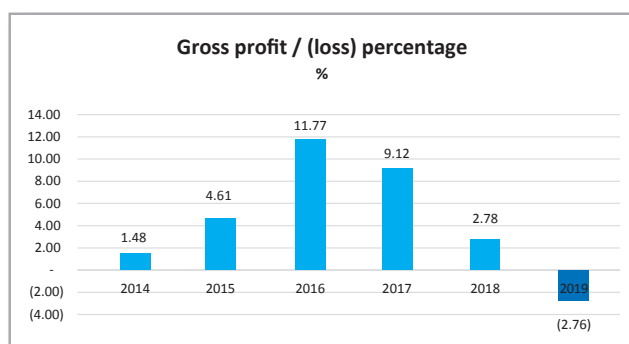
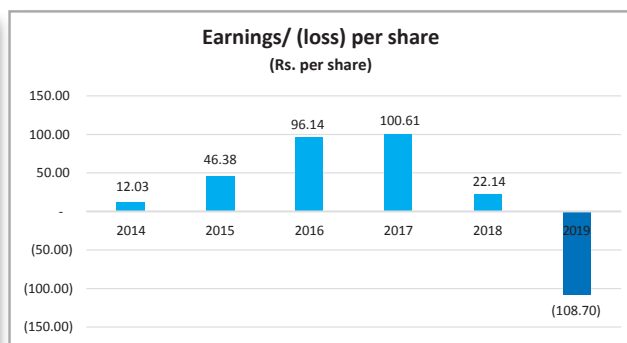
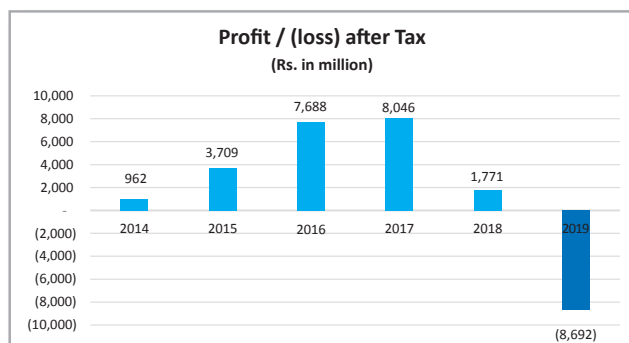
Shuaib A. Malik
Chairman

Six Years **At A Glance**

Description		2018-19	2017-18	2016-17	2015-16	2014-15	2013-14
		← Rupees in million →					
Statement of Profit or Loss							
Net sales		160,906	136,985	107,447	93,788	148,457	207,403
Cost of sales		165,355	133,173	97,648	82,745	141,611	204,350
Purchases		166,822	123,951	91,855	75,120	126,374	200,565
Gross (loss) / profit		(4,449)	3,812	9,800	11,043	6,846	3,053
Operating (loss) / profit		(5,743)	2,673	8,498	10,365	6,413	2,732
(Loss) / profit before tax		(11,029)	907	8,315	10,089	5,560	1,880
(Loss) / profit after tax		(8,692)	1,771	8,046	7,688	3,709	962
Statement of Financial Position							
Share Capital		800	800	800	800	800	800
Reserves		33,074	42,452	42,540	36,023	29,334	25,794
Shareholder equity		33,874	43,252	43,340	36,822	30,134	26,594
Fixed Assets		35,695	37,719	38,547	23,628	8,066	5,061
Current Assets		37,489	27,548	22,752	29,957	39,901	47,465
Current Liabilities		42,001	22,206	16,683	16,241	17,163	25,802
Net current assets/ liabilities		(4,512)	5,342	6,069	13,716	22,738	21,663
Financial Ratios		2018-19	2017-18	2016-17	2015-16	2014-15	2013-14
Gross (loss) / profit	%	(2.76)	2.78	9.12	11.77	4.61	1.48
Net (loss) / profit to sales	%	(5.40)	1.29	7.49	8.20	2.50	0.46
EBITDA Margin to sales	%	(3.91)	3.12	8.33	11.15	3.98	1.06
Return on Equity	%	(25.66)	4.09	18.56	20.88	12.31	3.62
Return on Capital Employed	%	(22.54)	4.09	20.07	22.96	13.08	3.60
Liquidity Ratios							
Current Ratio	Times	0.89	1.24	1.36	1.84	2.32	1.84
Quick /Acid test ratio	Times	0.28	0.67	0.71	1.15	1.53	0.92
Cash to Current Liabilities	Times	0.02	0.02	0.17	0.73	1.01	0.34
Activity / Turnover Ratios							
Inventory turnover	Days	41.69	31.84	40.89	54.03	47.59	40.89
Debtors turnover	Days	17.32	18.42	18.98	24.09	21.17	18.39
Creditors turnover	Days	27.27	33.76	31.82	47.38	45.72	37.60
Total Assets turnover ratio	Times	2.11	2.08	1.75	1.75	3.09	3.93
Fixed assets turnover ratio	Times	4.51	3.63	2.79	3.97	18.40	40.98
Investment / Market Ratios							
(Loss) / earnings per share and diluted (LPS) / EPS	Rs.	(108.70)	22.14	100.61	96.14	46.38	12.03
Price earning ratio	Times	(1.04)	20.01	7.22	4.94	5.00	17.87
Dividend yield ratio	%	-	2.26	3.10	4.21	4.31	-
Cash Dividend payout ratio	%	-	45.17	22.36	20.80	21.56	-
Dividend cover ratio	Times	-	2.21	4.47	4.81	4.64	-
Cash Dividend per share	Rs./share	-	10.00	22.50	20.00	10.00	-
Market value per share at year end	Rs./share	113	443	726	475	232	215
Breakup value per share	Rs./share	423	541	542	460	377	333



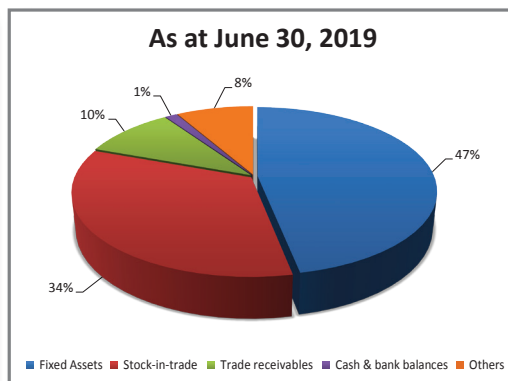
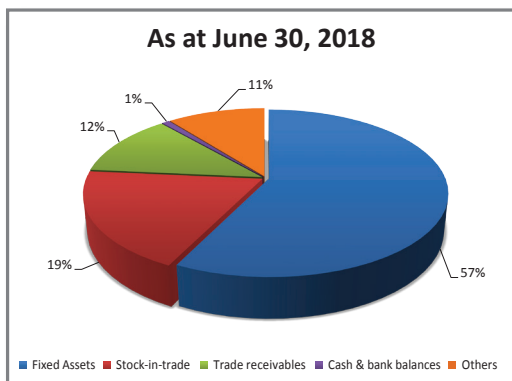
Financial Performance **Graphic Presentation**



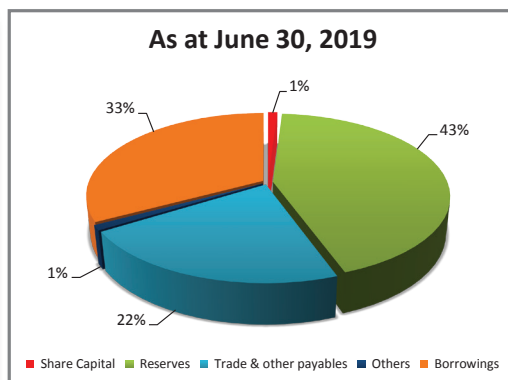
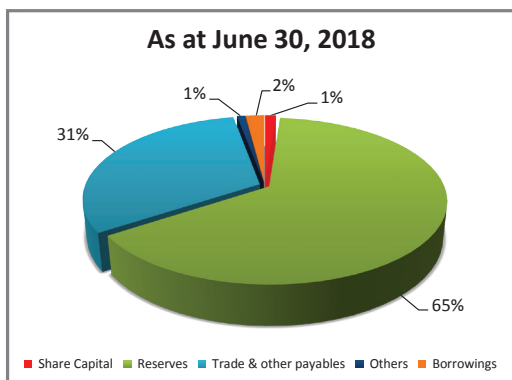
Graphical Representation

STATEMENT OF FINANCIAL POSITION

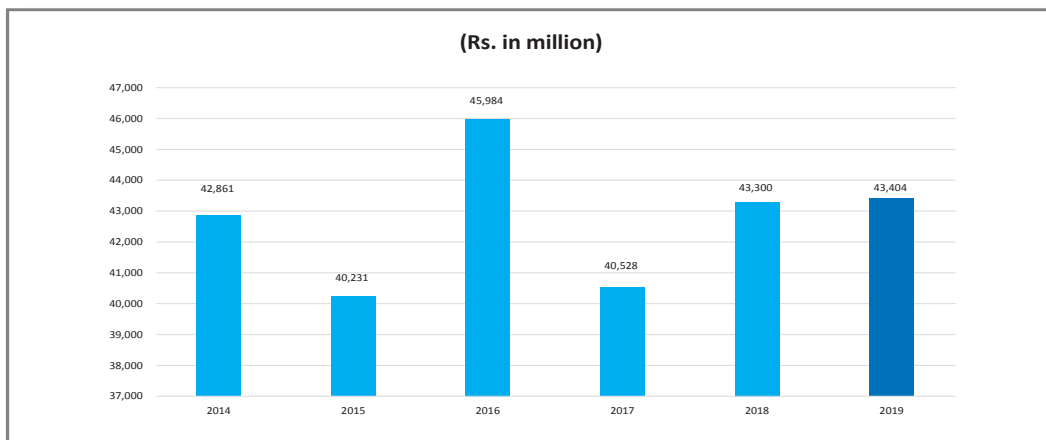
ASSETS



EQUITY AND LIABILITIES



CONTRIBUTION TO NATIONAL EXCHEQUER





**REVIEW REPORT TO THE MEMBERS ON STATEMENT OF COMPLIANCE WITH
THE CODE OF CORPORATE GOVERNANCE**

We have reviewed the enclosed Statement of Compliance with the best practices contained in the Code of Corporate Governance (the Code) prepared by the Board of Directors of National Refinery Limited for the year ended June 30, 2019 to comply with the Listed Companies (Code of Corporate Governance) Regulations, 2017 where the Company is listed.

The responsibility for compliance with the Code is that of the Board of Directors of the Company. Our responsibility is to review, to the extent where such compliance can be objectively verified, whether the Statement of Compliance reflects the status of the Company's compliance with the provisions of the Code and report if it does not and to highlight any non-compliance with the requirements of the Code. A review is limited primarily to inquiries of the Company's personnel and review of various documents prepared by the Company to comply with the Code.

As a part of our audit of the financial statements we are required to obtain an understanding of the accounting and internal control systems sufficient to plan the audit and develop an effective audit approach. We are not required to consider whether the Board of Directors' statement on internal control covers all risks and controls or to form an opinion on the effectiveness of such internal controls, the Company's corporate governance procedures and risks.

The Code requires the Company to place before the Audit Committee, and upon recommendation of the Audit Committee, place before the Board of Directors for their review and approval, its related party transactions distinguishing between transactions carried out on terms equivalent to those that prevail in arm's length transactions and transactions which are not executed at arm's length price and recording proper justification for using such alternate pricing mechanism. We are only required and have ensured compliance of this requirement to the extent of the approval of the related party transactions by the Board of Directors upon recommendation of the Audit Committee. We have not carried out any procedures to determine whether the related party transactions were undertaken at arm's length price or not.

Based on our review, nothing has come to our attention which causes us to believe that the Statement of Compliance does not appropriately reflect the Company's compliance, in all material respects, with the best practices contained in the Code as applicable to the Company for the year ended June 30, 2019.


Chartered Accountants
Karachi

Dated: August 26, 2019

Description of Facilities **Location & Layout**

NRL is located in an industrial zone (at 24°50'46"N, 67°07'32"E), in the Korangi district, to the east of Karachi, Sindh Province, Pakistan. Its Storage and distribution Terminal is located at Keamari, the port district in the south of Karachi (at 24°48'58" North, 66°58'52" East) about 18km away from the Refinery, and is linked to the Refinery via 4 pipelines. Karachi is the largest city in Pakistan (population approximately 21.2 million) located on the Arabian Sea in the south of Pakistan.

National Refinery Limited:

NRL, is the largest petroleum-refining complex of Pakistan and comprises of three refineries & a BTX plant located in the industrial zone of Korangi in Karachi Metropolitan Area, 15 KM South East of the center of Karachi. The company was incorporated on August 19, 1963 as a public limited company. NRL was nationalized under economic reform order in January 1972 and its corporate matters were entrusted to State Petroleum Refining and Petrochemical Corporation Pvt. Limited (PERAC) under the Ministry of Production. In 1998 the corporate control of NRL was transferred to the Ministry of Petroleum & Natural Resources and in June 2005, NRL was privatized through Privatization Commission of Pakistan and Management control was transferred to Attock Oil Group of Companies through sale of 51% equity stake of the company.



History:

The first Lube Refinery was constructed by SNAM Progetti of Italy in May 1964 having a capacity to process 0.6 Millions Tons of crude oil per year. The refinery commenced its production in 1966 having design capacity 76,200 tons of lube base oil and 110,000 tons asphalt per year.

In 1974, a turnkey agreement was signed between National Refinery Ltd and Industrial Export Import (IEI)

of Romania, to design and construct the Fuel Refinery with 1.5 million tons per year of crude oil refining capacity. The Fuel Refinery was commissioned in April 1977.

Its processing capacity was further increased to 2.2 million tons per year of crude oil in the year 1990.

In January 1974, NRL entered into an agreement with Nordon et Cie of France for the design and erection of an Aromatics Extraction Unit for the production of Benzene, Toluene and Xylene (BTX). It was the country's first petrochemicals unit integrated with the unit of the Fuel Refinery. The Project was completed and commissioned in April 1979 in order to meet the country's requirements of feedstock for Aromatic solvents and explosives production.

The setting up of BTX plant downstream of the Fuel Refinery has been a valuable product portfolio expansion measure as it provides pure petrochemicals i.e. Benzene, Toluene and Xylene for the specialty chemicals market. Toluene was made available for usage at NRL's own Lube Dewaxing Units, and also the requirements of Toluene for Defence purposes are fulfilled by NRL.

Over the years, the demand for Lube Base Oils (LBO) increased and a need was felt to enhance production of LBO, the value added product from the Furnace Oil, which was exported till 1986. A second Lube Refinery was therefore planned, for which basic engineering and design was carried out by C.E. Lummus of U.K. A turnkey agreement was signed between IEI of Romania and NRL in 1981 to construct a second Lube Refinery to produce 100,000 tons of Lube Base Oils and 100,000 tons of Asphalts. The second Lube Refinery was commissioned in January 1985.

At present NRL is the sole producer of Lube Base Oils, with a combined achieved production capacity of 190,000 tons/year of its two Lube Refineries. Besides, it produces 225,000 tons/year of road Bitumen from its Lube Refineries.



NRL has grown and developed with the country and today possesses a key position in oil refining sector of the country. The refinery complex of NRL consists of four production entities:

Raw Material:

Crude oil is the raw material for any refinery. The crude oil processed at NRL includes Arabian Light and local crude. The approximate ratio of imported Crude and Local Crude is 85% and 15% respectively. The crude oil is stored in tanks.

Crude oil is a mixture of different hydrocarbons in liquid

form, which is lighter than water. Crude oil of different origins has different compositions and quality. It also contains very small quantities of other elements like Sulphur, Nitrogen and some metals. Some quantity of water and salts are also present in the crude oil.

Chemicals Used:

Various types of chemicals are used in refining processes. Besides refining processes, various types of chemicals are also used in water treatment as well as in finished products. Some of the chemicals used in refining processes or as additives in finished products, with their specific functions are shown in Table I & II respectively.

Table – I
Chemical Used in Various Processes

Chemical Name / Brand Name	Function
Caustic Soda	For neutralization & removal of Sulphur compounds.
Ammonia	For pH control.
PERC (Perchloroethylene)	Uses at plat-forming unit and enhances the acid side reaction.
Sulpholane	At BTX unit Sulpholane is used in the extraction section.
Clay	In the fractionation section of BTX unit, clay is used to removed olefins.
Propane	Used in De-asphalting process. It acts as a solvent & separates the asphalt from the oil.
Furfural	To remove the non-paraffinic hydrocarbons from lube oil distillate at Furfural Extraction Unit.
Platinum catalyst	Plat-forming catalyst.
Cobalt Molybdenum Catalyst	Hydro treatment catalyst.
Methyl Ethyl Ketone	Used for de-waxing of lube oil.
De-emulsifiers	To break oil water emulsion in desalters.
Corrosion inhibitor	To combat overhead corrosion.
Hydrazine's	Anti oxidants in Boilers.
Anti scaling	To control scale formation
Hydrochloric Acid	Water Treatment Plant

Table – II
Chemical Used as Additive in Finished Products

Chemical Name / Brand Name	Function
Pour point depressant	To reduce the pour point.
Antioxidants	Used for aviation fuel.

Production Process (Fuel Refinery):

Crude oil is processed at fuel refineries to produce products like LPG, Motor Spirit, Kerosene, Aviation Fuels, High Speed Diesel and Furnace oil. The atmospheric bottom is used as feedstock for producing lube base oil at Lube Refinery. Different processes carried out at refinery are discussed below:



Desalting:

The purpose of desalting is to remove brine, solids and other insoluble impurities from crude oil. To accomplish this, crude is first preheated in heat exchangers in order to have the required viscosity normally in the range of 5-15 centistokes. Salts and sediments are removed in desalter by washing the crude oil with water (typically 2-4% of the total crude feed). These are settled with wash water and tend to form emulsions. The wash water is separated by electrostatic precipitation using de-emulsifiers.

The salts thus removed are mainly chlorides and Carbonates of Magnesium, Sodium and Calcium. They



cause corrosion downstream in the heat exchangers, furnaces and distillation units if not removed. The desalting process is an important upstream step to reduce the maintenance cost of the downstream equipments.

Distillation Process:

The desalted crude oil after preheating by heat exchangers and furnaces is fractionated in distillation tower. The distilled fractions of crude oil mainly consist of residue, gas oil and overhead (mixture of gases, light Naphtha, Heavy Naphtha, Kerosene and steam/condensate) products. The gas oil and kerosene are drawn off from side strippers where lighter ends are removed to maintain the flash point.



Naphtha Stabilizer and splitter:

Naphtha stabilizer is provided to remove light ends from full range naphtha. LPG separated during process is sent to storage. Stabilized naphtha is then charged to naphtha splitter where it is splitted into light naphtha and heavy naphtha fractions. Major part of heavy naphtha is upgraded at hydrobon and plat-forming units. Light naphtha is used for gasoline blending.



Merox Sweetening Units:

LPG, Light Naphtha, Heavy Naphtha and Kerosene are treated at Merox sweetening units in the presence of catalyst and thus Sulphur compounds are removed to make these products suitable for marketing.



Hydro-Treating Unit:

In the Hydro unit, Heavy Naphtha is treated with hydrogen rich gas stream at high pressure and elevated temperature in the presence of catalyst (Cobalt Molybdenum). The Sulphur present in Heavy Naphtha is converted to H_2S , Nitrogen to ammonia (NH_3), Halide to HCl and oxygen to H_2O . In this process hydro treated Naphtha is produced which is feed stock for Plat-Forming Unit.



Plat-Forming Unit:

Plat-forming is a catalytic reforming process to up-grade the Octane Number of the low octane hydro-treated Naphtha to produce High Octane Blending Component (HOB) for the production of motor gasoline or the feed stock for BTX Extraction Unit.

The treated Naphtha is the feed of plat-forming unit, which consists of a Bi-metallic catalyst (Platinum Rhenium and Aluminum oxide as a carrier). Basically, the plat-forming process is the re-arrangement of the molecules of Naphtha feed by changing the molecular structure of the hydrocarbons. The by-products of plat-forming unit are LPG, hydrogen rich gas (part of which is recycled in the

plat-forming process and remaining is used as a refinery fuel). LPG after sweetening goes to storage.



Propane Recovery Unit:

Liquefied Petroleum Gas (LPG) from plat-forming unit is further fractionated for production of high purity refrigeration grade propane. Propane is used In-house as solvent at Propane De-asphalting unit (PDA) and for refrigeration purpose at MEK units.



BTX Plant:

Based on Reformate as feedstock from the Fuel Refinery. The unit is designed to extract the aromatic by SHELL Sulfolane extraction process. This aromatic mixture is fractionated through multi stage distillation for the production of high purity Benzene, Toluene, and Xylene. The BTX unit has two sections:

- Extraction section
- Fractionation section.

In the Extraction Section Aromatics are extracted from the Reformat using the solvent "Sulfolane". Non-aromatics are pumped to storage after washing with water. They are used to blend in motor gasoline.

In the Fractionation Section Aromatic extract is clay-treated, to remove Olefins. Thereafter Benzene, Toluene, and Xylene are separated in fractionating columns.



Production Process (Lube Refinery):

NRL's two Lube Refineries were installed with a time gap of nearly 19 years with each other. The starting point of first Lube Refinery is a Crude Distillation Unit (CDU) and subsequent Vacuum Distillation Unit (VDU), whereas the Second Lube Refinery directly starts with a Vacuum Distillation as it takes feedstock from Fuel Refinery's Crude Distillation Unit (CDU). Whereas the downstream process units are same in basic technology, The second Lube Refinery designed in eighties has more sophisticated, advanced and energy efficient plants.



Atmospheric and Vacuum Distillation Process:

The Reduced Crude oil is usually heated to 395°C and fed to the Vacuum Distillation Tower, which is kept under high vacuum (26-27 inches of Hg). The gases from the top of the vacuum Tower are sucked by means of steam ejectors and condensed along with steam. The oil and water are then separated.

The lubricating oil distillates obtained by vacuum distillation process are about 47% of the feedstock and the remaining 53% is called Vacuum Residue, which is a valuable material as it still contains about 38% lube oil in it, which cannot be taken out by the above distillation process. It is therefore processed at the Propane De-asphalting Unit (PDA).



Propane De-Asphalting Process (PDA):

In this process the Vacuum Residue product i.e the heaviest residual portion of the vacuum distillation, is treated with propane for the production of heavy lubricating oils and asphalts. The process is carried out at a high-pressure approximately 480-525 psig and at a controlled temperature of 55°C to 70°C. Liquid propane acts as a solvent and dissolves higher fractions of oil and rejects the heavier asphalted material from the charge oil. The oil thus extracted from the feedstock is called de-asphalted oil and the material recovered from the bottom of the tower is termed as Asphalt. Propane is recovered from oil using Flash Towers, Stripping Towers.



Furfural Extraction Process:

In this process low viscosity index (LVI) non-paraffinic hydrocarbons of lube oil distillate are extracted from the lubricating oil distillates obtained from vacuum distillation unit & PDA units. In extraction process the charge oil is brought in contact with solvent (Furfural) counter-currently in a Rotating Disc Contractor (RDC) Tower. The RDC tower is operated and is full of oil and solvent. As the Furfural is heavier than oil, it travels to the bottom of the tower along with the extracted non-paraffins, which remain dissolved in it.

Finally the solvent and non-paraffin mix is drawn from the bottom of the RDC tower. The solvent has to be separated from the non-paraffin mix so that it can be



reused. The oil available near the top portion of the RDC tower from which non-paraffinic hydrocarbons have been extracted in the RDC tower is termed as “Raffinate”. This Raffinate also contains about 10-30% of Furfural. This Furfural is separated under a vacuum of 66 cm of Hg at a temperature of 205°C. The Raffinate (Lube oil) is the product from which non-paraffinic hydrocarbons have been extracted and its viscosity index (VI) is raised.



Methyl Ethyl Ketone (MEK) De-Waxing Process:

The de-waxing process is employed to remove the waxes from the raffinate oil by dissolving the raffinate in a solvent mixture containing Methyl Ethyl Ketone (55%) and Toluene (45%). The mixture of oil and waxes is then cooled to crystallize the waxes. The wax is then separated from the oil in the rotary filter.

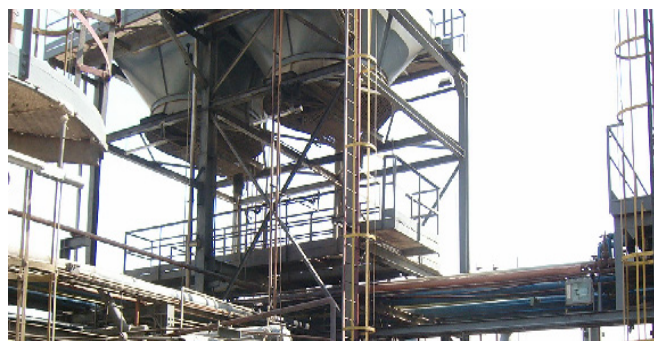
The wax and the filtrate oil are processed further in separate system in which the solvent is recovered by evaporation and steam stripping.



Hydro Finishing Process:

In this final processing stage, the lube base oils are stabilized and their colour is further improved by hydrogenation reaction in the presence of a catalyst.

The hydro finished lube oils are dispatched to refinery storage tanks for distribution to Oil Marketing and Lube Oil Blending Companies.



Diesel Hydro-Treating Block Design Capacity

a. Hydrogen Production Unit (305)

The Hydrogen Production Unit (HPU – Unit 305) is designed to produce 12837.6 Nm³/h of hydrogen (expressed as pure hydrogen) with a minimum purity of 99.9 vol%. The hydrogen production unit uses Natural Gas and Heavy Naphtha Arabian Light as feed-stocks according to the following cases at 100% plant capacity (Operating feed cases) with capacity:

Case 1	(100% Natural Gas)	12837.6 Nm ³ /hr (H ₂ Produced)
Case 2	(100% Naphtha)	12837.6 Nm ³ /hr (H ₂ Produced)
Case 3	(Mixed Stock 50% Natural Gas & 50% Naphtha)	12881.8 Nm ³ /hr (H ₂ Produced)



b. Diesel Hydro-treating Unit (306)

Distillate Union fining Unit (DHT) is designed to process 22600 BPSD of straight run feed and 7100 BPSD of uniflex feed to produce 29722 BPSD diesel product, which meet Euro IV specification.

The Distillate Union fining Unit shall be capable of operating in the range of 60% to 110% of its design capacity.



is converted to H₂S, Nitrogen to Ammonia (NH₃), Halide to HCL and Oxygen to H₂O. In this process, Hydrotreated Naphtha is produced which is feedstock for PENEX unit.

DESIGN CAPACITY: 7395 BPSD
Commissioning Date: 24-June-2017



Naphtha Block Design Capacity

a. Naphtha Splitter (U-307)

In Naphtha Splitter, the light Naphtha is split into light and heavy fractions. The light naphtha C₆- is then sent to Naphtha Hydro treating Unit for the removal of undesired impurities which then becomes a feedstock for the Isomerization unit while the heavy material C₇+ is sent to a Merox Unit.

DESIGN CAPACITY: 14,154 BPSD
Commissioning Date: 24-June-2017



b. Naphtha Hydrotreating Unit (U-308)

In the hydro treating unit, Light Naphtha is treated with hydrogen rich gas stream at high pressure in the presence of catalyst HYT-119. The Sulphur present in Light Naphtha

c. PENEX/DIH Unit(U-309)

The Penex Process is a continuous catalytic process used in the refining of crude oil. It isomerizes light straight run naphtha (C₅/C₆) into higher-octane branched C₅/C₆ molecules. The feedstock is passed through a DIH (Deisohexanizer) column whose end product typically has an octane rating of 87.5-88.0. The core of operation is to obtain the maximized product yield, the best product quality and the longest catalyst service life under the precondition of safe and stable operation

DESIGN CAPACITY: 6793 BPSD
Commissioning Date: 10-October-2017



Sulphur Recovery Block Design Capacity

a. Amine Treating Unit (U-310)

Amine treatment unit is design to remove acid gas (H₂S) from DHT, NHT off-gases using amine absorption and regeneration.

Off-gases fed to amine absorber where these gases counter currently contacted with MDEA solution to absorb H₂S while H₂S free gases called sweet gases sent to fuel gas system of refinery.

Rich amine from absorber, U-306(DHT) and U-312(SRU) sent to regenerator stripper column where H₂S is stripped out and sent to U-312(SRU) while regenerated lean amine again distributed back to absorber, U-306(DHT) and U-312(SRU).

Commissioning Date: 17-Jun-2017
Off - Gas: 353488.0 Nm³/Day
Rich Amine: 33426.7 Barrels/ Day



b. Non Phenolic Sour Water Stripping Unit (U-311)

Non-phenolic sour water stripping unit is design to remove acid gas (H₂S) from non-phenolic sour water coming from U-306 (DHT), U-308(NHT) and U-312(SRU) while H₂S free stripped sour water sent back.

Sour water is fed to stripper column where H₂S is stripped out and sent to U-312(SRU) while stripper bottom product called stripped sour water is sent back to DHT/ NHT (as per requirement) and API sewer.

Commissioning Date: 20-Jun-2017
Non-Phenolic Sour Water: 5230.0 Barrels/ Day



c. Sulfur Recovery Unit (U-312)

Sulfur recovery unit is designed to convert H₂S rich acid gases into >99.9% pure elemental sulfur through modified Claus process.

tail gas from Claus process is sent to tail gas cleaning unit to reduce the SO_x emission up to 400 mg/Nm³ and recover maximum sulfur from acid gas.

Liquid sulfur degassing section is provided to remove free and dissolved H₂S from liquid sulfur product.

Commissioning Date: 01-Jul-2017
Sulfur Production: 38 M.Tons / Day
Product Purity: ≥ 99.8 wt. %



d. Sulfur Solidification Unit (U-312X)

Liquid sulfur is converted into solid sulfur granules in sulfur solidification granulator and stored in storage silo.

Commissioning Date: 10-Jul-2017
Sulfur Production: 132 M.Tons / Day
Product Purity: ≥ 99.8 wt. %



Oil Movement And Shipping:

Huge quantity and variety of crude oils i.e about 3 million tons per annum and about equal tonnage distributed in about thirty products are handled at NRL. For this, elaborate system of pumping stations, pipelines, tackage and loading gantries are maintained. The inventory of crude oil and products stored at refinery tackage has enormous monetary value. This operation involves receipt and transfer of crude oil from port terminal, inland domestic crude oil receipts, transfer to and receipts from processing units, product transfer to Oil Marketing Companies and product shipment through tank lorry filling gantries.

About 150 Nos. crude oil and product storage tanks are utilized for this purpose. Shipping, Marketing & Sales Departments work side-by-side with Oil Movement to facilitate documentation's and coordination with Excise Authorities.



Asphalt Production:

The residual effluents from the two Propane De-Asphalting Units and Furfural Extraction Units are blended here for the production of paving grade asphalts. At asphalt filling unit it is filled in drums or filled in tank lorries for Marketing.



Keamari Terminal:

NRL maintains a port terminal installations located at Keamari Oil peers about 18 Km from the Refinery premises. The Keamari Terminal is connected with the main Refinery through Korangi-Keamari pipelines. Very large Crude Oil storage tanks at Keamari Terminal receive imported Crude from the oil tankers, which is then transferred to the Refinery through pipeline. Huge tackage is available for export of Naphtha, which is also handled at Keamari Terminal. Fuel products from the Refinery are pumped via Keamari Terminal manifolds to Oil Marketing Companies, located adjoining to Keamari Terminal.

Keamari Terminal has the facility to receive the products, to store into the tanks and to distribute the products to OMCs (Oil Marketing Companies).



Korangi-Keamari Pipeline:

Finished oil products are stored separately in premises at Korangi. The Lube base oil, Asphalt, and BTX are transported by road either in drums or in tankers. Fuel products are dispatched through Korangi-Keamari (KK) pipeline to Keamari Terminal and finally to OMCs (Oil Marketing Companies). Similarly imported crude oil received at Keamari terminal is pumped to crude storage tanks at Korangi site.



Utilities At Refineries:

The major utilities required for the operation of refineries are fuel oil / Natural gas, water, steam, and electricity. The steam is used for the following purposes:

- To operate the turbine driven pumps and compressors.
- As process steam.
- As atomizing steam for oil fired burners of furnaces
- For heating purposes.
- To pull vacuum by steam ejectors.

Water before feeding into boiler is treated at water treatment units to remove salts like calcium sulphate, calcium nitrates, magnesium-sulphate, and magnesium nitrates. Ion-exchange method is used to remove these salts.

Fuel Gas:

Refinery fuel gas demand is met by supply of natural gas from the Sui Southern Gas Company.

Flare System:

The Fuels refinery, Lube I refinery and Lube II refinery each have their own dedicated flare and elevated flare header systems with knock out drums. All the process controlled and emergency pressure relief is routed to these flares through flare headers.

The cooling water is used for the following purpose:

- Cooling the products.
- Condensing the vapors.
- Cooling of the equipments.

Cooling water cycle is a closed circuit system in which hot water from different sections of plant is collected, cooled in cooling tower in which heat is transferred from the water to the air by direct contact and again utilized with the addition of make up water.

a. Flare (U-314)

The Unit-314 Flare system has been designed for the maximum relief load which is expected in correspondence of General Electrical Power Failure for the Phase 1, Phase 2 and existing Lube 2 Refinery. Flare comprises of two individual flare, Hydrocarbon Flare and Acid Gas Flare which shall share a common flare structure support (Demountable flare system)

Licenser: UOP Callidus
Hydrocarbon Flare: 1751660 Lb/H (794552 Kg/H)
Acid Flare: 101633Lb/H (46101Kg/H)
Commissioning Date: 12th June 2017

Reverse Osmosis Plant:

The shortfall in water supply from Karachi Water & Sewerage Board has been partially managed by installation of 100,000, 200,000, 300,000 & 400,000 Imperials Gallons per day four R.O Plants. It is designed on underground

brackish water source for which wells have been made to supply raw water. 02 ROEDI (Electric De-Ionizer) plants were commissioned in 2018 Where products of all 04 RO's is being treated to form boiler feed water.



Power Generation:

Self-Power Generation plant has two 7.5 MW steam turbo-generator and 4.0 MW & 8.2 MW Diesel-Fuel Oil Engine Power Generator.

The self-power generation is meant for continuous uninterrupted power supply and to avoid plant shutdown and production loss due to power breakdown.



Quality Control And R & D:

Each and every product leaving the refinery has to conform to stringent international specifications. In order to achieve this fine degree of control, extensive monitoring of crude oils, feed stocks, intermediates, finished products and utilities is carried out with the aid of modern sophisticated instruments.

The role of the laboratory is, however, not limited to this activity alone. Research and Development work is carried out to give a basis for innovations in processes and products.

NRL strives to satisfy the customer by providing best value products within specifications. Close monitoring of refinery operations is coupled with testing of samples of intermediates and finished products on round the clock basis. Strict quality controls are ensured through testing and certification of each petroleum product before pumping to marketing companies.



Safety And Fire Fighting:

Crude oil and petroleum products are highly inflammable and dangerous materials. Therefore adequate precautionary and preventive measures are mandatory for safe operation. Safety and Fire Fighting personnel are responsible to ensure implementation of safety procedures developed to maintain safe conditions at plant during operation and maintenance to avoid accidents. A fully equipped and well trained Fire fighting contingent is available round the clock with fleet of fire fighting trucks and adequate inventory of foam to handle emergencies.



Maintenance And Workshop:

Petroleum refining involves high temperature and high-pressure technologies utilizing high-pressure reactors, vessels, towers, heat exchangers, furnaces, pipelines, pumps and compressors along with sophisticated instrumentation and electrical installations.

Reliability of Refinery equipments running round the clock basis is ensured through regular monitoring, preventive maintenance and repairs by the Maintenance Departments. Operational history of each equipment is maintained for diagnosis and to plan the future needs. Complete shutdowns of units are planned for preventive maintenance and replacements to avoid breakdowns and forced shutdowns.

The Workshop, a vital unit of Maintenance department provides support to the production by undertaking necessary repair in case of contingencies. The Workshop possesses

sophisticated machinery for undertaking repair work and fabrication of parts to ensure continuous refinery operation.



Ware House:

National Refinery Limited maintains a large Warehouse for storing mechanical spares and supplies for the maintenance of refinery equipment. Warehouse is also responsible for storing and supply of chemicals used in refinery processes. A large number of different parts and supplies of high value are stored and maintained in NRL Warehouse. An elaborated re-ordering system is followed so that quality product supply is ensured at all points in time.



Effluent Treatment Plant

Process areas are paved and sloped with drainage channels in and around the process plants. The LPG bullets storage area is also paved and sloped. Liquid effluent from the refinery plants is routed to the waste treatment plant on site.





National Refinery Limited



Occupational Health, Safety, Environment & Quality

Policy Statement

National Refinery Limited is committed to the **Occupational Health & Safety** of its employees, protection & continual improvement of the **Environment** and to produce **Quality** products to the satisfaction of customers.

It staunchly believes in the application of this commitment to its customers, contractors, suppliers and the community in which it operates to produce value added products. This guiding principle shall be used to demonstrate through the following:

- Carry out business in a manner to **prevent injury/ ill health** of entire workplace and community.
- Work on the principle that all **incidents can be prevented**. Therefore, vigorously promote a high standard of safety consciousness and permit to work system.
- Provide a safe working environment through **effective leadership** by supporting safety, fire protection & security programs and by protecting assets of the company.
- Develop contingency and emergency **preparedness plans** to minimize harm from any incident.
- Comply with **applicable laws and regulations**. Interact with government, industry and community on environmental issues.
- **Prevent pollution** by establishing programs to conserve energy, continually improve production processes, minimize wastes, harmful releases into the air, land and sea.
- **Continual Improvement** in Health, Safety, Environment & Quality Management and its performance by acquiring superior professional competencies, value addition & improvement in development of Human Capital.
- Periodically **evaluate performance** against established objectives.
- Provide **training** and create awareness to ensure that all employees, contractors and all stakeholders are fully informed about HSEQ policy.

Chief Executive Officer

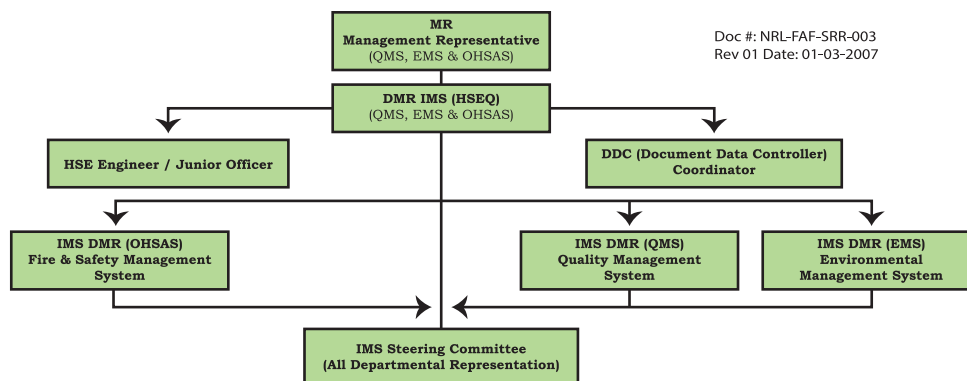
NRL-POL-001

Rev-03 / April 2008

IMS (HSEQ) Management System

(based on ISO 14001:2015 ISO 9001:2015 OH&SMS 18001:2007)

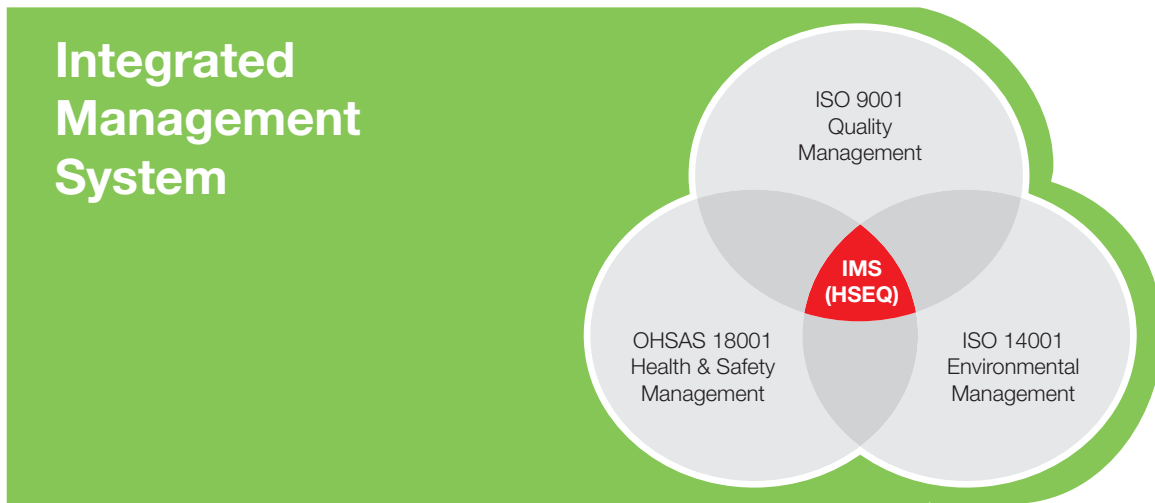
IMS (HSEQ) Responsibilities Chart



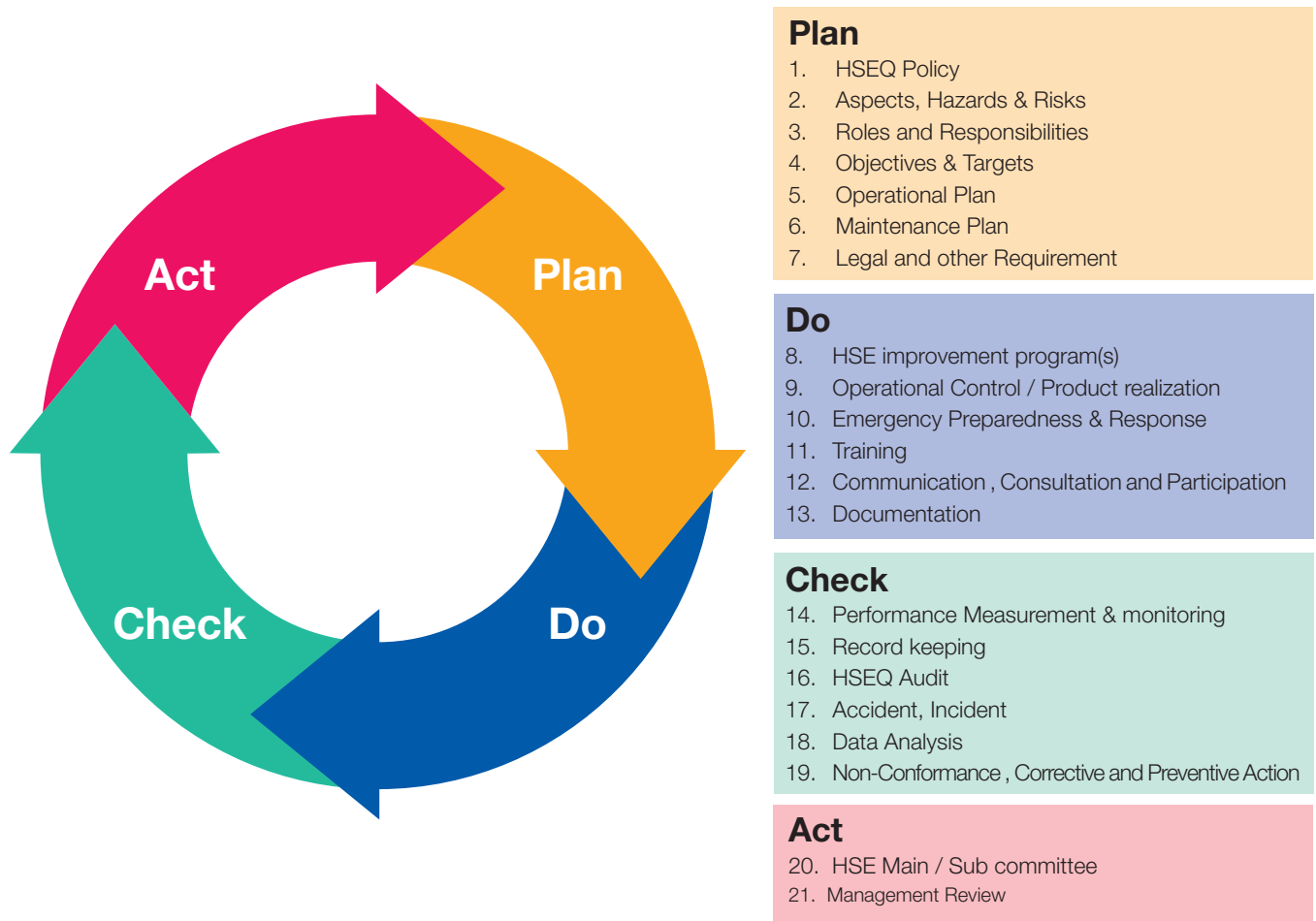
IMS (HSEQ) Mandatory Requirements Compliance Mechanism:

S.NO	System Procedure No	System Procedure Title
01	NRL-SPR-DDC-001	Document Data Control And Record Management
02	NRL-SPR-MRM-002	Management Review Meeting
03	NRL-SPR-SRR-003	Structure, Roles, Responsibilities and Accountabilities
04	NRL-SPR-CPA-004	Corrective and Preventive Action
05	NRL-SPR-AWT-005	Awareness, Training and Competence
06	NRL-SPR-CAC-006	Communications, Consultation and Participation
07	NRL-SPR-MAM-007	Calibration, Monitoring and Measurement
08	NRL-SPR-EVC-008	Evaluation of Compliance
09	NRL-SPR-AUD-009	Internal Audit
10	NRL-SPR-EPR-010	Emergency Preparedness and Response
11	NRL-SPR-TRR-011	Tracking of Regulations and other Requirements
12	NRL-SPR-AAP-012	Agency Approvals for EMS & OHSAS
13	NRL-SPR-OCP-013	Operational Control
14	NRL-SPR-CCP-014	Contractor Control
15	NRL-SPR-AIA-015	Environmental Aspects & Impacts Analysis
16	NRL-SPR-EOT-016	Environmental Objectives, Targets and Management Programs
17	NRL-SPR-HRA-017	Occupational Health & Safety Hazards Identification and Risks Assessment
18	NRL-SPR-OTM-018	Occupational Health & Safety Objectives and Management Programs
19	NRL-SPR-RIP-019	Review of (HSEQ) Identified Projects
20	NRL-SPR-NCR-020	Control of Non-Conforming Product
21	NRL-SPR-QOB-021	Quality Objectives, Targets and Analysis of Data
22	NRL-SPR-PRO-022	Process Risk and Opportunity Management

Integrated **Management System**



IMS (HSEQ) **Management System**



Emergency Preparedness and Response

S.NO	Procedure No	Procedure Title / Situation Description
1.	NRL-SPR-EPR-010	Emergency Preparedness and Response
2.	NRL-SPR-OCP-013	Operational Control
3.	NRL-SOP-ADM-005	Emergency Response Plan for Telecommunication failure external
4.	NRL-SOP-ADM-009	Rain Emergency Management
5.	NRL-SOP-PGR-006	Procedure for Power Supply arrangement during failure of TG/DG
6.	NRL-SOP-PGR-018	Load / Supply arrangement during failure of any source or all sources
7.	NRL-SOP-HSE-006	Emergency Response Plan for Oil Spillage from a storage tanks
8.	NRL-SOP-HSE-007	Emergency Response Plan for Chemical Spillage
9.	NRL-SOP-HSE-008	Emergency Response Plan for K-K pipeline leakages
10.	NRL-SOP-HSE-009	Contingency Plan for Terrorist Attack (Bomb Threat)
11.	NRL-SOP-HSE-010	Emergency Response Plan for Flood Control
12.	NRL-SOP-HSE-011	Emergency Response Plan for propane / LPG Handling / Mass release of flammable gases
13.	NRL-SOP-HSE-017	Evacuation Procedure for Lube-I
14.	NRL-SOP-HSE-018	Evacuation Procedure for Lube-II
15.	NRL-SOP-HSE-019	Evacuation procedure for Fuel Refinery
16.	NRL-SOP-HSE-020	Evacuation Procedure for Old Boiler House Utilities
17.	NRL-SOP-HSE-021	Evacuation procedure for Boiler-V / Power Generation
18.	NRL-SOP-HSE-022	Emergency Response Plan for Earthquakes
19.	NRL-SOP-HSE-024	Procedure for Management Block evacuation in case of Fire, Bomb Threat, or other emergencies like earthquake
20.	NRL-SOP-HSE-025	Procedure for Mock Drill (Fire) Korangi and Keamari Terminal
21.	NRL-SOP-HSE-026	Emergency Response Plan for handling spillage of oil due to leakage of pipelines in pipe alley, all tank lorries, including JP-I / JP-8 Bowzers
22.	NRL-SOP-HSE-027	Evacuation procedure for Shipping & Excise Building
23.	NRL-SOP-HSE-028	Procedure for Operation Block evacuation in case of Fire, Bomb Threat or other emergencies like earthquake
24.	NRL-SOP-HSE-029	Evacuation procedure for O.M-I office
25.	NRL-SOP-FPR-002	Fire Watch Coverage Procedure
26.	NRL-SOP-FPR-005	Safety requirements for Excavation
27.	NRL-SOP-FPR-006	Live Fire Drills / Exercise at Korangi Refinery
28.	NRL-SOP-FPR-007	Emergency Response Plan of Handling or Establishing Fire Fighting arrangement for combating fire like situation at K-K Pipelines
29.	NRL-SOP-FPR-008	Fire Fighting Plan for Korangi refinery
30.	NRL-SOP-FPR-009	Fire Fighting Plan for NRL Keamari Terminal
31.	NRL-SOP-FPR-010	Fire Drill / Exercise at Keamari Terminal



32.	NRL-SOP-FPR-016	Hose Handling practice
33.	NRL-SOP-FPR-012	Ensuring the fire water network operability and reliability testing to ensure the integrity & sustainability to meet emergencies
34.	NRL-SOP-OKR-024	Emergency Response plan for oil spills from carrying crude oil (Having heavy leakage from its body)
35.	NRL-SOP-OKR-025	Emergency Response Plan to control the leakage from Bottom / Shell of a storage tank to recover spilled oil from the area
36.	NRL-SOP-OKR-026	Emergency Response plan increase of overflow of a storage tank
37.	NRL-SOP-OKR-032	Emergency Response Plan for un-loading of asphalt tank lorry having leakage from its body
38.	NRL-SOP-OKR-036	Handling of field & empty chemical drums / container, contingency plan of chemical drums / container
39.	NRL-SOP-OKR-046	Emergency Response Plan for handling spillage of JP-8 tank lorry having leakage from its body
40.	NRL-SOP-LR1-001	Emergency Shutdown Procedure for PDA-I Unit
41.	NRL-SOP-LR1-008	Emergency shutdown procedure for Two-Stage / Bender Unit
42.	NRL-SOP-LR1-012	Emergency Shutdown Procedure for FEU-I Unit
43.	NRL-SOP-LR1-017	Emergency shutdown procedure for BTX unit
44.	NRL-SOP-LR1-026	Emergency shutdown procedure for MEK/HFU Unit
45.	NRL-SOP-LR1-031	Handling of filled chemical drums contingency plan.
46.	NRL-SOP-LR2-001	Emergency shutdown of Vacuum Distillation unit incase of power failure
47.	NRL-SOP-LR2-008	Emergency shutdown procedure of Propane De-Asphalting unit
48.	NRL-SOP-LR2-016	Emergency shutdown operating procedure for FEU unit of Lube-II Refinery
49.	NRL-SOP-LR2-025	Emergency shutdown operating procedure for MEK unit of Lube-II Refinery
50.	NRL-SOP-LR2-036	Mitigation plan / Procedure for Heat Exchanger leakage from flanges
51.	NRL-SOP-LR2-042	Emergency Shutdown procedure for MEK Dilchill Dewaxing unit
52.	NRL-SOP-FRE-007	Emergency shutdown procedure of 101-Crude Distillation Unit
53.	NRL-SOP-FRE-034	Mitigation plan / Procedure for heat Exchanger leakage from flanges
54.	NRL-SOP-FRE-041	Emergency shutdown procedure of naphtha Hydrobon and Platforming unit in case of power failure, steam failure, cooling water failure, charge oil
55.	NRL-SOP-FRE-046	pump failure, instrument air failure, 102-F1/F2 Tube Rupture Emergency shutdown procedure of Propane Recovery unit in case of steam failure, cooling water failure, instrument air failure
56.	NRL-SOP-TLW-009	Evacuation procedure for Workshop
57.	NRL-SOP-TLW-015	Emergency Response Plan for malfunctioning of workshop machine
58.	NRL-SOP-OKT-014	Procedure for Evacuation of Keamari Terminal
59.	NRL-SOP-OKT-022	Emergency Preparedness and Response Plan for Keamari Terminal
60.	NRL-SOP-OKT-024	Procedure for Mutual Aid Emergency Response (MAERP) & Communication Management System for Oil Installation area at Keamari
61.	NRLSOP-WHS-010	Procedure for Contingency plan for Chemical spillage
62.	NRL-SOP-WHS-011	Evacuation procedure for HR training center / Ware House / LMC
63.	NRL-SOP-OKT-024	Mutual Aid Emergency Response Plan
64.		National Marine Disaster Contingency Plane
65.		Business Continuity Plane

Risk Control - Management Systems

The NRL management structure is a typical hierarchical organisation (see below Organogram).

The staff at NRL is generally educated to a high level, and NRL exhibit a high level of investment in training of their personnel. There is a well-resourced Human Resource Development Centre (HRDC) which manages all staff training. For example, each year every Department has training on relevant Standard Operating Procedures (SOP), with typically in excess of 5,000 man-hours of SOP training per year. Turnover of non-MPT staff is low and the site has an apprentice scheme to replace employees who leave. The site also has a graduate training scheme. A large number of these graduate trainees leave for opportunities abroad when their training is complete.

The refinery management system, procedures and documentation is well-managed and has received ISO-9001, ISO-14001 and OHSAS 18001 accreditation. M/s. ANM transformational solution through NQA certification Limited.

Training

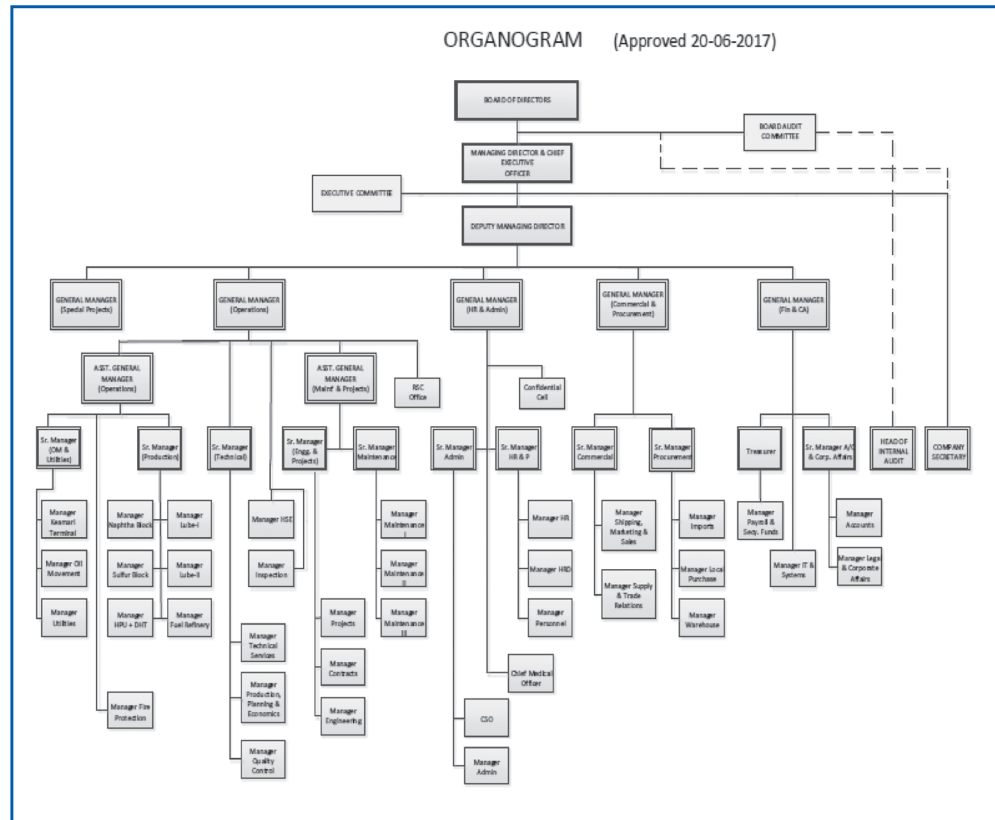
The Operator training program is well established. The training programme includes training in standard operating procedures, emergency operating procedures and skills based training. New Operators with a Technical Diploma receive 4 months classroom and 20 months on the job training, with formal assessment every 3 months. The classroom training is conducted in the dedicated Human Resource Development Centre (HRDC).

As discussed above, Operations have increased the number of Apprentice recruits in preparation for the

new upgrade project. The general strategy is to train the new Apprentices on the existing units; then to release the more experienced Operators for training on the new units. The existing Operators do not have any experience of operating a DCS, but the training plan includes sending the Operators off-site for simulator training; and sending the Operators to the Attock Refinery in Rawalpindi for on-the-job training with the DCS Operators at that site.

Graduate Production Engineers undergo a 1-year training programme. It includes training on Standard Operating Procedures and technical training by HRDC experts. In addition, Engineers are sent abroad for specific technical training as required.

There is on-going HSE and technical training programme for all Operators and Engineers, managed by the HRDC. This includes annual refresher training on Emergency and Standard Operating Procedures.



Permit to Work System

All maintenance and project work on the process plants are controlled through the Permit to Work system. The Maintenance or contract staff planning the work must prepare a job method. There is a lock out/tag out system for electrical and mechanical isolations. For electrical isolation this requires a lock and tag on the switchgear in the sub station. Entry to electrical rooms is only by authorized personnel i.e. Electrical Technicians and Supervisors. For process and pipe isolations, double isolation including blinds at pipe ends is required. Valves are locked closed and tagged with relevant information.

The work permit includes work risk assessment, precautions and formal handover sections for Maintenance/contractors and Operations. A copy of the completed work permit is retained by Operations. In addition to Cold Work and Hot Work there are permits for excavation, confined space entry, crane operations, radiography, scaffolding and vehicle entry in restricted process areas. The permit to work system also controls any work activity around the pipeline corridor from the refinery to the terminal.

Each permit is valid for one shift and all jobs in the field are overseen by Field Operators. For critical hot work, fire watch is provided at the work site (during the work and for 30 minutes after completion of the work) and portable continuous gas detectors are placed near the work area. Atmospheric flammable gas readings are also taken and recorded.

All active maintenance jobs on the plants are entered in the relevant plant control room logbook, and a separate register is maintained containing instructions regarding the on-going work.

Control of Ignition Sources

Smoking or use of mobile phones is not allowed in the process and storage areas. Matches and lighters must be left at the site entrance gate, and there are designated smoking shelters on site. Use of electrical equipment by contractors is strictly controlled. The equipment has to go through an authorization procedure, requiring assessment of the equipment according to the relevant area electrical classification. Vehicle access to restricted process areas requires a vehicle entry permit. All staff or contractor vehicles which have to be used in the process or storage areas must be fitted with flame arrestors.

Emergency Shutdown (ESD) System By-Pass

If an ESD has to be bypassed, there is a form which must be completed and authorized by Area Operations and

Maintenance management, and retained in a file in the local control room. A Hazard Analysis is required for any ESD bypass needed for longer than a shift. The forms retained in the local control room were reviewed and it was confirmed that all ESD bypasses were properly authorized and completed within a shift.

Bypass of other critical equipment, for example essential for fire response is strictly controlled through appropriate authorizations and every activity is logged.

Operating Procedures

Manuals of controlled process operating procedures are kept in the control rooms. A copy of emergency procedures is also kept in each control room. The procedures show clearly the name of the procedure, the affected department, the last review date and the next review date.

The refinery is IMS (HSEQ) certified, and as part of certification the procedures are reviewed annually. A copy of emergency procedures is also kept in each control room.

Handover / Shift change

Because the instrumentation in the control rooms is panel-mounted digital and analogue controllers, the Panel Operators complete detailed log sheets with critical process data several times per shift. The Field Operators have a checklist which they complete every four hours, logging critical plant data. The Shift Foremen have a logbook in which they record all important plant issues. The Panel Operator log sheet, Field Operator checklist and Foreman logbook are all handed over formally at each shift change.

Likewise, in the oil Movements area, manual level readings for all tanks are recorded every four hours on a log sheet and handed over to the next shift.

House Keeping

Housekeeping in the plants, storage areas and buildings visited during the survey was found to be to a very good standard. Safety labels are displayed and equipment and pipe labels applied. Pipe trenches were clear of grass. Paintwork and fireproofing was generally in good condition. Pipe work drain plugs and blinds were also in place.

MAINTENANCE

The Maintenance Division / Section has three departments as follows –

- i) Maintenance I - responsible for the maintenance and repair of process area equipment.
- ii) Maintenance II - responsible for the maintenance and Operation of Power Generation.
- iii) Maintenance III - responsible for the maintenance and repair of the Boilers, Utilities equipment, Tank farm, Korangi to Keamari pipelines and Keamari Terminal.

The maintenance philosophy is largely preventive and is scheduled using the SAP Planned Maintenance module which was commissioned in 2014 when the site received SAP edition 6 (it was previously a paper-based system). Corrective Maintenance Work Orders are raised manually in a Job Order book by Operations and are then entered into the SAP Corrective Maintenance module by the Maintenance Planners. The work is then planned and scheduled by the Planner in SAP, with a link to the SAP Materials Stock module which enables materials to be assigned to the job as well as contract call-offs e.g. for scaffolding.

The turnaround (TAR) schedule is one refinery per year, so overall each refinery has a TAR every 3 years.

Rotating Equipment

The Maintenance team plans to carry out a full Preventative Maintenance (PM) survey on all critical rotating equipment every 3 months, and non-critical rotating equipment every 6 months. For operational reasons they have found this isn't possible. They therefore measure the completion of PM as a KPI and have a target of 80%. The PM survey is done using a checklist generated from SAP which includes checking alignment, greasing, lube oil quality and lube oil levels.

The Inspection Department carries out manual vibration checks more critical pumps and compressors every month. The compressors also have Bentley Nevada on-line vibration monitoring, which will automatically trip the machine on a high vibration reading. Daily checks are carried out on any machines which have a specific concern. The vibration monitoring data is recorded and trended in a spreadsheet database.

The diesel engine and steam turbine are maintained according to the OEM run hour guidelines. For example, the maintenance of the diesel engine ranges from 50-hour checks on levels and bearing screws to a full service at 64,000 run hours. The engine has now run for 85,000 hours and has had its full service.

Lube oil quality checks on all rotating machines are carried out quarterly. The oils are tested for gums, water and foam and the oil is changed if the quality is found to have deteriorated.

Fixed Equipment

All fire water/foam monitors are inspected and maintained every quarter.

Electrical

The refinery is currently going through a programme of changing oil filled 11kV switchgear and circuit breakers to dry vacuum type equipment. The switchgear is tested every turnaround (TAR) with the trip testing carried out by current injection. Equipment grounding and earthing checks are carried out at least every turnaround or whenever work is done on any equipment. Tanks earthing/bonding is checked at least every 3 months.

The refinery carries out PM checks on pump motors every month including the use of an infrared thermometer to check the temperature of the motor and switchgear in the MCC.

Bearings are replaced on all motors during every TAR with the HT motors sent to the Siemens workshops located 20 km from the refinery.

Transformer oil is tested annually by the Pak-Hy Oils lab located next to the refinery. The testing includes dielectric properties, viscosity and water.

Instruments

All instrument loops and relays are tested every turnaround, with all control valves and level legs removed for servicing. Trip loops e.g. for furnaces and levels on distillation columns, are tested once a month, without shutting the isolation valves (XVs). However, the full action of the valves is checked as part of trip tests during the start up procedure following each turnaround. Propane compressors, hydrogen compressors and refrigeration compressors have their own PLCs which allow on-line testing (Siemens machines). The ESD PLCs are manufactured by Allen Bradley, ABB and Siemens.

All the smoke detectors are tested and repaired as necessary each quarter by a third party contractor.

Spare Parts

The criticality of all spares has been identified from the criticality of the equipment and lead time for delivery of



the part (many parts and materials have to be imported). This information is in SAP so that spares ordering are automated. Critical equipment includes mechanical seals; heater tubes; exchanger bundles; and diesel engine and reformer compressor cylinder rings and liners.

All pump services have a standby spare, and a single pump has the capacity to operate in all services, meaning that plant operation has minimal exposure to pump failure.

Inspection

All equipment inspections are done using API codes, and procedures are documented. All static equipment including pressure vessels and pipes within the refinery and storage terminal are inspected during the turnarounds every three years. On the basis of observations made, major repair or replacement is planned in the next turnaround. In some cases immediate repair or replacement is also carried out if required.

The site Engineers are trained and certified by the Pakistan Atomic Energy Commission in radiography, UT and MT NDT techniques to level 1 and 2. For level 3 or API techniques, qualified contractors are used e.g. from SGS or Bureau Veritas to draw up equipment schemes of examination and inspection plans.

The Inspection Team carries out rotating equipment vibration monitoring. The refinery uses contract welders, certified by SGS. The work of contractors is supervised by the relevant Inspection staff, with welds checked using dye test and RT by Global Engineering.

Fixed Equipment

All static equipment including pressure vessels and pipes within the refinery and storage terminal are inspected internally during the turnarounds. In some cases immediate repair or replacement is also carried out if required. SGS Pakistan and Bureau Veritas carry out pressure vessel inspections. External visual checks and ultrasonic thickness measurements are taken once every year.

External inspection of tanks, including tank wall thickness measurements, is carried out on an annual basis. Paint thickness on all tanks is also checked every year. Tanks are inspected internally every 5-10 years.

LPG storage vessels are inspected externally annually, and internally every 10 years, which meets API 510 guidelines.

The internal inspections include radiography checks on the welds.

The four pipelines connecting the refinery and the terminal are buried and have cathodic protection. The voltages are checked at test poles along the length of the lines once per month. If an issue is suspected the lines are excavated and thickness checks are carried out.

The thickness of all cold pipes on the units is checked prior to each turnaround with the thickness of the hot pipes checked during the Turnaround. If any thinning is identified a repair is planned for the next turnaround or sooner if necessary. The thickness of the pipe is not necessarily checked in the same spot each time and the results are recorded.

The fire water main is underground, but there are pits installed to enable thickness checks to be made. Flexible hoses are tested on receipt and boiler fuel oil hoses are tested annually. Inspection and maintenance of Boilers is carried out annually by Government Inspectors. Cranes and chains are tested by third parties.

The crude distillation column (101-C1) vapor line had some corrosion problems in the past, leading to the line being upgraded from Schedule 20 to Schedule 60. There are now also corrosion coupons in place and corrosion inhibitor chemicals are injected. The corrosion is monitored closely and there have been no issues since upgrading to Schedule 60.

Furnaces are monitored continuously with skin temperature probes and daily visual checks for flame impingement. Thickness and hardness checks are done on the tubes during TARs, with the PDA units shutdown every six months to allow a full inspection of the furnaces. None of the furnaces operate at high temperature so that creep is not an issue.

Pressure Safety Valves (PSVs)

All safety relief valves (there are 530 on site) are inspected in every Turnaround and undergo pre-pop test. The pre-pop test results are kept for reference.

ENGINEERING

Design Standards

International design codes were used for the construction of the different process plants. The standards followed

vary depending on the EPC contractor and licensor and include Oil & Gas Authority Pakistan, API, ASME, NFPA, BS, ANSI; and those of Licensors such as UOP, Snamprogetti and ABB.

The Engineering section uses International standards for the smaller projects developed on site, principally ASME, API, ANSI and TEMA.

Management of Change (MOC)

The refinery uses a formal management of change procedure which has the following steps – Proposal & justification, Risk Review, Technical evaluation, Concept Approval, Detailed Engineering, Funding Approval, Document Control, Job Completion and Plant Change Closure.

Hazard Analysis is covered using a checklist to assist in the identification of risks. A HAZOP will also be carried out if deemed necessary.

The Engineering section has its own drawing office and draughts men, which manages updates to P&ID and other engineering documentation. The MOC process also required Operating Procedures to be updated and Operators to be trained as required.

Small modifications are handled in-house, but larger projects are handled through Third Party Contract Engineering companies in coordination with the in-house Engineering team.

Document Control

The drawing office uses an AutoCAD system. All existing P&IDs have been converted to CAD format. Only the draughtsman currently has access to the system and will print off copies of drawings and engineering documents on request. Modified drawings must be signed off by Operations Engineers as well as functional Engineers, the HSE Manager, the Engineering Manager, the Plant Manager and Operations Management.

HAZOP

The Management of change MOC process includes the requirement for a HAZOP to be done on all plant changes. This is managed by the HAZOP Committee which is chaired by the HSE Manager. The HSE Manager is an experienced HAZOP chairman, and he has now trained a number of Engineers on site to chair HAZOPs and to participate in HAZOPs.

EMERGENCY RESPONSE

Organization

The Refinery and Keamari Terminal each have their own dedicated full time fire brigades. The Refinery has a Superintendent, Foreman and six Fire Fighters per shift. The Terminal has a Superintendent, Foreman and three Fire Fighters per shift.

In addition, there are thirteen auxiliary Fire Fighters per shift in the refinery from Operations, the Laboratory and Security.

Fire & Safety Training

Full time firemen are trained on-site and by the Civil Defence Authority and National Institute of Fire and Technology.

On site fire training drills are conducted weekly for the fire crews and auxiliaries. The drills include pool fire, pump seal failure fire and breathing apparatus training. HSE Engineers observe the fire drills and record response times. Target response time is 5 minutes 30 seconds with typical average response time less than 5 minutes. This includes time for the fire tender to reach the location of the fire; laying water / foam hoses; and water on. In addition, there are weekly hose handling drills for the fire crews. The site also has its own fire training ground where live fire training is conducted.

Flood response and evacuation drills are conducted monthly, with the exercise observed, and response time for all personnel to evacuate the designated area measured by HSE Engineers.



Emergency Planning

The refinery has an emergency response plan which is controlled by the Health, Safety, Environment and Quality Management System. The plan details the organization and response to an emergency. It includes major emergencies such as flood, terrorist attack and major fire.

The Refinery Shift Controller (RSC) acts as the Emergency Coordinator and will call in a designated list of Managers in case of a major incident. The RSC's office will be used as the incident control room. There are also emergency response pre-plans for 18 specific, high risk incidents e.g. for a fire on the PDA compressor.

As discussed above, the emergency pre-plans are practiced regularly by the fire crews and there are regular site evacuation drills.

Mutual Aid

The refinery has a mutual aid Emergency Response Plan with the Pakistan Refinery Ltd and PARCO oil refineries (each approximately 4 km distant), and the three local Oil marketing companies at Keamari Terminal. The Terminal has participated in Government organized major oil spill exercises to test the National Marine Disaster Plan. These exercises include the Civil Defence Authority and other companies local to the Terminal.

Safety Organization

The site has a clear Occupational Health, Safety, Environment and Quality Policy which covers all HSE aspects. In addition, the Refinery achieved OHSAS 18001, ISO 9001 and ISO 14001 certification through NQA Certification Ltd. by Auditor / Assessor M/s. ANM transformational solution in 2018.

The site has three management level committees for the governance of HSE –

- The Management committee which includes all the site General Managers
- The Technical sub-committee which includes Managers from Operations, Maintenance Projects and Engineering
- The Non-technical sub-committee which includes all other non-technical Managers

These committees meet regularly to review audit reports, inspection reports and KPIs and agree actions and resources to address relevant HSE issues.

All the Safety & IMS Officers are experienced engineers and they cover all the process safety aspects, auditing

and regular reporting. Process safety KPIs are defined and are formally reported to the management in monthly meetings and to the IMS (HSEQ) Council Meeting every 6 months. In these meetings all the audits / compliance issues are discussed, actions reviewed and actions follow up and completion queried by the management.

NRL had achieved 30.54 million man-hours without a Lost Time Injury as on December 31, 2018. There is a monthly HSE Newsletter where key safety issues are highlighted and achievements publicized.

Safety, health and environment are part of the permanent topics of all the site management key meetings and included in the weekly operations meeting. The Safety Department is involved in refinery and terminal staff and contractor safety training, and maintains all safety-training records. They also, along with maintenance, check the suitability of contractor equipment, including site area classification requirements and equipment condition.

Safety Training

The site has an extensive training programme for all employees, managed by the HRDC and supported by the HSE team. Some elements of the training programme are Hazard Identification and Awareness, First Aid Training, Permit to Work, Use of Fire Extinguishers, Use of Explosimeters, Environmental Awareness, Use of PPE and Occupational Health Awareness.

In addition, the training programme includes the Emergency Response and Preparedness Training Program Where relevant, the above safety training is also given to Contractors.

There are regular toolbox talks, with briefs prepared for line management by the Safety team, based on internal and external incidents.

IMS (HSEQ) Auditing

To maintain the site ISO 9001:2015 (Quality Management System), ISO 14001:2015 (Environmental Management System) and OSHAS 18001:2007 (Occupational Safety & Health Management System) accreditations, there are internal and external audits carried out every year. In addition to this, internal audits of individual department of the Health, Safety, Environment and Quality Management Systems are carried out every year. To achieve this there are a number of trained internal auditors in each refinery Department.

The Civil Defence Local Authority, EPA and Federal Authority also conduct audits once a year.

A formal safety inspection is carried out on each of the seventeen different locations of refinery and terminal operating areas each month. These inspections are carried out by the asset teams using checklists provided by HSE Department. The HSE Department takes an overview of the inspections and reports findings to the HSE committees.

Incident Investigation

The refinery has a procedure for the investigation of incidents, accidents and near misses, including root cause failure analysis. Incidents are summarized and reported to the HSE committees every year. The refinery also has a system for reporting Near Misses called 'Corrective and Preventive Actions'. Any employee can raise one of these if they observe an unsafe situation and may recommend actions to be taken.

Permit to Work

Safety staff has a significant involvement in the Permit to Work System. Safety Officers carry out hydrocarbon (% LEL) tests for hot works. They also carry out toxic gas, oxygen level gas tests and including hydrocarbon (% LEL) tests for confined space entry work. Safety Officers also make daily safety walkabouts with operational staff, and carry out audits of all work permits using a detailed checklist.

The HSE Department provides in-house Permit to Work system training to the Hot Work Authorities and Cold Work Authorities.

Key Performance Indicators (KPIs)

The plant has a comprehensive set of HSE KPIs. This includes injury statistics, emergency exercise and safety training, environmental testing e.g. water and air quality, incident investigation and reporting, near miss reporting, training, toolbox talks, audits, safety communication and SOP reviews. There are also a number of Process Safety KPIs reported by separate Departments.

Security

The refinery is surrounded by high boundary walls topped with high barbed wire. There are manned watchtowers around the boundary wall. In addition, there are sentry posts around the process area which is regarded as the fall-back area for defence in case of a terrorist attack. To

the south of the refinery there is a second boundary wall separated from the main boundary. The administration buildings and main entrance to the refinery are within this walled area. The main entrance comprises a double fixed gate. All vehicles are searched upon entering the refinery. Personnel on foot pass through a metal detector. All matches and lighters must be left at the gate. There are a number of CCTV cameras around the boundary wall and within the refinery. The CCTV system is being upgraded to a Video Surveillance System which includes facial recognition, number plate recognition and movement detection.

Similar to the refinery, the terminal is also surrounded by a wall topped by barbed wire with watch towers and CCTV cameras.

Security vehicles patrol the pipeline corridor between the refinery and the terminal. There are two vehicles traveling in opposite directions continuously along this corridor.

The refinery has good relations with the local police and Rangers for support in local stations. There is a daily police patrol to the refinery. There are bi-monthly meetings with the police to keep apprised of security issues. The refinery has a security response plan which has been agreed with the national security service. This plan is audited and is exercised regularly by the security services. The site also carries out its own internal security exercises.

The refinery is surrounded by industrial areas to the North and South, and residential areas to the East and West. The refinery has good relations with the community to the East and many employees live in this community. However, the residential area to the West is not authorized by the local authority so the refinery and police maintain close surveillance of this area.

Active Process Protection

All process units have panel mounted analogue and digital control systems. The plants also have PLC-based Emergency Shut down (ESD) systems which protect the furnaces and major vessels from high or low levels, but there is no full plant make-safe system. The compressors all have local automatic shutdown systems which will trip the machine on high vibrations and high temperatures.

None of the PSVs are twinned, but all PSVs are pre-pop tested before being serviced during each TAR (every 36 months).

There are regular off-line vibration checks on all pumps using hand-held measuring devices.

Active Fire Protection

There are 4 electric (capacities: 2000, 2000 & 4000 igpm and 4000 gpm; 10 barg discharge pressure) and 3 diesel (capacities: 1660, 2000 and 2900 igpm; and 4000 gpm 10 barg discharge pressure) firewater pumps and 4 jockey pumps (04 Nos. 220 igpm each & 02 Nos. 200gpm each, maintaining a main pressure of 7 bar) at the Refinery site. They are located in a common, below ground level pump house adjacent to the fire station. The pump house is near the site entrance and well separated from the process areas. The pumps take suction from three open basin reservoirs and one storage tank (with a total storage capacity of 8.63 million gallons), as follows –

- Lube I, 4.2 million gallons
- Lube II, 1.13 million gallons
- New Basin, 2.6 million gallons
- S-80, 0.7 million gallons

The reservoirs are filled with fresh water supplied by pipeline by the Karachi Water Board. The main fire pumps are started manually as required.

There are also two 2 x 93 gpm foam pumps at the refinery which take suction from a dedicated foam tank. The foam is pumped into dedicated foam main where it is mixed with firewater. The foam main extends around the tankage area to supply foam to the tanks and process areas.

The fire pump capacity is sufficient to meet the worst-case scenario of a largest crude oil tank (tank S4) fire.

At the Keamari Storage Terminal there are 2 x 2250 gpm capacity electric firewater pumps and 3 x diesel pumps (capacities 2000 & 3000 gpm) taking suction from the 2 million gallon fire water reservoir. There is also an 842 gpm diesel pump at the jetty taking suction from the sea. The pumping capacity has been checked as sufficient to meet the firewater demand in the worst case scenario at the Terminal. The fire pumps are started manually as required.

In addition, at the Keamari Terminal, there are 2 x 116 gpm diesel foam pumps which take suction from a dedicated foam tank. The foam is pumped into dedicated foam main where it is mixed with firewater. The foam main extends around the Tankage area to supply foam to the tanks.

The refinery and terminal fire mains are sectionalized, to allow maintenance on one section of the main without having to shut down the entire main. There are 267 fixed firewater hydrants around the refining complex and 42

Fire hydrants in the Keamari terminal. In addition, there are fixed water and water/foam monitors in the refinery process areas.

The refinery firewater system is pressure tested twice per year at 12 bar, and the terminal fire water system is tested once per year at 9 bar. Fire hydrants are tested monthly and section valves are checked. Firewater pumps are run tested every day with an annual performance test.

Deluge Systems

All storage tanks at the Refinery and the Keamari Terminal (except some of the heavy lube oil and lube extract tanks) have water cooling rings at the top and half-way down the tank. The tanks also have fixed and semi-fixed foam pourers onto the floating roof seals and foam injection systems into the roof space. The eleven LPG and four Propane storage bullets have a water deluge system. There are fixed water and foam suppression systems on the API separators; and fixed water suppression systems on each floor in the Admin and Operations Building. All the deluge systems are automatic & manually operated.

Mobile Systems

At the Refinery there are a Suzuki Hi-Roof, a Suzuki Pick-up, a Fire Jeep, 2 ambulances and 5 Fire Tenders as follows –

- Mazda carrying 750 kg of dry chemical powder (DCP)
- National Foam / GMC carrying 1,900 litres of foam and 1,800 kg of DCP
- Meraj / Isuzu carrying 3,000 litres of foam and 2,500 litres of water
- Meraj / HINO carrying 3,500 litres of foam and 2,000 litres of water
- Meraj/ ISUZU carrying 8,000 litres of foam and 3,000 litres of water.

The fire tenders have an annual third party fitness for service certification.

There is FP-70 foam concentrate & Alcolac foam and of DCP stock at the refinery in drums and storage tanks. The quality of the foam stock is checked annually.

In addition there are DCP and CO₂ stanchion-mounted fire extinguishers located around the site.

At Keamari Terminal there is a fire jeep. There is foam stock and DCP stock. There is also a Port Authority fire station 10 minutes from the Terminal which will provide support in an emergency.

In addition there are DCP and CO₂ stanchion-mounted

fire extinguishers located around the terminal. All of the fire protection equipment is checked monthly.

Passive Fire Protection

Layout

The fuels refinery and the two lubes refineries are laid out in line. The Fuels refinery is in the middle with a 90m clear space to Lube II and a 60m clear space to Lube I. The layout within each Refinery is considered average to somewhat congested in parts. Overall layout is such that a vapour cloud explosion in one refinery complex is likely to cause major physical damage to that refinery and minor damage to the adjacent refinery complex. The new ISOM unit and Naphtha Hydro-treater which are part of the Upgrade project will be built in the vacant piece of land between the Lube II and Fuels refineries, which will increase congestion. The Diesel Hydro-treater, hydrogen plant and other units will be located in a location remote from the other process units to the north of the tankage area.

The pressurised LPG storage bullets are located well away from the process areas. Smaller atmospheric storage tanks for intermediate products are approximately 55 metres from the process plants; and the Crude oil and main products storage tanks are between 175 metres and 500 metres distant to the North.

Spacing between the crude oil storage tanks is greater than one diameter. The larger product tanks' separation is more than one diameter, with the smaller tanks' separation 0.5D or less. At the Terminal, the tanks are in individual concrete bunds. At the refinery, the larger tanks are in individual bunds, with the smaller tanks in common bunds. Some of the small intermediate storage tank areas have low kerbs. The bunds have concrete walls and earthen floors – the bunds are clean and well-maintained.

The electrical transformers are separated from the process units and are located within individual concrete buildings to contain any explosion; and penetrations into the MCC buildings are properly sealed. There is a dedicated transformer for each HV motor and each service has a main pump / compressor and spare. The site therefore does not have a single transformer supplying the HV network so that the impact of a transformer loss is reduced.

Fireproofing

In the process areas, there is concrete fireproofing of structural steel pipe rack and equipment supports. The

height of the fireproofing is according to the hazard perceived, typically varying from 4m to 8m.

Most equipment support tables / columns and column skirts are also fire proofed. The fireproofing was reported to be rated for 2 hours. LPG storage at the Refining site is in pressurised bullets, and their supports are fire proofed. There is no pressurised storage at the Keamari Terminal.

Process floor areas are paved and sloped. All the critical buildings are constructed with concrete and non-combustible materials.

Fire, Gas and Smoke Detection

Smoke detectors are installed in all Smoke detectors have also been installed in the Lube I, Lube II and Fuels refinery, CCR-1, CCR-2, PIB-1, PIB-2 and PIB-3 control room rack rooms.



FIRE ALARM CONTROL PANEL

Hazards, Evaluation and **Risk Assessment**

Frame Work

- OH&S hazards of Normal Operation
- OH&S Turnaround / Shutdown Operation
- Routine activities
- Non Routine activities
- Access to the work place
- Facilities at work place
- Absence of control measures

Hazards Categories

- Ergonomics Hazards
- Mechanical hazards
- Electrical hazards
- Pressure hazards
- Pneumatic hazards
- Falling hazards
- Biological hazards
- Noise hazards
- Vibration hazards
- Toxic hazards
- Radiation hazards
- Explosion hazards
- Chemical hazards
- Fire hazards
- Psychological hazards
- Traffic hazards
- Others

OH&S Hazards Impacts Categories

- Injury / Illness
- Disability / Death
- Production delays and interruption
- Asset Loss
- Property damage
- Tools and equipment damage
- Product and material damage

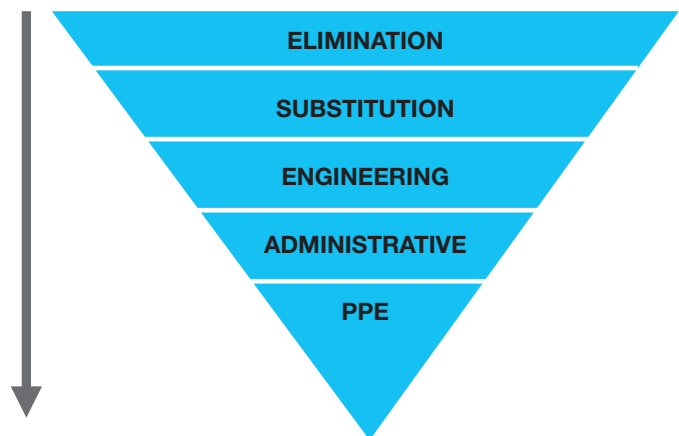
Evaluation of Risks Assessment for identified hazard

- Legislative and regulatory requirements
- Identification of the OH&S Risks face by NRL
- Review OH&S practices, process and procedures
- Evaluation of feed back from the investigation
- Audit results & Recommendations
- Direct inspection and measurement

Risks Control

- Residential hazard identified, even after current control measures, will be assessed for risk and classified under tolerable risks and un-tolerable risks.
- Measure taken with the principal of
Eliminate,
Substitute,
Engineering Control,
Administrative Control,
Personal Protective Equipment

If risk can not be converted into tolerable risk than PPE's used to reduce the impact



Hazard Risk Management

Facility / Operation / Activities / Process / Equipment	III Health Injury hazard	Hazard Potential Impact Towards III Health / Injury	Current Risk Control ▪ Meeting measures ▪ Preventive measures ▪ Mitigative measures
<ul style="list-style-type: none"> ➤ To receive imported crude oil from crude oil ship tanker through 30" dia pipeline. ➤ To load export Naphtha through 16" dia pipeline from storage tanks to ship tanker. ➤ Crude oil pumping through 14" dia pipeline from Keamari Terminal to NRL Korangi ➤ Operation of high-tension motors / pumps ➤ Product, pumping operation through pipelines from NRL to KT and then Oil Marketing Companies ➤ Pumping of effluent water to sea and recovery of oil 	VOC's emission	<ul style="list-style-type: none"> ➤ III Health due to vapors inhalation ➤ Air Pollution ➤ Degradation of air quality 	<ul style="list-style-type: none"> ✓ Define & documented SOP's for each activity along with record management ✓ Emergency Response Plan ✓ House keeping properly maintained. ✓ Auto tank gauging system and bob-gauge system monitoring. ✓ API sewer system properly cleared. ✓ Dyke wall properly sealed. ✓ Routine Maintenance regularly done. ✓ Training is being given to all concerned ✓ Preventive maintenance / inspection schedule is being properly followed. ✓ Earthing of tanks properly maintained. ✓ Provided security to safeguard pipeline in KPT trench. ✓ KPT maintains chikson arms, pipelines and valves in side BOP-I, II, III ✓ Sufficient lighting has been provided ✓ MSDS being followed ✓ Communication system walki / talkies & telephones are maintained in working order. ✓ Low and high level alarms are being provided on API to avoid backflow ✓ Preventive maintenance / inspection schedule implementation ✓ Electrical wiring is regularly inspected & maintained ✓ PPE's being used
	Overflow of tank	<ul style="list-style-type: none"> ➤ Water Contamination. ➤ Soil contamination. 	
	Fire	<ul style="list-style-type: none"> ➤ Human Injuries. ➤ Asset loss. 	
	Pipeline leakage	<ul style="list-style-type: none"> ➤ Water Contamination. ➤ Soil contamination. 	
	Falling hazard / Slippery hazard	<ul style="list-style-type: none"> ➤ Human Injuries. 	
	Spillage	<ul style="list-style-type: none"> ➤ Human Injuries / asset loss. ➤ Soil contamination. ➤ Water Contamination. 	
	Overflow of collecting tray	<ul style="list-style-type: none"> ➤ Soil contamination. ➤ Water Contamination. 	
	High temperature Product	<ul style="list-style-type: none"> ➤ Human Injuries. ➤ Asset loss. 	
<ul style="list-style-type: none"> ➤ Loading and Unloading of chemical drums / material through Fork lifter. ➤ Disposal of empty Drums 	Ergonomic Hazard	<ul style="list-style-type: none"> ➤ Human Injury 	<ul style="list-style-type: none"> ✓ Define & implemented SOP's for each activity properly implement along with record management ✓ Fork lifter load capacity being followed ✓ Designated area marking ✓ Display of sign boards ✓ Proper Illumination of area ✓ MSDS being followed ✓ Proper preventive maintenance of Fork lifter ✓ Emergency Response Plan ✓ PPEs being used
	Mechanical Hazard	<ul style="list-style-type: none"> ➤ Human Injury 	
	Falling Hazard	<ul style="list-style-type: none"> ➤ Human Injury 	
	Oil / chemicals spillage from empty Drums	<ul style="list-style-type: none"> ➤ Human Injury 	



Facility / Operation / Activities / Process / Equipment	Ill Health Injury hazard	Hazard Potential Impact Towards Ill Health / Injury	Current Risk Control ▪ Meeting measures ▪ Preventive measures ▪ Mitigative measures
➤ Gauging of petroleum products stored in fixed and floating roof tanks.	VOC's Emission	➤ Ill Health due to inhalation	<ul style="list-style-type: none"> ✓ Define & documented SOP's for each activity along with record management ✓ Emergency Response Plan ✓ Proper house keeping being maintained. ✓ Maintenance of Auto tank gauging system is being regularly done ✓ Training is being given to all concerned ✓ Preventive maintenance / inspection schedule implementation. ✓ PPEs being used.
	Falling hazard	➤ Minor / Major Human injuries	
	Minor spillage from pump seal / pipeline fittings	<ul style="list-style-type: none"> ➤ Soil / Water contamination. ➤ Human Injuries / asset loss. 	
➤ Chemical Handling and testing e.g. Acid, caustic, Ammonia etc.	Chemical hazard (Irritant and Toxic)	<ul style="list-style-type: none"> ➤ Injuries ➤ Burns 	<ul style="list-style-type: none"> ✓ Define & implemented SOP's for each activity properly implement along with record management ✓ Testing is carried out. ✓ MSDS being followed ✓ Emergency Response Plan ✓ PPEs being used
	Spillage / Leakage	<ul style="list-style-type: none"> ➤ Human Injuries / asset loss. ➤ Soil contamination. ➤ Water Contamination. 	
➤ Fire Tender / Vehicle Movement inside NRL	Traffic Hazard	<ul style="list-style-type: none"> ➤ Minor / Major Human injuries. ➤ Asset loss. 	<ul style="list-style-type: none"> ✓ Define & implemented SOP's for each activity properly implement along with record management ✓ Trained and HTV / LTV licensed holder drivers ✓ Safe speed limit being followed ✓ Designated area marking ✓ Display of sign boards ✓ Proper preventive maintenance of vehicle ✓ 3rd party fitness certification. ✓ Authorized driving by security department inside refinery ✓ Spark Arrestors are installed ✓ Emergency Response Plan
	Fire hazard	<ul style="list-style-type: none"> ➤ Minor / Major Human injuries. ➤ Asset loss. 	
➤ Vehicles Entry (In / Out)	Fire hazard	<ul style="list-style-type: none"> ➤ Human injuries ➤ Asset loss 	<ul style="list-style-type: none"> ✓ Define & implemented SOP's for each activity properly implement along with record management ✓ Vehicle speed limit 25 km / hr being followed ✓ Display of notice board/warning sign ✓ Designated area marking ✓ Spark Arrestors are installed ✓ Emergency Response Plan
	Bomb Threat	<ul style="list-style-type: none"> ➤ Human injuries. ➤ Asset loss. 	
	Traffic Hazard	<ul style="list-style-type: none"> ➤ Human injuries. ➤ Asset loss. 	

Facility / Operation / Activities / Process / Equipment	Ill Health Injury hazard	Hazard Potential Impact Towards Ill Health / Injury	Current Risk Control ▪ Meeting measures ▪ Preventive measures ▪ Mitigative measures
➤ Visitors / Labor Force (In / Out)	Terrorist Threat	<ul style="list-style-type: none"> ➤ Human loss. ➤ Human injuries. ➤ Asset loss. 	<ul style="list-style-type: none"> ✓ Define & implemented SOP's for each activity properly implement along with record management ✓ Visitors checking at gate ✓ Visitor passes issued ✓ Mobile phones are retain at gate office and issue token ✓ All types of fire material like lighter / matchbox are taken at gate ✓ Display of notice board / warning sign ✓ Communication with concerned department ✓ Emergency Response Plan
	Bomb Threat	<ul style="list-style-type: none"> ➤ Human loss. ➤ Human injuries. ➤ Asset loss. 	
➤ Sanitation Management	Biological Hazard (Microbial / Cross contamination, Transmission disease, etc)	<ul style="list-style-type: none"> ➤ Illness ➤ Infection 	<ul style="list-style-type: none"> ✓ Define & implemented SOP's for each activity properly implement along with record management ✓ Designated area marking ✓ Emergency Response Plan
	Insect Bits	<ul style="list-style-type: none"> ➤ Illness ➤ Infection 	
	Suffocation	<ul style="list-style-type: none"> ➤ Illness ➤ Infection 	
	Underground gasses	<ul style="list-style-type: none"> ➤ Human injuries ➤ Illness 	
➤ Solid Waste management	Mechanical Hazards	<ul style="list-style-type: none"> ➤ Illness ➤ Bleeding ➤ Headache ➤ Sinus 	<ul style="list-style-type: none"> ✓ Define & implemented SOP's for each activity properly implement along with record management ✓ Emergency Response Plan
	Chemical hazard (Irritant and Toxic)	<ul style="list-style-type: none"> ➤ Injuries ➤ Burns 	
	Biological Hazard (Microbial / Cross contamination, Transmission disease, etc)	<ul style="list-style-type: none"> ➤ Illness ➤ Infection 	
➤ Excavation using excavator ➤ Concrete mixer machine operation ➤ Operation for area dressing by hand shawl / tractor ➤ Asphalt mixing machine operation	Mechanical Hazard.	<ul style="list-style-type: none"> ➤ Injury / Illness ➤ Skin burn ➤ Back Ache problem 	<ul style="list-style-type: none"> ✓ Define & implemented SOP's for each activity properly implement along with record management ✓ Proper barrication. ✓ Follow Permit to Work System ✓ Flame arrestor is to be installed at exhaust ✓ Emergency Response plan ✓ Proper display board provided during activity ✓ Providing PPE's including dust mask.
	Electrical Hazard.	<ul style="list-style-type: none"> ➤ Injury / Illness ➤ Electrocution ➤ Skin burn 	
	Hazard of Collapse	<ul style="list-style-type: none"> ➤ Human loss. ➤ Human injuries. ➤ Asset loss. 	
	Noise Hazard	<ul style="list-style-type: none"> ➤ Hearing loss 	
	Heat & Temperature Hazard	<ul style="list-style-type: none"> ➤ Injury / Illness ➤ Skin burn 	
	Ergonomic Hazards	<ul style="list-style-type: none"> ➤ Injury / Illness ➤ Back Ache problem 	
	Fire Hazard	<ul style="list-style-type: none"> ➤ Human injury ➤ Property loss 	



Facility / Operation / Activities / Process / Equipment	Ill Health Injury hazard	Hazard Potential Impact Towards Ill Health / Injury	Current Risk Control • Meeting measures • Preventive measures • Mitigative measures
➤ Canteen Food and Burner Operation	Biological Hazard	➤ Ill health ➤ Food poisoning	✓ Define & implemented SOP's for each activity properly implement along with record management ✓ Emergency Response Plan
	Fire Hazard	➤ Human injury ➤ Property loss	
➤ Maintenance checking and on / off L.T motor breaker, Power cables, electrical equipments	Fire / Flash Hazard	➤ Ill health ➤ Minor and Major Human injury ➤ Asset loss	✓ Define & implemented SOP's for each activity properly implement along with record management. ✓ Inspection of breakers and monitor the current on ampere meter. ✓ Area barrication. ✓ Energizing / De-energizing. ✓ Completely check all the internally installed components before switching or starting the motor. ✓ Preventive maintenance schedule. ✓ Emergency Response plan. ✓ Ensure the proper insulation of cables. ✓ Ensure the proper earthing. ✓ PPE's being used.
	Electrical Hazard	➤ Injury / Illness ➤ Electrocutation ➤ Skin burn ➤ Electrical Shock	
	Heat & Temperature Hazard	➤ Injury / Illness ➤ Skin burn	
➤ Loading / Unloading & stacking of materials, general items, pipes, fitting sheets and spares through Crane / Lifter	Falling Hazard (Falling Object from height, Falling object on a moving machine, etc)	➤ Minor / Major Human injuries. ➤ Asset loss.	✓ Define & implemented SOP's for each activity properly implement along with record management Load chart to be checked. ✓ Certified crane to be used. ✓ Certified shilling wire to be checked. ✓ Area Marking. ✓ Follow the load chart. ✓ Emergency Response Plan. ✓ PPE's being used.
	Traffic Hazard (Movement of Crane / heavy vehicles)	➤ Minor / Major Human injuries. ➤ Asset loss.	
	Ergonomic Hazard	➤ Minor / Major Human injuries.	
➤ Handling of Gas Cylinders	Chemical Hazard (Leakage of Gas or Leakage of oxygen diluting gases)	➤ Minor / Major Human injuries.	✓ Define & implemented SOP's for each activity properly implement along with record management ✓ While receiving the cylinders checking of valves for any leakage ✓ Training is being given to all concerned ✓ Emergency Response Plan ✓ Use of PPE's
	Ergonomic hazard	➤ Minor / Major Human injuries.	
	Fire Hazard	➤ Minor / Major Human injuries. ➤ Asset loss	
➤ Catalyst Regeneration	Chemical Hazard	➤ Minor / Major Human injuries.	✓ Define & implemented SOP's for each activity properly implement along with record management Designated area for drums ✓ Follow MSDS ✓ Emergency Response Plan ✓ Use of PPE's
	Health Hazard	➤ Human injury ➤ Ill health	

Facility / Operation / Activities / Process / Equipment	Ill Health Injury hazard	Hazard Potential Impact Towards Ill Health / Injury	Current Risk Control ▪ Meeting measures ▪ Preventive measures ▪ Mitigative measures
➤ Sulfur Determination by X-Ray Sulphur Meter	Radiation hazard (X-Ray)	➤ Ill Health ➤ Chronic effects	<ul style="list-style-type: none"> ✓ Procedure is followed (ASTM # 4294) / equipments manufacturer precaution ✓ Define & implemented SOP's for each activity properly implement along with record management ✓ Use TLD badges ✓ Equipment to be checked before operating for proper covering ✓ Emergency Response Plan
➤ Maintenance Related Activities during Normal / Turnaround / Shutdown <ul style="list-style-type: none"> ▪ Furnace ▪ Scrapping / Cleaning ▪ Refractory Works ▪ Column Tray ▪ Vessels ▪ Tanks ▪ Compressor ▪ Pumps ▪ Welding at Plant ▪ Liqua Blaster Operation ▪ Sand Blasting ▪ Painting ▪ Insulation installation / replacement ▪ Valve ▪ Hydrocarbon pipeline ▪ Welding / cutting / grinding ▪ Erection of scaffolding ▪ Mechanical work at height ▪ Electric / Gas welding ▪ Heat Exchanger ▪ Air Cooler ▪ Storage tanks ▪ Work-Shop machine operation (Radial drill, lathe, milling, shaper, lapping machine) ▪ Metalizing (Thermo spray gun operation) ▪ Air Compressor, Welding generator ▪ Hydraulic Press Operation ▪ Fork Lifter ▪ Gasket Fabrication ▪ Overhead Crane ▪ Chain blocks pulley testing ▪ Radiography 	Mechanical Hazard	➤ Human Injury / Illness.	<ul style="list-style-type: none"> ✓ Define & documented (Shutdown / Startup / Turnaround) SOP's for each activity properly implement along with record management ✓ Cold work permit ✓ Isolation complete ✓ Proper Blinding ✓ Training for procedure ✓ Isolation valve checked. ✓ Complete flushing ✓ Oxygen test ✓ Proper steaming ✓ Proper ventilation oxygen test ✓ De-energize permit ✓ Good house keeping ✓ Proper isolation of the place of job ✓ Inspection of welding machine ✓ Certified welder ✓ Certified hoses & nipples ✓ Skilled manpower ✓ Safe handling of insulation debris in bags ✓ Proper dust mask / safety goggles used. ✓ Proper bath after handling insulation material. ✓ Area barrication ✓ Identification of area ✓ Emergency Response Plan ✓ Use of PPE's
	Fire Hazard	<ul style="list-style-type: none"> ➤ Human Injury / Illness. ➤ Skin Burn. ➤ Asset loss. 	
	Ergonomic Hazard	➤ Human Injury from hitting with heavy object	
	Chemical Hazard	<ul style="list-style-type: none"> ➤ Human Illness. ➤ Acute & Chronic effect on health. 	
	Noise Hazard	<ul style="list-style-type: none"> ➤ Hearing loss ➤ Human injury / illness. 	
	Radiation Hazard	<ul style="list-style-type: none"> ➤ Ill Health ➤ Chronic effects 	
	Heat & Temperature Hazard	<ul style="list-style-type: none"> ➤ Human Injury / Illness. ➤ Skin Burn. 	
	Electrical Hazard	<ul style="list-style-type: none"> ➤ Electrocution. ➤ Skin Burn. ➤ Human Injury. 	
	Traffic Hazard	<ul style="list-style-type: none"> ➤ Human Injury. ➤ Asset loss. 	



Facility / Operation / Activities / Process / Equipment	Ill Health Injury hazard	Hazard Potential Impact Towards Ill Health / Injury	Current Risk Control <ul style="list-style-type: none"> Meeting measures Preventive measures Mitigative measures
<ul style="list-style-type: none"> Repair & Maintenance of Field mounted instruments, Electronic instruments & laboratory analyzer, controllers, transmitters, recorders, alarm systems, pneumatic instruments, instruments & control system 	Pressure Hazard	<ul style="list-style-type: none"> Human Injury Asset damage / loss. 	<ul style="list-style-type: none"> Define & implemented SOP's for each activity properly implement along with record management Proper isolation drain Be vigilant Use of proper insulation Use of proper fittings Use of standard material Use of cold work permit Emergency Response plan Use of PPE's
	Falling Hazard	<ul style="list-style-type: none"> Minor / Major Human Injury 	
	Heat & Temperature Hazard	<ul style="list-style-type: none"> Minor / Major Human Injury Skin Burn 	
	Electrical Hazard	<ul style="list-style-type: none"> Electrocution Skin Burn Human Injury 	
	Fire Hazard	<ul style="list-style-type: none"> Asset Damage / loss. Human Injury 	
<ul style="list-style-type: none"> Start-up, shutdown and running of Turbo Generator and Diesel Generator Air compressor operation and maintenance 	Pressure / Temperature Hazard	<ul style="list-style-type: none"> Minor / Major Human Injury Skin Burn Asset Damage / loss. 	<ul style="list-style-type: none"> Define & implemented (Start up and Shutdown) SOP's for each activity properly implement along with record management Implementation / monitoring for usage of PPE's Routing checking through shift Engineers Display boards Sign boards Emergency Response Plan
	Noise Hazard	<ul style="list-style-type: none"> Hearing loss. Human Illness. 	
	Falling / Tripping Hazard	<ul style="list-style-type: none"> Minor / Major Human Injury 	
	Fire Hazard	<ul style="list-style-type: none"> Asset Damage / loss. Human Injury 	
<ul style="list-style-type: none"> LPG sampling from vessel and units Lube Base Oil sampling from tank Light hydrocarbons Solvents (Benzene, Toluene, Xylene) sampling and testing 	Pressure / Temperature Hazard	<ul style="list-style-type: none"> Cold Burning Human Injury / Illness. Asset loss. 	<ul style="list-style-type: none"> Define & implemented SOP's for each activity properly implement along with record management Procedure of sampling (ASTM) to be followed Before sampling check the valve carefully for rust pitting, leakage Emergency Response Plan Follow MSDS Use PPE's
	Chemical Hazard	<ul style="list-style-type: none"> Impact on Human Illness. Degradation of air quality 	
	Falling / Tripping Hazard	<ul style="list-style-type: none"> Minor / Major Human Injury 	
<ul style="list-style-type: none"> Noise Level Monitoring. H₂S & Volatile Organic Compounds (VOCs) Monitoring Illumination Monitoring Stack Emission Monitoring Rain Water Channel Monitoring Collection of drinking water and effluent water for 3rd Party Testing 	Chemical Hazard	<ul style="list-style-type: none"> Human Illness Respiratory problems 	<ul style="list-style-type: none"> Define & implemented SOP's for each activity properly implement along with record management Proper use of PPEs specially earplugs / muff during reading Effective coordination Use of sign boards Emergency Response Plan
	Noise Hazard	<ul style="list-style-type: none"> Hearing loss Ill Health 	
	Ergonomic Hazard	<ul style="list-style-type: none"> Human illness Eye sight loss 	
	Mechanical Hazard	<ul style="list-style-type: none"> Human Injury / Illness. 	
	Heat & Temperature Hazard	<ul style="list-style-type: none"> Human Injury / Illness. 	

Facility / Operation / Activities / Process / Equipment	Ill Health Injury hazard	Hazard Potential Impact Towards Ill Health / Injury	Current Risk Control ▪ Meeting measures ▪ Preventive measures ▪ Mitigative measures
<ul style="list-style-type: none"> ➤ Filling of Fire Extinguishers ➤ Carbon dioxide cartridge refilling 	Chemical Hazard	<ul style="list-style-type: none"> ➤ Human illness ➤ Mild irritation to the eyes, skin, respiratory track 	<ul style="list-style-type: none"> ✓ Define & implemented SOP's for each activity properly implement along with record management ✓ Follow MSDS ✓ Proper Training ✓ Filling instruction ✓ Adequate supervision ✓ Ensure proper ventilation ✓ Emergency Response Plan ✓ Use of PPEs
	Temperature Hazard	<ul style="list-style-type: none"> ➤ Frost bite ➤ Cold burning 	
<ul style="list-style-type: none"> ➤ Fire Fighting at Fire Drills / Process Area 	Fire Hazard	<ul style="list-style-type: none"> ➤ Human Injury / illness. ➤ Skin burn ➤ Asset loss 	<ul style="list-style-type: none"> ✓ Define & implemented SOP's for each activity properly implement along with record management ✓ Safe escape route ✓ Water should be applied through spray nozzle. ✓ Use of SCBA against any toxic fumes, vapor & gas. ✓ Proper Communication ✓ Emergency Response Plan ✓ Use of PPE's
	Heat & Temperature Hazard	<ul style="list-style-type: none"> ➤ Illness ➤ Injuries ➤ Burning 	
<ul style="list-style-type: none"> ➤ Biological waste disposable (Drugs antibiotics) 	Biological hazard	<ul style="list-style-type: none"> ➤ Human illness 	<ul style="list-style-type: none"> ✓ Define & implemented SOP's for each activity properly implement along with record management ✓ Disposal to municipal waste. ✓ Biological or contaminated waste for treatment in incineration ✓ Training ✓ Area Identification ✓ Emergency Response Plan
<ul style="list-style-type: none"> ➤ Treatment by Injection 	Chemical Hazard (Hypersensitivity Reaction)	<ul style="list-style-type: none"> ➤ Human illness ➤ Infection 	<ul style="list-style-type: none"> ✓ Define & implemented SOP's for each activity properly implement along with record management ✓ Used of packed sterilized disposable syringes. ✓ Checking of Date of expiry before use. ✓ Wearing of gloves ✓ Identification of shelves ✓ Verification of date by label over the injectable ✓ Proper storage of injectable / medicines ✓ Emergency Response Plan
<ul style="list-style-type: none"> ➤ Under Ground Sewer Network 	Chemical Hazard	<ul style="list-style-type: none"> ➤ Human illness ➤ Infection ➤ Headaches 	<ul style="list-style-type: none"> ✓ Define & implemented SOP's for each activity properly implement along with record management ✓ Emergency Response Plan
	Biological Hazard	<ul style="list-style-type: none"> ➤ Sinus ➤ Infection 	
<ul style="list-style-type: none"> ➤ Horticulture Management 	Heat & Temperature Hazard	<ul style="list-style-type: none"> ➤ Human illness (Sunstroke, dehydration, sweating, headache, etc.) 	<ul style="list-style-type: none"> ✓ Define & implemented SOP's for each activity properly implement along with record management ✓ Emergency Response Plan
<ul style="list-style-type: none"> ➤ ITS management (Computer, Servers, Printers, Plotters, UPS, Scanners, Network bridges, Switches, Towers, Fiber optic cable) 	Electrical Hazard	<ul style="list-style-type: none"> ➤ Electrocution ➤ Human Injury / illness ➤ Skin burn 	<ul style="list-style-type: none"> ✓ Define & implemented SOP's for each activity properly implement along with record management ✓ Monitoring, inspection and maintenance of IT related equipments as specified by the manufacturers and suppliers of the IT equipments. ✓ Emergency Response Plan



Environmental Monitoring and **Reporting Strategies as per Legal Requirement Compliance**

I. Ambient Air Quality

Ambient air quality within the refinery premises was monitored. The Monitoring results suggested that the all parameters of ambient air quality in different locations are within the SEQS limits. On the basis of visual observation and monitoring results the compliance status in terms of ambient air quality was found to be satisfactory.

Exhibit 3. 1: Parameters and Points of Locations

S. No	Monitoring Parameter	Monitoring Location
1	<ul style="list-style-type: none">• Carbon Monoxide (CO);• Sulphure dioxide (SOx);• Oxide of Nitrogen as (NO & NO2);• Suspended Particulate Matter (SPM);• (PM₁₀), (PM_{2.5});• Ozone (O₃)&• Lead (Pb).	<ul style="list-style-type: none">• North Side of Flare Area;• North West Side of Quality Control Area;• New Cooling Tower Area; &• West Side of Chemical Yard.• SRU
2	<ul style="list-style-type: none">• H2S	<ul style="list-style-type: none">• North Side of Flare Area, South Side of Quality Control Area, Fuel Refinery, SRU, DHT, and Naphtha Block & outside of CCR

II. Noise Level

Noise quality was monitored at different location within the NRL premises to assess the compliance status with SEQS. The overall compliance status in terms of noise quality was found to be satisfactory compliance.

III. Stack Emissions

Stack emissions of NRL facility were monitored in order to assess the compliance status with SEQS. The monitoring parameters are PM, CO, SOx, NOx, H2S & Exhausted Flow. The monitoring results suggest that the parameters are within the SEQS limits. The compliance status of services facility in terms of gaseous emission was found to be Satisfactory Compliance.

Exhibit 3. 2: Stacks Monitoring Detail

S. No	Monitoring Parameter	Monitoring Location
1	<ul style="list-style-type: none">• PM• CO• SOx• NOx• H2S &• Exhausted Flow	<ul style="list-style-type: none">• Boilers• Lube-I & Lube-II• Fuel Refinery• Naphtha Block• Power Generation• DHB• SRU

IV. Vehicular Emission

Vehicular emission quality within the refinery premises was monitored. The testing parameter was done CO; Smoke & Noise the all parameter of the tens vehicular emission testing report are within the SEQS limit. The Compliance status in terms of vehicular is satisfactory compliance.

V. Drinking water Quality

Drinking water sample was collected from sterilize bottle and sent to the laboratory for microbiological and chemical analysis. The microbiological and chemical results of drinking water were found safe to the recommended standards as per WHO/USEPA for microbial and chemical analysis of Drinking Water.

VI. Liquid Effluent

A wastewater sample was collected from main drain to analyze the priority parameters prescribed by SEPA i.e. Temperature, pH, BOD5, COD, TSS, Oil & Grease, and Phenolic Compound. It was observed that all the parameters are in desired limit of SEQS. It is to be noted that the processed wastewater of the facility isn't directly discharged in municipal drain because of the inside treatment facility are available in the form of ETP. The compliance status of the service facility in terms of processed wastewater was found to be Satisfactory Compliance.

VII. Soil Contamination

In case of spillage or leakage, the soil will not only get contaminated but it will reduce the soil productivity which may ultimately affect soil and underground water in the given area but during site assessment it was observed that the usage of lubricant at site are in minimal quantity and the storage and transportation of fresh lubricant and used lubricant are as per guidelines mentioned in HSE plan, however the risk assessment has been established. HSE teams minimize the chances of leakage or seepage of oil/lubricant by applying appropriate controls.

VIII. Solid Waste Management

NRL has defines the working methodology for collection, recovery, proper stacking & placement of discarded waste material at designated yard till the disposal through controlled monitoring from NRL Korangi and Keamari Terminal. Furthermore, Placement of Recovered material as identified by Inspection for further use. Furthermore, NRL is in process to acquire SEPA approved vendor for disposal of waste.

IX. Occupational Safety And Industrial Hygiene

Onsite visual assessments and brief interviews with management and staff were made in order to assess the health and safety practices within the facility. It was observed that the employees are trained for any emergent situation. It was also noted that employees are well equipped by PPEs and safety trainings related to it. NRL is highly committed towards HSE practices and has developed a detailed integrated management policy, health & safety policy & emergency response fire safety & evacuation plan and waste management plan. The fire extinguishers were installed and relevant sign boards were found at workplace. They have design well-defined system in each department.



Environmental Aspect, **Impact Risk Assessment**

Activity / Area	Aspect	Impact	Control / Mitigation
Crude Oil / Lube / Fuel Product receipt, handling and storage <ul style="list-style-type: none"> ➤ Pumping Operation ➤ Transportations through pipeline and tank lorries ➤ Breather valves ➤ Sampling ➤ Dipping ➤ Chemical injunction ➤ API separators ➤ Bowzer decantation ➤ Loading / un-loading 	Hydrocarbon sludge from tanks and drains channels	<ul style="list-style-type: none"> ➤ Soil contamination ➤ Water contamination 	NRL-SOP-HSE-002 NRL-SOP-HSE-006 NRL-SOP-HSE-007 NRL-SOP-HSE-008 NRL-SOP-HSE-011 NRL-SOP-HSE-012 NRL-SOP-HSE-014 NRL-SOP-HSE-016 NRL-SOP-HSE-026 NRL-SOP-HSE-029 NRL-SOP-HSE-031 NRL-SOP-HSE-032 NRL-SOP-HSE-033 NRL-SOP-HSE-034 NRL-SOP-HSE-035 NRL-SOP-HSE-036 NRL-SOP-QCL-001 NRL-SOP-ISP-001 NRL-SOP-ISP-002 NRL-SOP-ISP-004 NRL-SOP-ISP-005 NRL-SOP-FPR-001 NRL-SOP-FPR-007 NRL-SOP-FPR-008 NRL-SOP-FPR-009 NRL-SOP-FPR-012 NRL-SOP-SCY-001 NRL-SOP-ENG-007 SOP's KT SOP's OM SOP's Maintenance
	Leakages / Spillages	<ul style="list-style-type: none"> ➤ Soil contamination ➤ Oil slippage to sea 	
	Volatile Organic Compounds emission	<ul style="list-style-type: none"> ➤ Air pollution ➤ Health impact 	
	During Maintenance activities, Possibility of fire	<ul style="list-style-type: none"> ➤ Loss of property / life ➤ Air pollution ➤ Health impact 	
	Effluent Water	<ul style="list-style-type: none"> ➤ Contamination of sea / water ➤ Marine Destroy 	
Utility Operations <ul style="list-style-type: none"> ➤ Furnace for heating ➤ Cooling Towers ➤ Chemical injection ➤ Vessels pump ➤ Fuel Oil Storage Tanks ➤ Regeneration and un-loading ➤ ETP plant ➤ RO Plants 	Cooling water blow down water	<ul style="list-style-type: none"> ➤ Soil contamination ➤ Water contamination 	NRL-SOP-HSE-002 NRL-SOP-HSE-005 NRL-SOP-HSE-007 NRL-SOP-HSE-014 NRL-SOP-HSE-016 NRL-SOP-HSE-020 NRL-SOP-HSE-021 NRL-SOP-HSE-031 NRL-SOP-HSE-032 NRL-SOP-HSE-033 NRL-SOP-HSE-034 NRL-SOP-HSE-035 NRL-SOP-HSE-036 NRL-SOP-FPR-008 NRL-SOP-FPR-012 NRL-SOP-QCL-002 NRL-SOP-QCL-003 NRL-SOP-TSR-009 NRL-SOP-TSR-010 NRL-SOP-TSR-011 NRL-SOP-TSR-012 SOP's Utilities
	Boiler blow down water	<ul style="list-style-type: none"> ➤ Soil contamination ➤ Water contamination 	
	Noise	<ul style="list-style-type: none"> ➤ Noise Pollution 	
	Water Consumption	<ul style="list-style-type: none"> ➤ Natural resource depletion 	
	Fuel Oil & Natural gas Consumption	<ul style="list-style-type: none"> ➤ Natural resource depletion 	
	Steam leakages	<ul style="list-style-type: none"> ➤ Energy wastage 	
	Sludge from brine and blow down pits	<ul style="list-style-type: none"> ➤ Soil contamination ➤ Water contamination 	
	Chemical spillage	<ul style="list-style-type: none"> ➤ Soil / land contamination ➤ Damage to asset / loss of life 	
	Flue gases	<ul style="list-style-type: none"> ➤ Air pollution ➤ Degradation of Air Quality 	
	During Maintenance activities, Possibility of fire	<ul style="list-style-type: none"> ➤ Loss of property / life ➤ Air pollution ➤ Health impact 	

Activity / Area	Aspect	Impact	Control / Mitigation
Chemical Storage and handling ➤ Drums handling ➤ Handling of Gas Cylinder	Leakages / Spillage	➤ Soil contamination ➤ Water contamination	NRL-SOP-HSE-001 NRL-SOP-HSE-007 NRL-SOP-HSE-011 NRL-SOP-HSE-014 NRL-SOP-WHS-007 NRL-SOP-WHS-008 NRL-SOP-WHS-011 NRL-SOP-WHS-013 NRL-SOP-SCY-001 NRL-SOP-FPR-008
	Empty plastic and metal drums	➤ Solid Waste Pollution	
	Release of toxic gases	➤ Air emissions	
	Leakages	➤ Soil contamination ➤ Water contamination	
Plant Operations (Production Lube – I + Lube – II + Fuel Refinery + SRB + DHB + Naphtha Block) ➤ Desalting ➤ Heating ➤ Distillation ➤ Naphtha Stabilizer and Splitter ➤ Merox Sweetening ➤ Hydro treating ➤ Platforming ➤ Propane Recovery ➤ BTX ➤ Atmospheric and Vacuum Distillation ➤ Propane de-asphalting ➤ Furfural Extraction ➤ De-waxing ➤ Hydro-finishing ➤ Pumping transportation ➤ Furnaces ➤ Heat exchangers ➤ Air cooler ➤ Valves ➤ Chemical charging ➤ Compressor ➤ Chillers ➤ Rotary Filter ➤ Amine Treating Unit ➤ Naphtha splitter unit ➤ Sulphur solidification unit	Oily waste water	➤ Soil contamination ➤ Water contamination	NRL-SOP-HSE-002 NRL-SOP-HSE-006 NRL-SOP-HSE-007 NRL-SOP-HSE-008 NRL-SOP-HSE-011 NRL-SOP-HSE-012 NRL-SOP-HSE-014 NRL-SOP-HSE-016 NRL-SOP-HSE-026 NRL-SOP-HSE-029 NRL-SOP-HSE-031 NRL-SOP-HSE-032 NRL-SOP-HSE-033 NRL-SOP-HSE-034 NRL-SOP-HSE-035 NRL-SOP-HSE-036 NRL-SOP-QCL-001 NRL-SOP-ISP-001 NRL-SOP-ISP-002 NRL-SOP-ISP-004 NRL-SOP-ISP-005 NRL-SOP-FPR-001 NRL-SOP-FPR-007 NRL-SOP-FPR-008 NRL-SOP-FPR-009 NRL-SOP-FPR-012 NRL-SOP-SCY-001 NRL-SOP-ENG-007 SOP's Lube – I Refinery SOP's Lube – II Refinery SOP's Fuel Refinery SOP's Maintenance
	Noise	➤ Noise Pollution	
	Hazardous solid waste e.g. oily rags	➤ Soil quality degradation	
	Leakages	➤ Soil Contamination	
	Steam leakages	➤ Energy wastage	
	Hydrocarbon sludge from cleaning and routine operations	➤ Soil contamination ➤ Water contamination	
	Heat	➤ Occupational Health	
	Spent caustic, amines & Sulphuric acid	➤ Soil contamination ➤ Water contamination	
	Release of CO ₂ during regeneration	➤ Degradation of air quality ➤ Air Pollution	
	Volatile Organic Compounds from pressure relief valves and leakages	➤ Degradation of air quality ➤ Occupational Health ➤ Air Pollution	
	Furnace oil / Refinery gases / natural gas Consumption	➤ Depletion of natural resource	
	Release of LPG, H ₂ S and other gases	➤ Health hazard ➤ Air Pollution	
	Stack emission	➤ Degradation of ambient air quality ➤ Air Pollution	
	Ash and particulate matters during regeneration / off-loading of catalyst	➤ Air Pollution ➤ Health hazard	
	Spent catalyst	➤ Solid Waste Pollution	
	During Maintenance activities, Possibility of fire	➤ Loss of property / life ➤ Air pollution ➤ Health impact	
Laboratory (Quality Control) ➤ Sampling ➤ Storage ➤ Disposal ➤ Crude oil ➤ Feed stock ➤ Intermediates ➤ Finished Products ➤ Utilities	Unused samples	➤ Soil contamination ➤ Water contamination	NRL-SOP-QCL-001 NRL-SOP-QCL-002 NRL-SOP-QCI-003 NRL-SOP-QCL-004 NRL-SOP-HSE-031 NRL-SOP-HSE-032 NRL-SOP-HSE-033 NRL-SOP-HSE-034 NRL-SOP-ADM-003 NRL-SOP-TLW-009
	Spillage / leakage / emissions / toxic fumes / Loss of products / Waste generation	➤ Water contamination ➤ Air pollution ➤ Health hazard ➤ Solid waste ➤ Odor	
	Used Chemicals	➤ Soil contamination ➤ Water contamination	
	During Maintenance activities, Possibility of fire	➤ Loss of property / life ➤ Air pollution ➤ Health impact	



Activity / Area	Aspect	Impact	Control / Mitigation
Power Plant Operations ➤ 7.5 MW Steam Turbine ➤ 7.5 MW Steam Turbine ➤ 4.0 MW Diesel Generator ➤ 8.2 MW Diesel Generator	Stack emission	➤ Ambient air quality degradation ➤ Air Pollution	NRL-SOP-HSE-031 NRL-SOP-HSE-032 NRL-SOP-HSE-033 NRL-SOP-HSE-034 SOP's Power Generation SOP's Maintenance
	Noise	➤ Noise Pollution	
	Oil drained from the air cleaner	➤ Soil contamination	
	Spillage of diesel from the diesel storage tank	➤ Soil contamination	
	During Maintenance activities, Possibility of fire	➤ Loss of property / life ➤ Air pollution ➤ Health impact ➤ Waste generation due to maintenance activities	
Routine Maintenance ➤ Crude oil / intermediate & finish Product storage tanks ➤ Production Plant area ➤ Utility Area ➤ Power Generation ➤ Korangi – Keamari (K - K) Pipeline ➤ Kemari Terminal (K.T)	Oil used for washings, etc	➤ Soil contamination	SOP's Maintenance SOP's Inspection SOP's Instrumentation NRL-SOP-HSE-001 NRL-SOP-HSE-002 NRL-SOP-HSE-031 NRL-SOP-FPR-001
	Discarded insulation material	➤ Health impacts	
	Miscellaneous scrap	➤ Soil quality degradation	
	During Maintenance activities, Possibility of fire	➤ Loss of property / life ➤ Air pollution ➤ Health impact ➤ Waste generation due to maintenance activities	
Turnaround / Shutdown / Emergency Shutdown activities ➤ Reactor, Vessels, columns, Steam lines, Towers, heat exchanger, furnaces, pipelines, pumps compressors, along with sophisticated instrumentation and electrical installation. ➤ Liqua Blaster for tube cleaning ➤ Diesel Engine ➤ Oxygen / Acetylene cylinders for welding & cutting ➤ Mobile air compressor engine running ➤ Fork lifter for lifting ➤ Welding rectifier ➤ X-Ray machine ➤ Sand Blasting	Scale / hydrocarbon sludge	➤ Soil contamination ➤ Water contamination	NRL-SOP-HSE-001 NRL-SOP-HSE-002 NRL-SOP-HSE-003 NRL-SOP-HSE-004 NRL-SOP-HSE-005 NRL-SOP-HSE-006 NRL-SOP-HSE-031 NRL-SOP-HSE-036 NRL-SOP-HSE-040 NRL-SOP-FPR-001 NRL-SOP-FPR-008 SOP's Turnaround Planning / Local Manufacturing / Workshop SOP's Turnaround Monitoring SOP's Maintenance SOP's Inspection SOP's Instrumentation
	Solid Waste e.g. oily rags, damaged insulation etc.	➤ Soil degradation	
	Oily waste water	➤ Water Contamination	
	Volatile Organic Compounds (VOCs) from opened vessel	➤ Degradation of air quality ➤ Health Impact	
	Fugitive emissions	➤ Degradation of air quality ➤ Health Impact	
	Flushing steam	➤ Resource depletion	

Activity / Area	Aspect	Impact	Control / Mitigation
Dispensary Management ➤ 1 st Aid ➤ Medicine Storage	Clinical & Biological waste generation	➤ Odor effects ➤ Diseases transmission ➤ Bacterial contamination ➤ Land contamination	NRL-SOP-DIS-002 NRL-SOP-DIS-003 NRL-SOP-DIS-004 NRL-SOP-ADM-003 NRL-SOP-ADM-004
Canteen Management ➤ Storage ➤ Food preparation ➤ Food serving ➤ Washing	Natural gas consumption Water consumption Food Waste Domestic liquid waste	➤ Natural resource depletion ➤ Solid Waste Pollution ➤ Effluent ➤ Water contamination	NRL-SOP-PER-005 NRL-SOP-PER-010 NRL-SOP-TSR-009 NRL-SOP-TSR-011 NRL-SOP-TSR-012 NRL-SOP-HSE-031
Workshop	Solid waste (Metal chips, Waste cotton rags, Packing materials, Unserviceable parts) Noise Exhaust Emissions Electricity usage Used oil	➤ Waste generation ➤ Land quality degradation ➤ Noise Pollution ➤ Air Pollution ➤ Degradation of air quality ➤ Consumption of resource ➤ Soil contamination ➤ Water Contamination	NRL-SOP-TLW-001 NRL-SOP-TLW-002 NRL-SOP-TLW-003 NRL-SOP-TLW-006 NRL-SOP-TLW-009 NRL-SOP-TLW-010 NRL-SOP-TLW-015 NRL-SOP-INS-022 NRL-SOP-MT3-014 NRL-SOP-MT2-006 NRL-SOP-MT2-011
Offices	Solid waste (Paper, Packaging, etc) Electricity usage Domestic Waste Water	➤ Waste generation ➤ Consumption of resource ➤ Consumption of resource ➤ Water pollution	NRL-SOP-ADM-003 NRL-SOP-CON-001 NRL-SOP-SCY-001 NRL-SOP-HSE-023 NRL-SOP-HSE-030
Motor Vehicles	Spark generation from exhaust causes fire Use of Fuel Exhaust Emission Noise	➤ Loss of property / life ➤ Air pollution ➤ Health impact ➤ Consumption of resource ➤ Air pollution ➤ Degradation of air quality ➤ Noise pollution	NRL-SOP-ADM-001 NRL-SOP-SCY-001 NRL-SOP-HSE-015 NRL-SOP-HSE-033 NRL-SOP-HSE-034
Natural Disaster	Heavy Rain Thunder Storm Lightening Earthquake	➤ Water Contamination ➤ Soil contamination ➤ Soil contamination ➤ Fire ➤ Fire	NRL-SOP-HSE-006 NRL-SOP-HSE-007 NRL-SOP-HSE-008 NRL-SOP-HSE-009 NRL-SOP-HSE-010 NRL-SOP-HSE-016 NRL-SOP-HSE-023 NRL-SOP-HSE-024 NRL-SOP-FPR-007 NRL-SOP-FPR-008 NRL-SOP-FPR-009



IMS (HSEQ) Objectives and Management Program

S.#	Department	Description	F.C	L.C	Total
			Rupees in `000		
01.	Maintenance – I	Procurement of hand pumps for Hydro-testing (2 Nos).	-	400	400
02.	Maintenance – II	Fire Alarm system required for ESS # 18 cable room, STG and DG-II Hall.	-	750	750
03.	Maintenance – II	Procurement of spares for overhauling of Diesel Generator-I.	-	15,000	15,000
04.	Maintenance – II	1 Documenting Multifunction portable calibrator.	80	200	12,600
05.	Lube I Refinery	Installation of new spill back control valve at discharge line of Pump 01-P-1 C	7	790	1,875
06.	Lube I Refinery	Replacement of complete pump 01-P20-A/B	106	2,000	18,430
07.	Lube II Refinery	Installation of 2nd automated block valve and bleed valve on 201/212/213/2014 (F01) Lube-II furnaces (07 block valves & 07 Bleed valves).	42	1,000	7,510
08.	Lube II Refinery	Replacement of Level & Flow Transmitters of various units at Lube-II Refinery.	5	250	1,025
09.	Fuel Refinery	Provision of Flow transmitter and orifice on 101-C-1 column & 101-E-12 Air Cooler wash water line.	6	160	1,090
10.	Fuel Refinery	Procurement of Thrust bearing segments for 101-P-1A/B (01 SET).	-	1,500	1,500
11.	Naptha Block	Procurement of moisture probes for gas & feed driers at Penex (309) Unit.	25	105	3,980
12.	Sulfur Block	Procurement and installation of double block and bleed valve on pilot burner fuel gas line for 312-F02 furnace.	-	1,700	1,700
13.	Diesel Hydrotreating unit	Procurement & installation of reusable metallic Filter at DHT Unit	90	3,150	17,100
14.	Fire protection	Additional Budget for Marine Oil Spill Equipment as per National Marine Disaster Contingency Plan-2007 legal requirements.	-	1,500	1,500
15.	Technical services	Procurement of chloride guard bed for 305-R-02A/B Reactor at Hydrogen production unit.	-	2,000	2,000
16.	Technical services	Replacement of block or fail steam traps at Sulfur Block.	-	3,239	3,239
17.	Quality Control	Accreditation of ISO 17025.	-	1,500	1,500
18.	Quality Control	Repair of Fuming Hoods (06 No).	19	270	3,215
19.	Fire protection	Additional Budget for Marine Oil Spill Equipment as per National Marine Disaster Contingency Plan-2007 legal requirements.			
20.	HSE	Procurement of Confined Space Kit for already procured MultiRae Lite Multi-Gas Meter (3 Nos.).	-	200	200
21.	Utilities	Procurement of portable conductivity meters for offsite testing at water bowlers decanting and wells (5 Nos.)	-	200	200
22.	Utilities	Procurement of bench top conductivity meters for old boiler and boiler V/VII control rooms (2 Nos.).	-	650	650
23.	Oil movement	Renovation of Storage Tank 183-S-41.	-	30,000	30,000
24.	Keamari Terminal	Procurement of Earth to trip system for APL Gantry	51	7,905	7,905
25.	Keamari Terminal	Renovation of Tank 155-S-43	-	27,000	27,000
26.	Keamari Terminal	Renovation of Storage Tank 155-S-44	-	5,500	5,500

Continual Monitoring Towards Applicable Legal

Regulatory and Other Requirements

Legal Requirement	Applicable Mechanism	
Working Environment <ul style="list-style-type: none"> Sindh Factory Act 2015 Sindh Rules 1975 Sindh Occupational Safety & Health Act 2017 SEPA 2014 	Monitoring of Labor Laws (NRL-SOP-CON-002) Solid Waste Disposal (NRL-SOP-ADM-003) Sanitation Management (NRL-SOP-ADM-004) EOBI Scheme (NRL-SOP-HUR-006) Leave Policy (NRL-SOP-HUR-007) Working Hours (NRL-SOP-HUR-008) Social Security Scheme (NRL-SOP-HUR-010) Labor Laws (NRL-SOP-HUR-011) Monitoring of Labor Canteen (NRL-SOP-HUR-019) Solid Waste management (NRL-SOP-HSE-031)	
Air Emissions / Air Pollution <ul style="list-style-type: none"> Sindh Factory Act 2015 The Pakistan Panel Code 1860 The Factories Act 1934 Pakistan Environmental Act NEQS SEPA 2014 	Monitoring Effluent water (NRL-SOP-HSE-032) Monitoring Gaseous Emission (NRL-SOP-HSE-033) Storm water channel (NRL-SOP-HSE-035) Evaluation of Compliance (NRL-SPR-EVC-008)	
Medical Waste <ul style="list-style-type: none"> The Pakistan Environmental Protection Act 1997 Sindh Hospital waste Management Rules 2014 Sindh Environmental Protection Act 2014 	Solid Waste Disposal (NRL-SOP-ADM-003) Dispensary waste (NRL-SOP-DIS-002) Incinerator (NRL-SOP-OKR-033) Solid Waste management (NRL-SOP-HSE-031)	
Soil & Effluent Waste <ul style="list-style-type: none"> Sindh Factory Act 2015 section 14 The Pakistan Environmental Protection Act 1997 Sindh Environmental Protection Act 2014 Sindh Environmental Quality Standard 2014 	Compliance of NEQS (NRL-SOP-HSE-032) Storm water drain (NRL-SOP-ENG-006) API Sewer Network (NRL-SOP-ENG-007) Solid Waste Disposal (NRL-SOP-ADM-003) Sanitation management (NRL-SOP-ADM-004)	
Marine Pollution <ul style="list-style-type: none"> The Pakistan Environmental Protection Act 1997 Pakistan Territorial Waters 1976 Maritime Security Act 1994 Environment 1973 constitution Port Act 1908 Section 21 Sindh Environmental Protection Act 2014 Sindh Environmental Quality Standard 2014 	Compliance of NEQS (NRL-SOP-HSE-032) Effluent water from API (NRL-SOP-OKT-008) Procedure for pumping of liquid effluent from effluent treatment plant to sea (NRL-SOP-OKR-030)	
Noise Pollution <ul style="list-style-type: none"> Environment, 1973 constitution Environmental Protection Act Motor Vehicle Ordinance 1965 Motor Vehicles Rules 1969 Sindh Occupational Safety & Health Act 2017 	Procedure for monitoring of noise level (NRL-SOP-HSE-034) Transport Management for company maintained vehicle (NRL-SOP-ADM-001)	
Water Pollution <ul style="list-style-type: none"> Sindh Factory Act 2015 The Factories Act 1934 Sindh Fisheries Ordinance 1980 The Pakistan Environmental Protection Act 1997 Environment and the 1973 constitution NEQs Sindh Environmental Protection Act 2014 Sindh Environmental Quality Standard 2014 	Compliance of NEQS (NRL-SOP-HSE-032) Sanitation management (NRL-SOP-ADM-004) Effluent water from API (NRL-SOP-OKT-008) Liquid effluent (NRL-SOP-OKR-030) Laboratory waste procedure (NRL-SOP-QCL-001) Evaluation of compliance (NRL-SPR-EVC-008)	

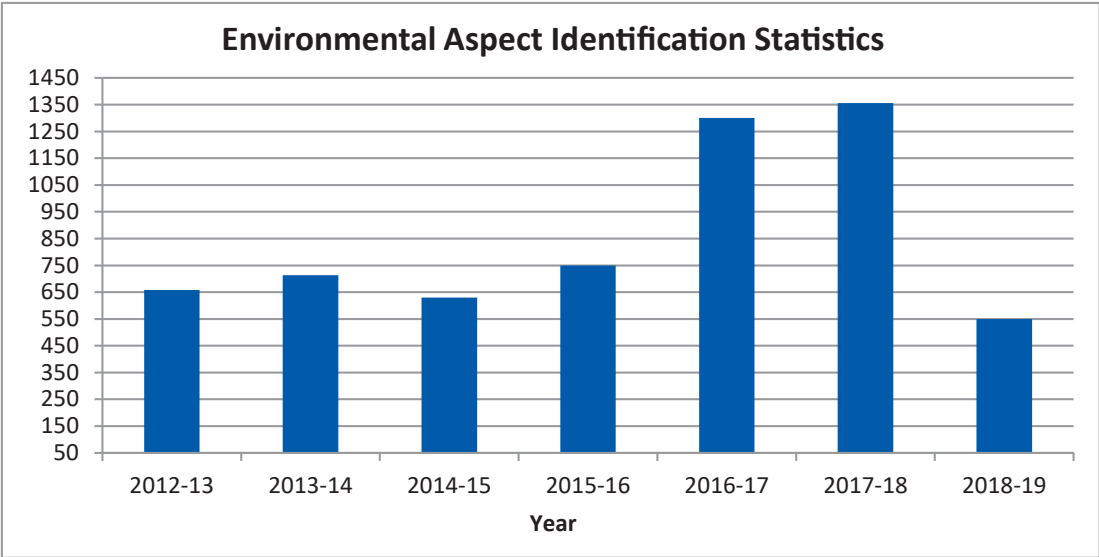
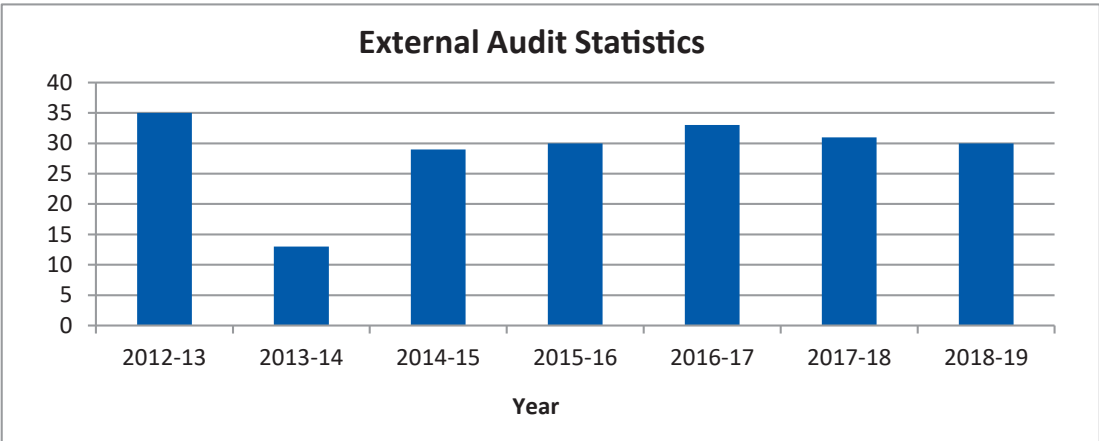
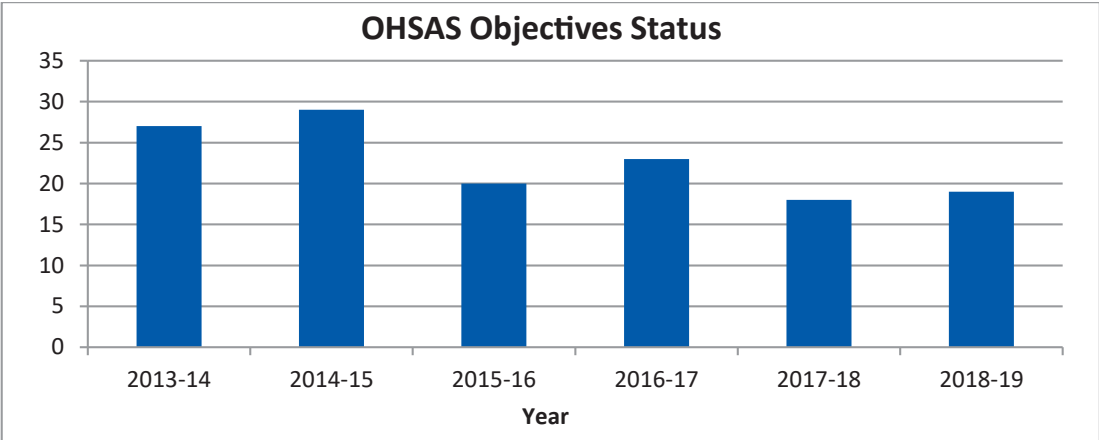


Legal Requirement	Applicable Mechanism
Sand Blasting <ul style="list-style-type: none"> The West Pakistan Hazardous Occupations (Sand Blasting) Rules, 1963 Sindh Occupational Safety & Health Act 2017 	Sand blasting Procedure (NRL-SOP-HSE-004)
Hazardous Substance and Waste <ul style="list-style-type: none"> The Explosive Act 1884 The Factories Act 1934 The Pakistan Environmental Protection Act 1997 The Factory Act 1934 The Hazardous Substance Rules 1999 Sindh Factory Act 2015 Sindh Environmental Protection Act 2014 Hardous Substance Rules 2014 	Handling / storage of materials (NRL-SOP-HSE-014) Empty chemical container (NRL-SOP-HSE-036) Solid Waste Disposal (NRL-SOP-ADM-003) Sanitation management (NRL-SOP-ADM-004) Dispensary waste (NRL-SOP-DIS-002) Laboratory waste (NRL-SOP-QCL-001) De-sludging of storage tank (NRL-SOP-OKR-021) De-sludging of asphalt tank (NRL-SOP-OKR-035) Contingency plan, chemical drums (NRL-SOP-OKR-036) Contingency plan (NRL-SOP-LR1-031) Contingency plan (NRL-SOP-LR2-037) Disposal of solid waste (NRL-SOP-MT3-011) Storage of HSD / Lube oil drums (NRL-SOP-OKT-015) Monitoring of chemical drums (NRL-SOP-WHS-008) Storage of filled gas cylinder (NRL-SOP-WHS-013)
Energy <ul style="list-style-type: none"> The Electricity Act 1910 KESC Control Order 1978 Electricity Rules 1937 Electricity Rules 1978 (Sindh) Electricity Duty Rules 1964 Electricity Ordinance 1965 Electricity Control Act 1952 Regulation of Generation, Transmission and Distribution of Electric Power Act 1997 	License
Emergency Response Plan <ul style="list-style-type: none"> Spill Prevention Containment and Clean-up (SPCC) Plans The Pakistan Environmental Protection Ordinance, 1997; and Article VI, Section 6.9 (g) Sindh Occupational Safety & Health Act 2017 	(SCR-EPR-010), (SCR-OCF-013), (SOP-HSE-006), (SOP-HSE-007), (SOP-HSE-008), (SOP-HSE-009), (SOP-HSE-010), (SOP-HSE-017), (SOP-HSE-018), (SOP-HSE-019), (SOP-HSE-020), (SOP-HSE-021), (SOP-HSE-022), (SOP-HSE-024), (SOP-HSE-025), (SOP-HSE-026), (SOP-HSE-027), (SOP-HSE-028), (SOP-FPR-007), (SOP-FPR-008), (SOP-OKR-024), (SOP-OKR-025), (SOP-OKR-026), (SOP-OKR-032), (SOP-OKR-046), (SOP-OKT-014), (SOP-WHS-010), (SOP-WHS-011), (SOP-LR1-001), (SOP-LR1-008), (SOP-LR1-012), (SOP-LR1-017), (SOP-LR1-026), (SOP-LR1-031), (SOP-LR2-001), (SOP-LR2-008), (SOP-LR2-025), (SOP-LR2-016), (SOP-LR2-036), (SOP-LR2-042), (SOP-FRE-007), (SOP-FRE-034), (SOP-FRE-041), (SOP-FRE-046), (SOP-TLW-009)

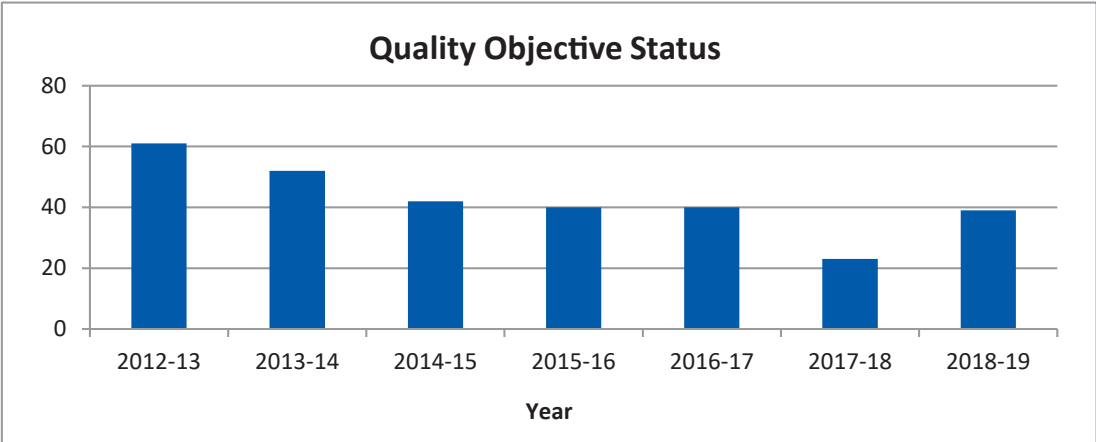
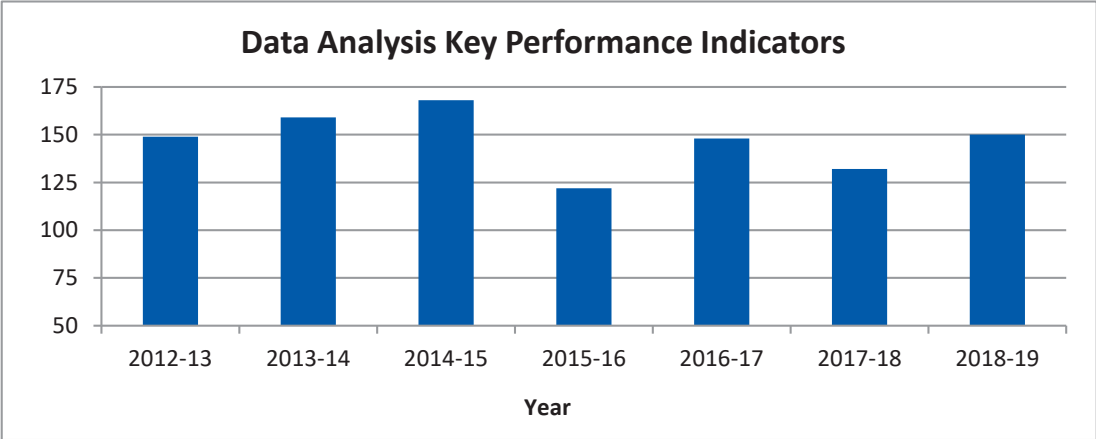
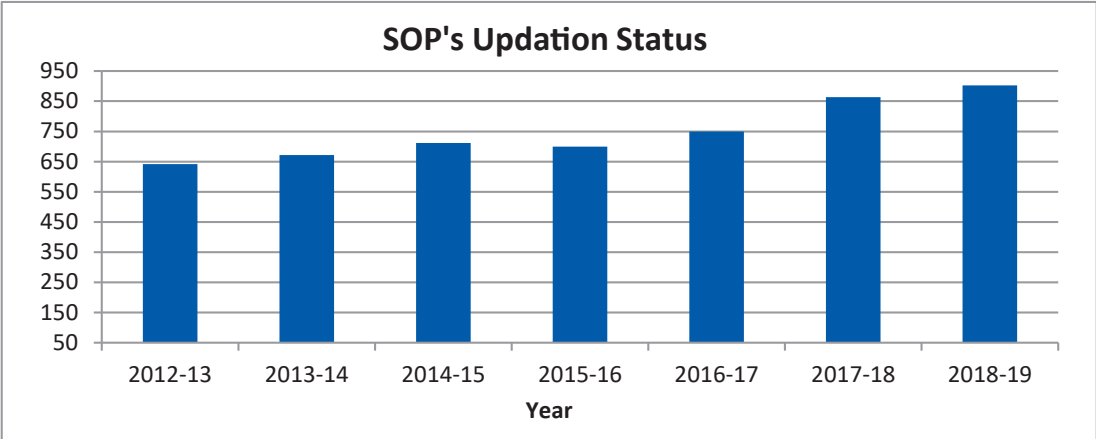
Legal Requirement	Applicable Mechanism
Petroleum Storage / Refining / Transportation, <ul style="list-style-type: none"> Pakistan Oil (Refining, Blending, Transportation, Storage & Marketing) Rules 2016 The Petroleum Act 1934 Pakistan Petroleum Rules 1971 The Petroleum Rules 1985 LPG (Production and Distribution) Rules 1971 	Plot plan from explosive department SOP's Oil Movement SOP's K.T SOP's STR SOP's Shipping
Boiler and Pressure Vessel <ul style="list-style-type: none"> The Boilers and Pressure Vessels Ordinance 2002 	Boiler Certificate
Gaseous Emissions <ul style="list-style-type: none"> The Pakistan Environmental Protection Act 1997 NEQs The Pakistan Environmental Protection Ordinance 1983 Sindh Environmental Protection Act 2014 Sindh Environmental Quality Standard 2014 	Compliance of NEQS, (NRL-SOP-HSE-032) Procedure for Monitoring Gaseous Emission for compliance of NEQS (NRL-SOP-HSE-033) Procedure for Cleaning and maintenance of Storm water channel (NRL-SOP-HSE-035) Evaluation of Compliance (NRL-SPR-EVC-008)
New Projects <ul style="list-style-type: none"> Pakistan Environmental Protection Agency (Review of IEE and EIA) Regulations 2000 	EIA Reports IEE Reports Review identified projects (NRL-SPR-RIP-019) Agency approvals (NRL-SPR-AAP-012)
The Sindh Standard Weight and measures enforcement Rules, 1976 License to establish, maintain and work wireless telegraph in Pakistan Telegraph Act 1885- and telegraph (Amendment) Act 1914.	Lube Base Oil Shipment Procedure (NRL-SOP-SHG-002) Maintenance of Weigh Bridge System (NRL-SOP-INS-019) License Maintenance of Wireless Communication System (NRL-SOP-INS-018)



Graphical Representation of **Continual Improvement Through Effective Monitoring**



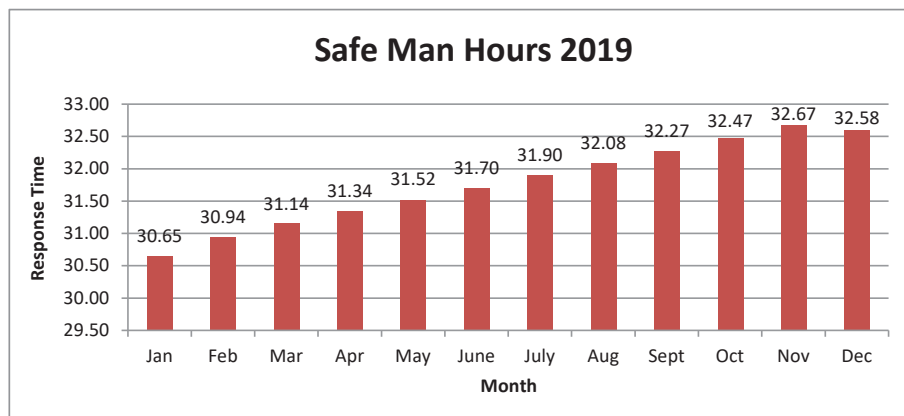
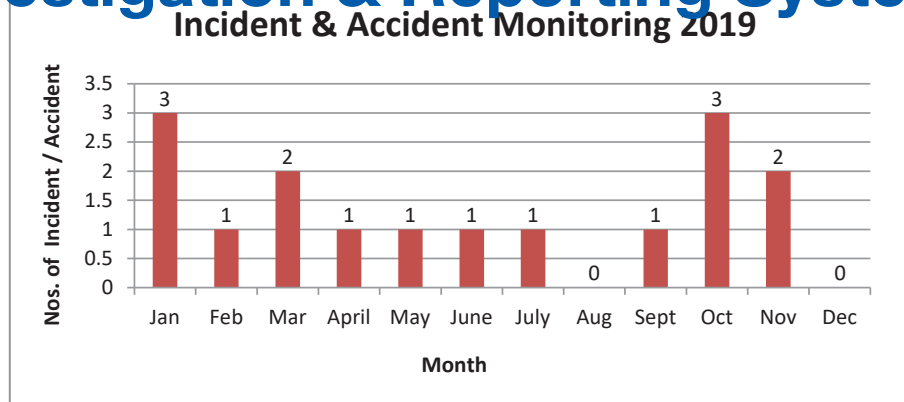
Graphical Representation of **Continual Improvement Through Effective Monitoring**



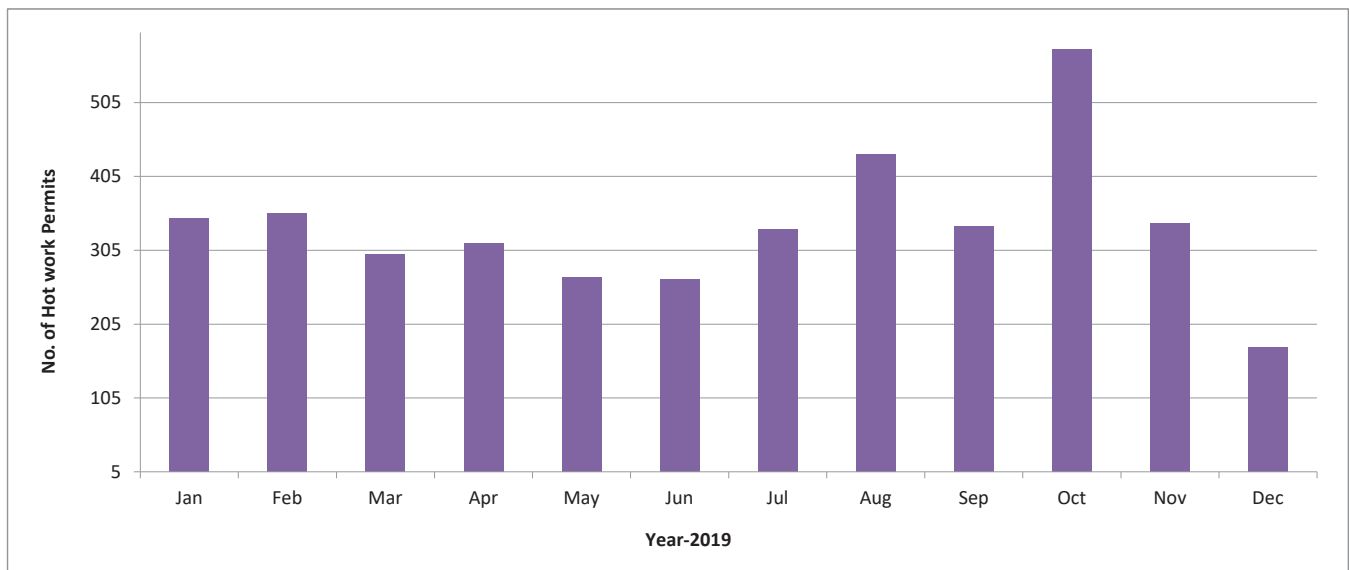
Graphical Representation of Incident Investigation & Reporting System

The refinery has a procedure for the investigation of incidents, accidents and near misses, including root cause failure analysis. Incidents are summarized and reported to the HSE committees every year. The refinery also has a system for reporting Near Misses identification.

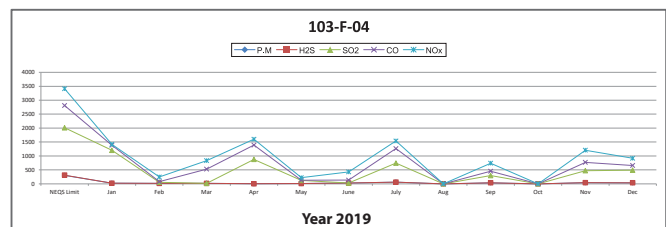
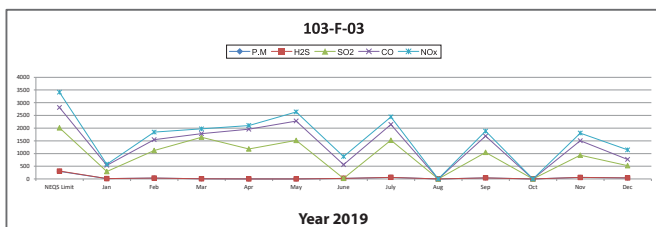
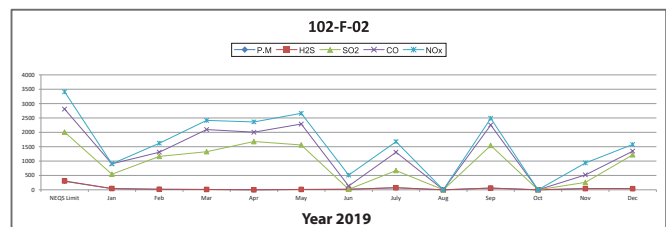
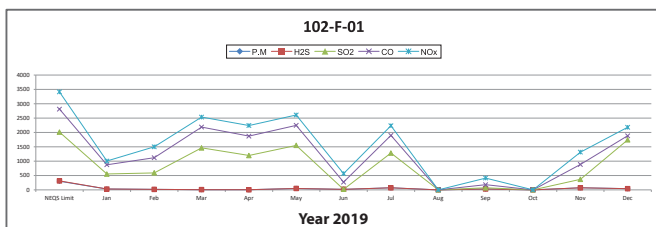
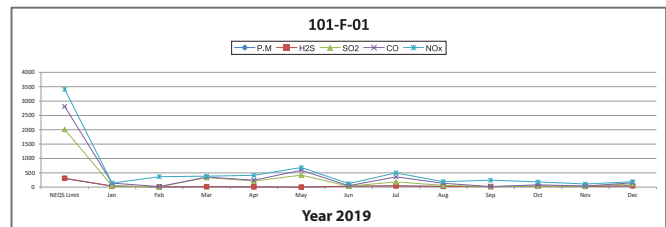
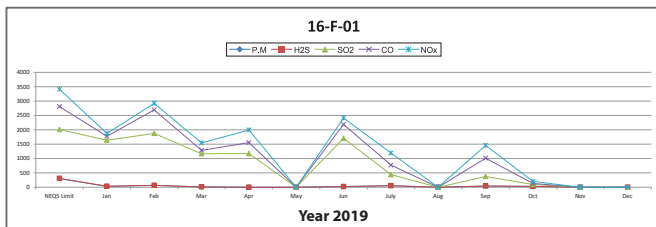
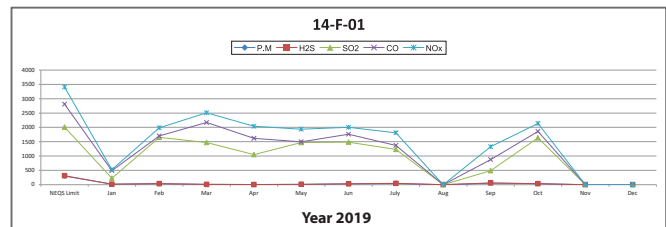
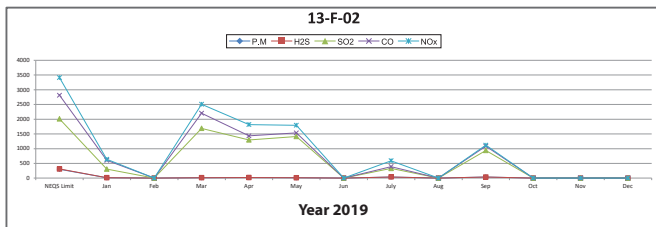
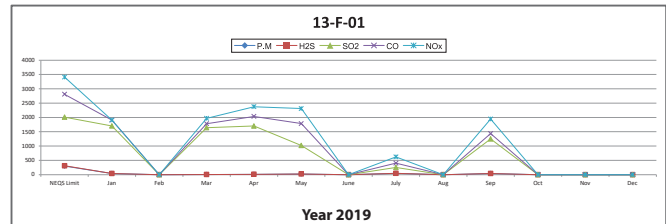
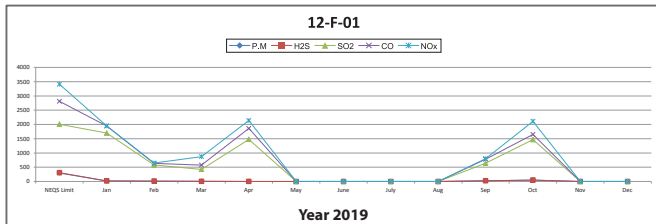
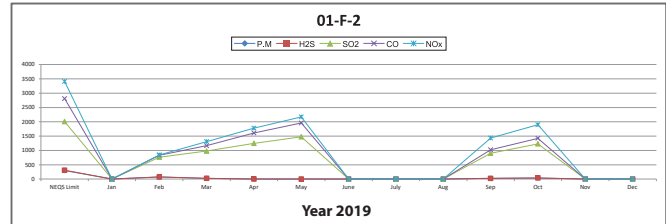
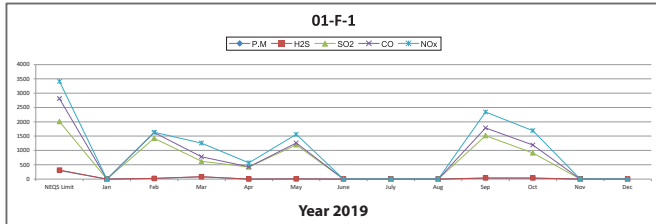
Any employee can raise one of these if they observe an unsafe situation and may recommend actions to be taken.



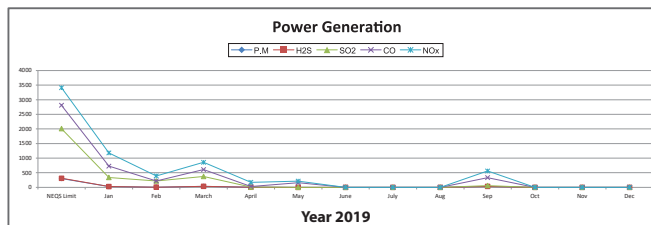
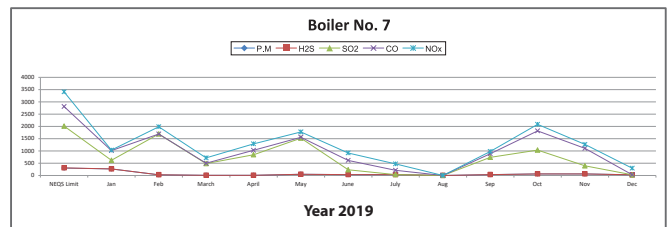
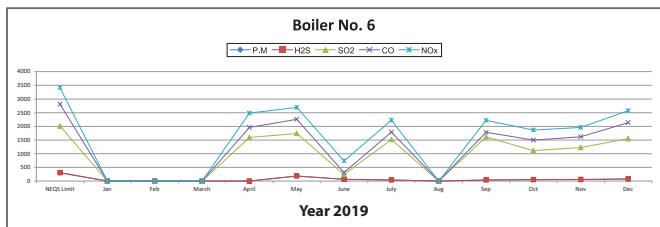
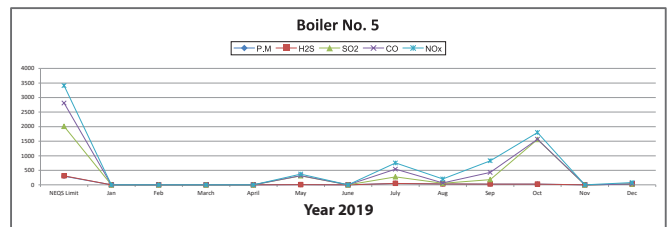
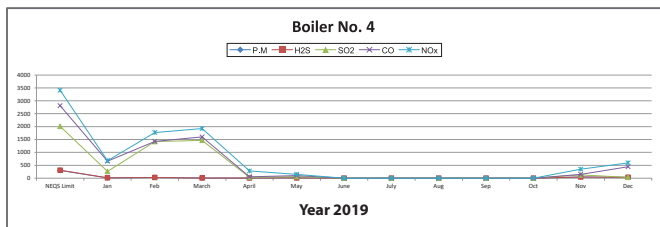
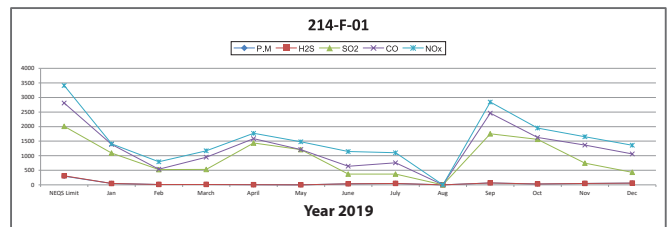
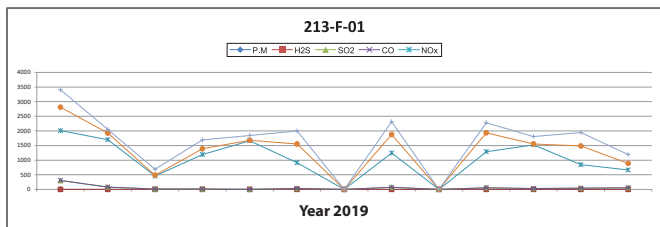
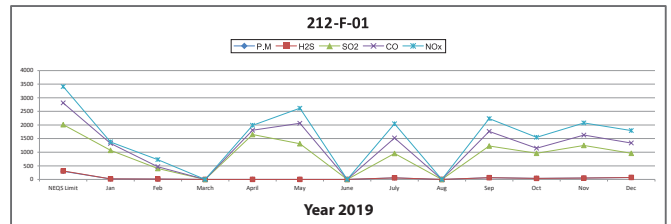
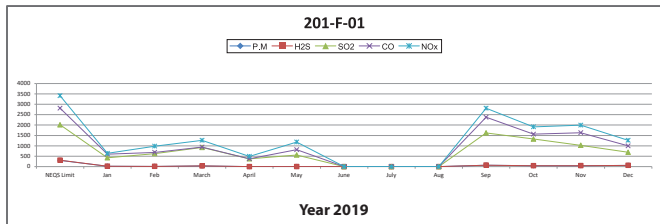
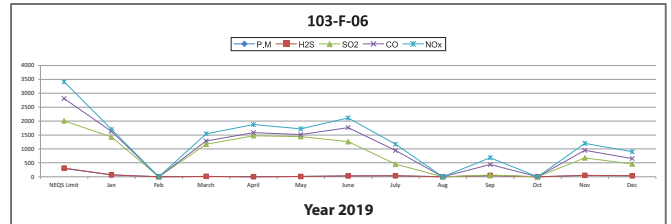
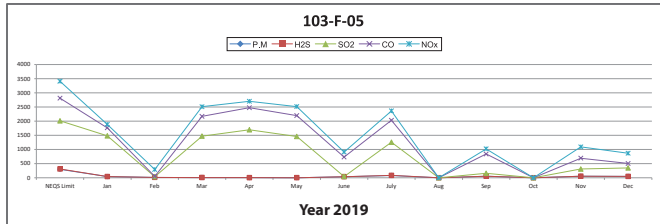
Permit To Work System Graphical Presentation



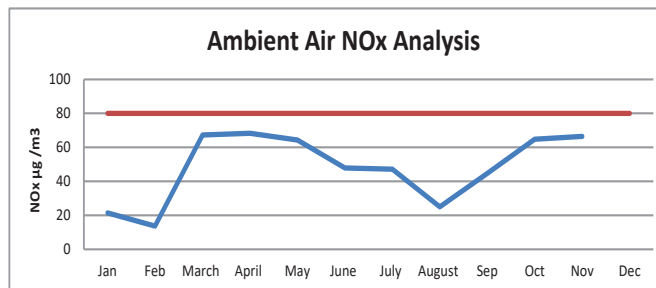
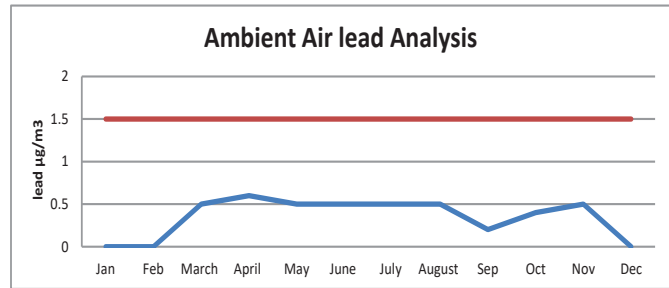
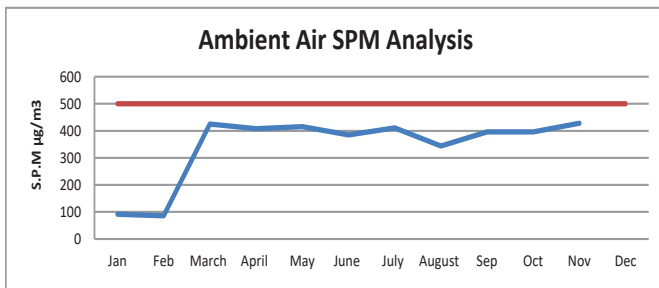
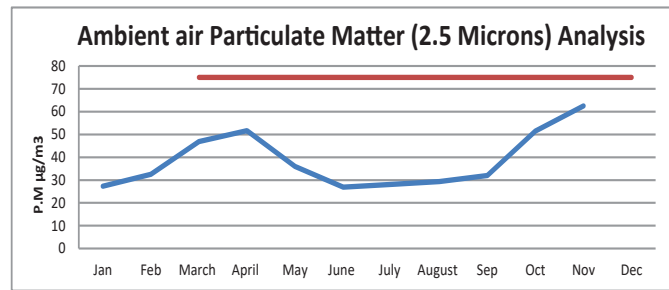
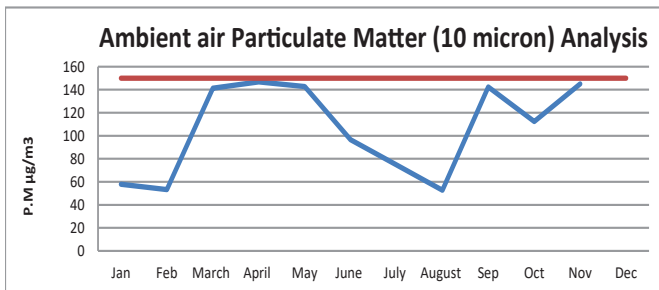
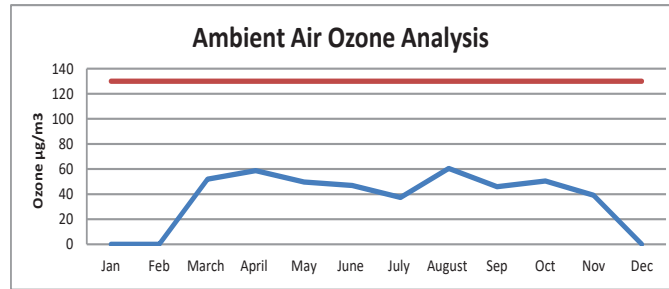
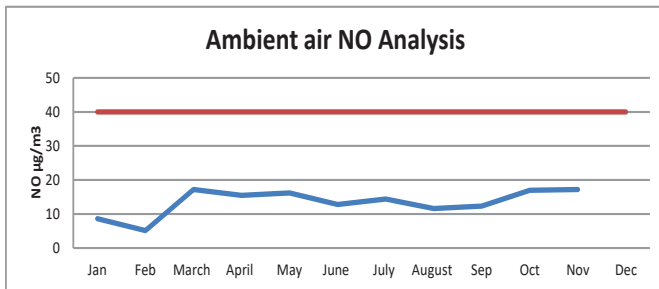
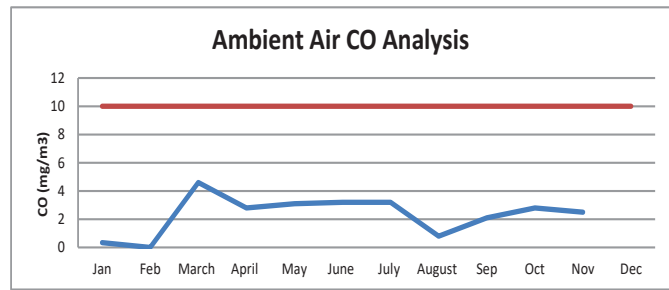
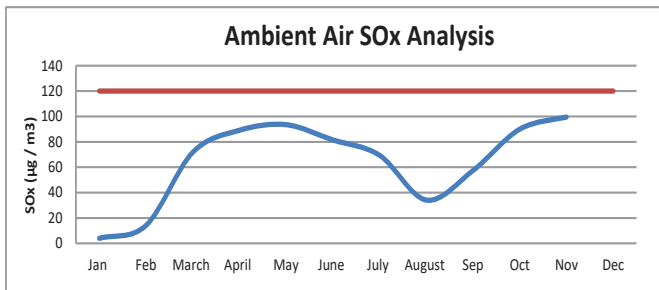
Graphical Representation of Stack Emissions Testing



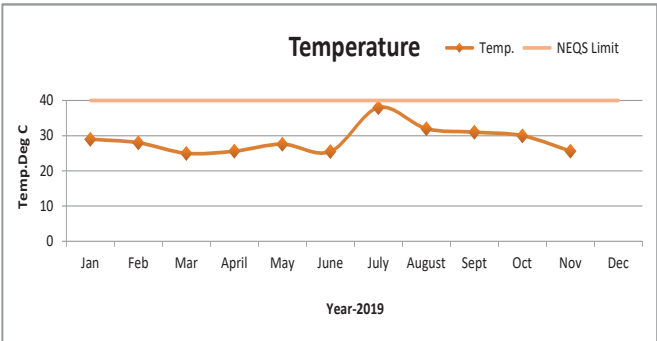
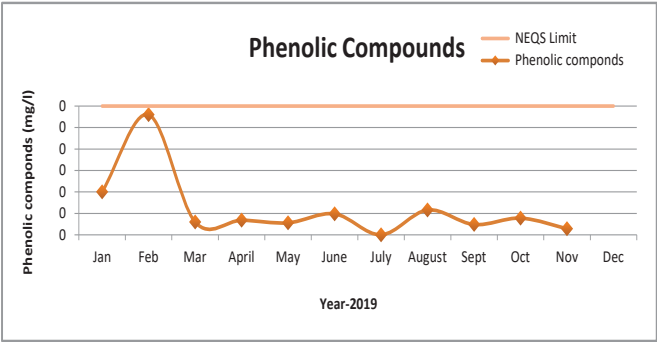
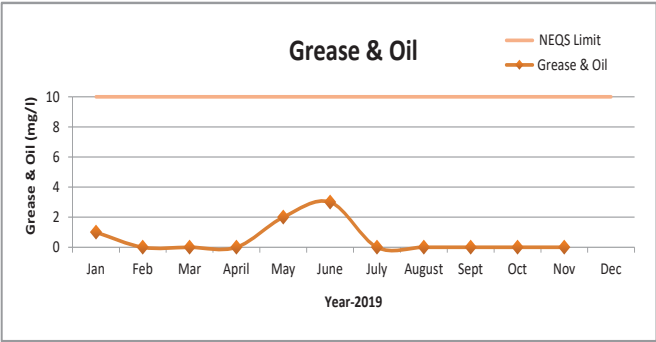
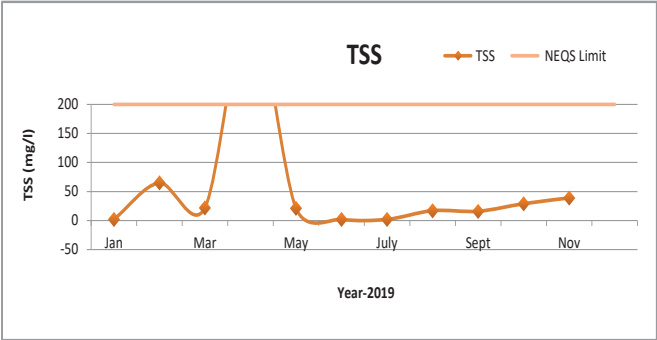
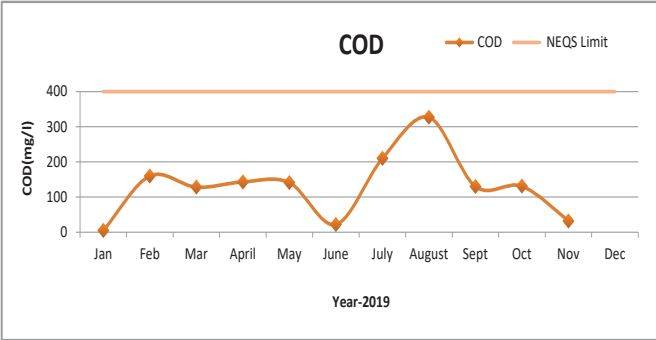
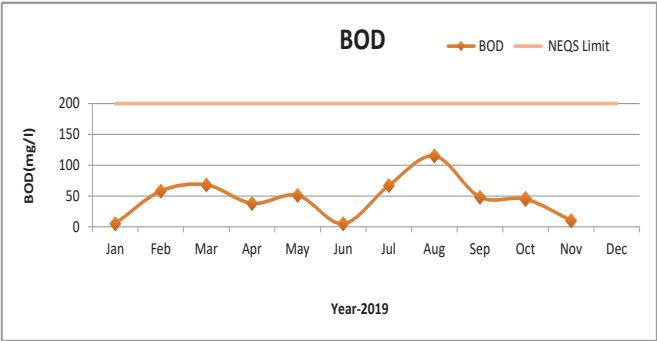
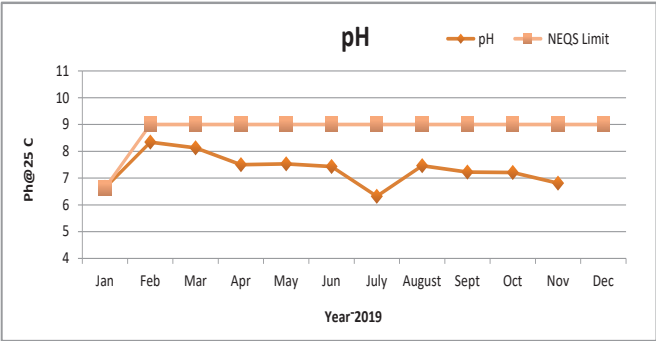
Graphical Representation of Stack Emissions Testing



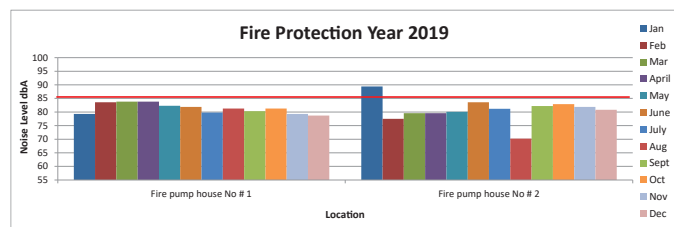
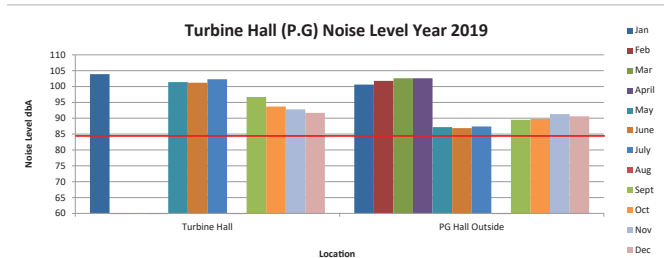
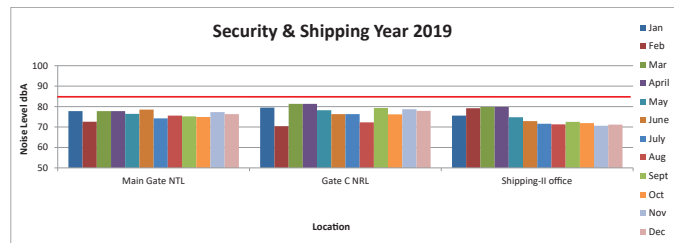
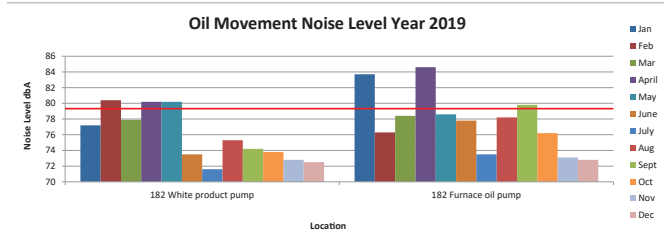
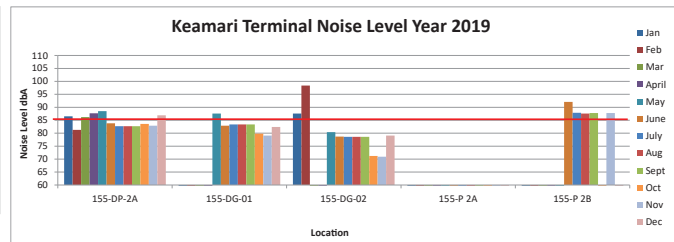
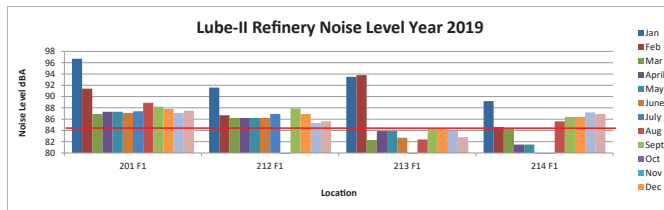
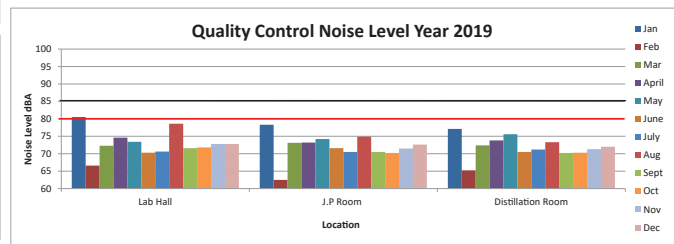
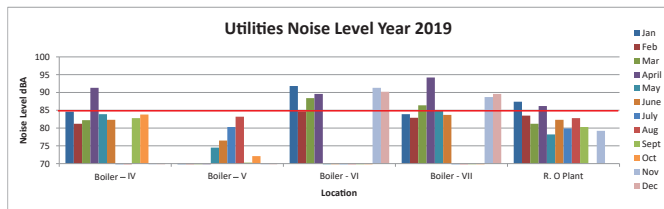
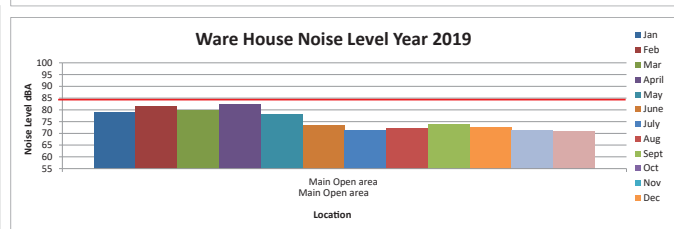
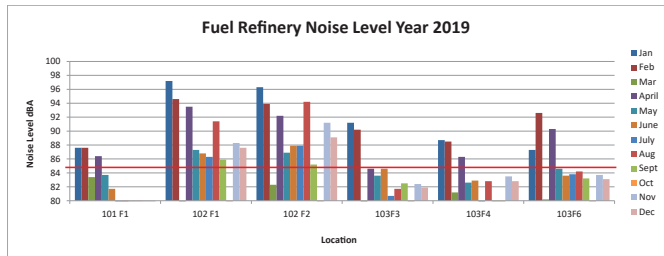
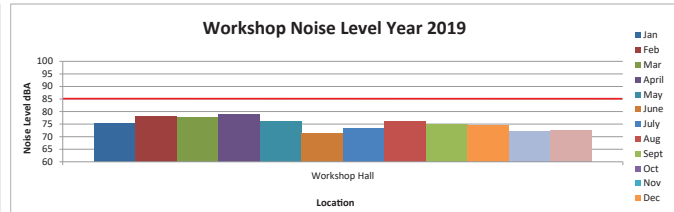
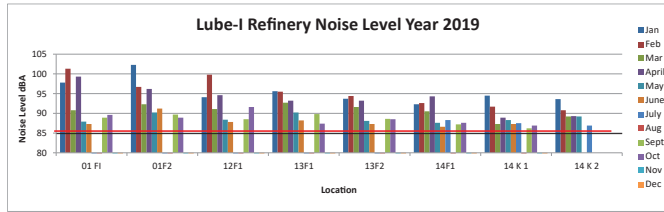
Graphical Representation of Ambient Air Monitoring



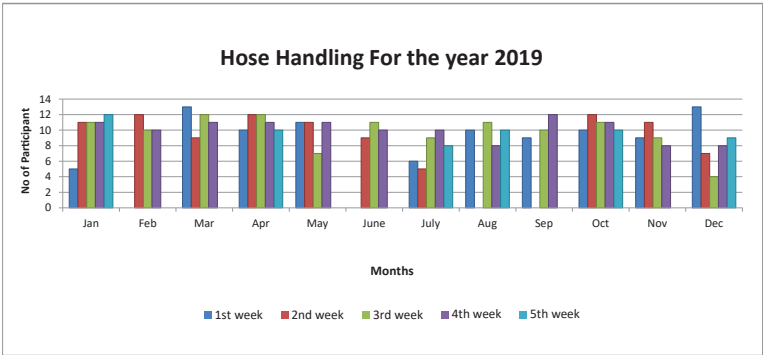
Graphical Representation of Effluent Monitoring



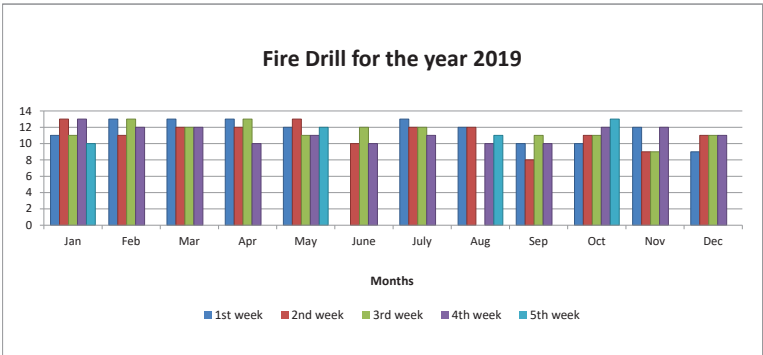
Graphical Representation of Workstation Noise Levels Monitoring



Hose Handling Practice



Live Fire Drills



ERP Drills



Baracuda **Exercise**



Internal Audit **Awareness Training**



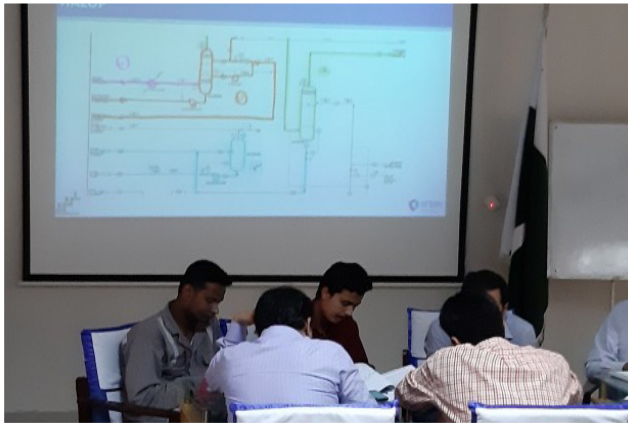
HSE **Awareness Training**



Meeting with **SEPA Representative**



Safety Management **Implementer Training**



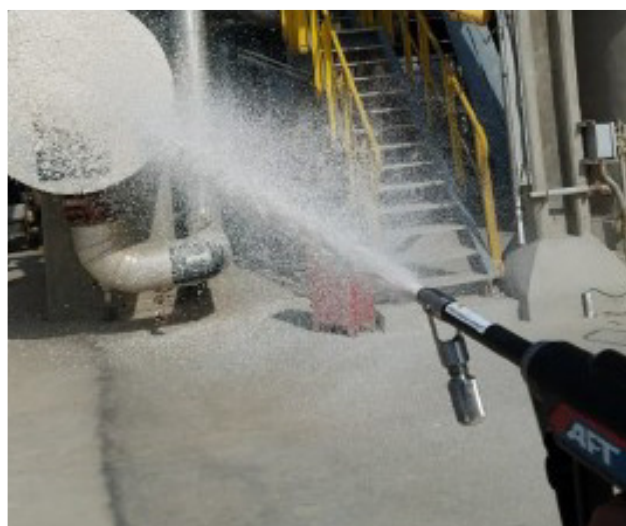
TSDU REVAMP, of Production **lube-I Refinery**



IMS (HSEQ) **Policy Training**



Compressed Air Foam **System Drills**



Tool Box Talk Conducted during **TSDU Revamp**



Coordination Meeting **TSDU Revamp**



Fire Extinguisher **Hands on Training**





Rescue Drill



SOPs Trainings



Environmental **Testing**



Ambien Air Testing



H₂S VOC Testing



Noise Level Testing



Stack Emission Testing



Drinking Water Testing

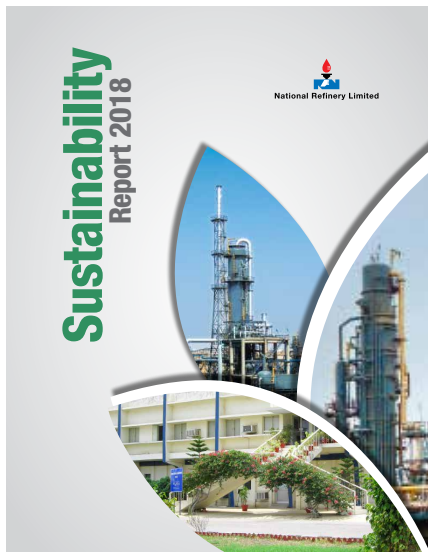


Vehicle Emission Testing



External **Communication:**

http://www.nrlpak.com/pdf/environment/NRL_Sustainability_Report_2019-4-23_2018.pdf



Annual **Report**

Annual Report are available to all the stake holders through NRL website.

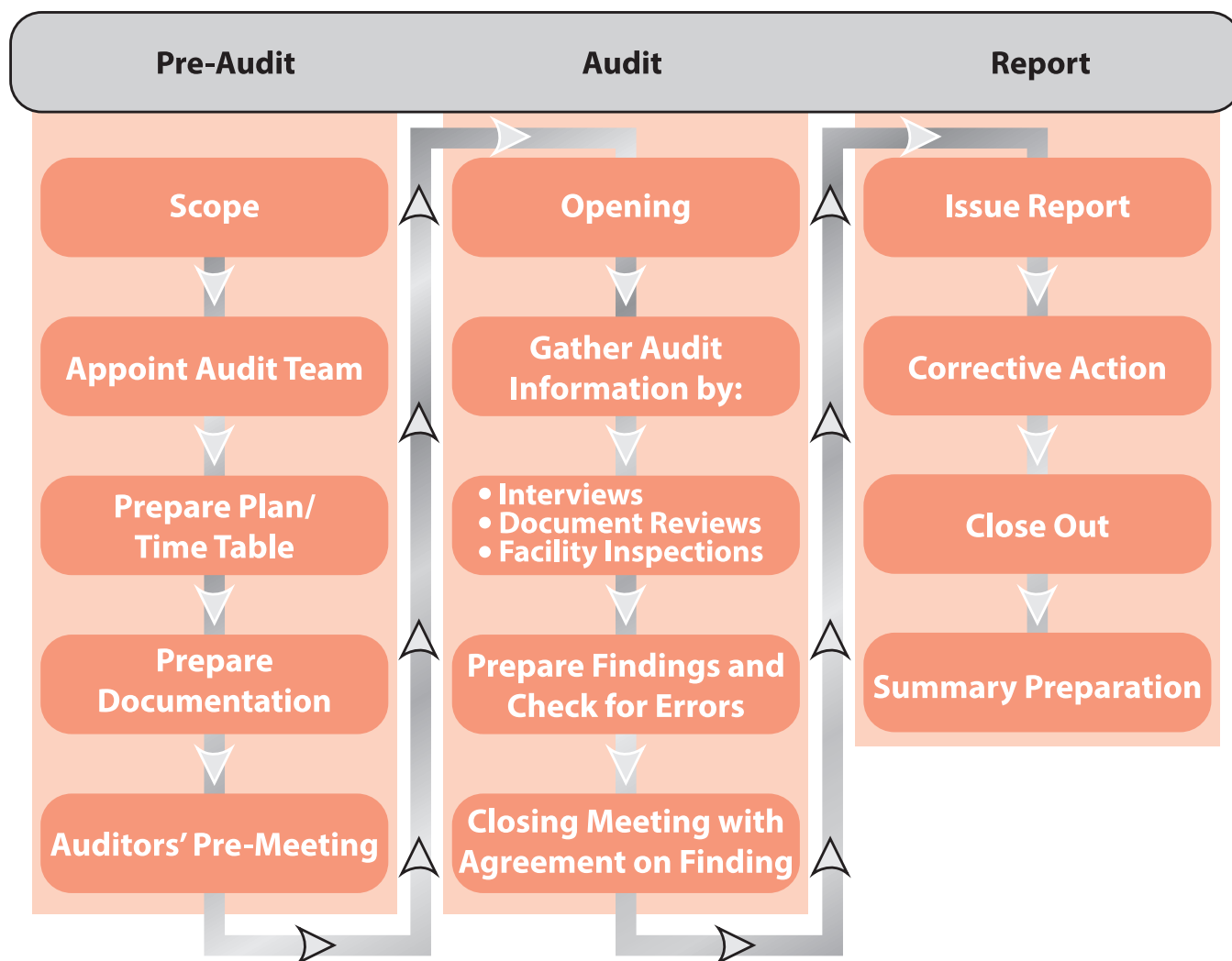


Internal Audit

The mechanism for the planning and implementation of Internal Audit for Quality, Environmental, Health and Safety management system against standards and verification of regulatory compliance at NRL.

To maintain the site ISO, EMS and OSHAS accreditations, there are internal and external audits carried out every year. In addition to this, internal audits of individual department of the Health, Safety, Environment and Quality Management Systems are carried out every year. To achieve this there are a number of trained internal auditors in each refinery Department.

The Civil Defense Local Authority and Federal Authority also conduct audits once a year.



Identification And Traceability



Area / Location / Venue	Safety Display Sign Board
NRL Korangi	191 Nos.
Keamari Terminal	74 Nos.

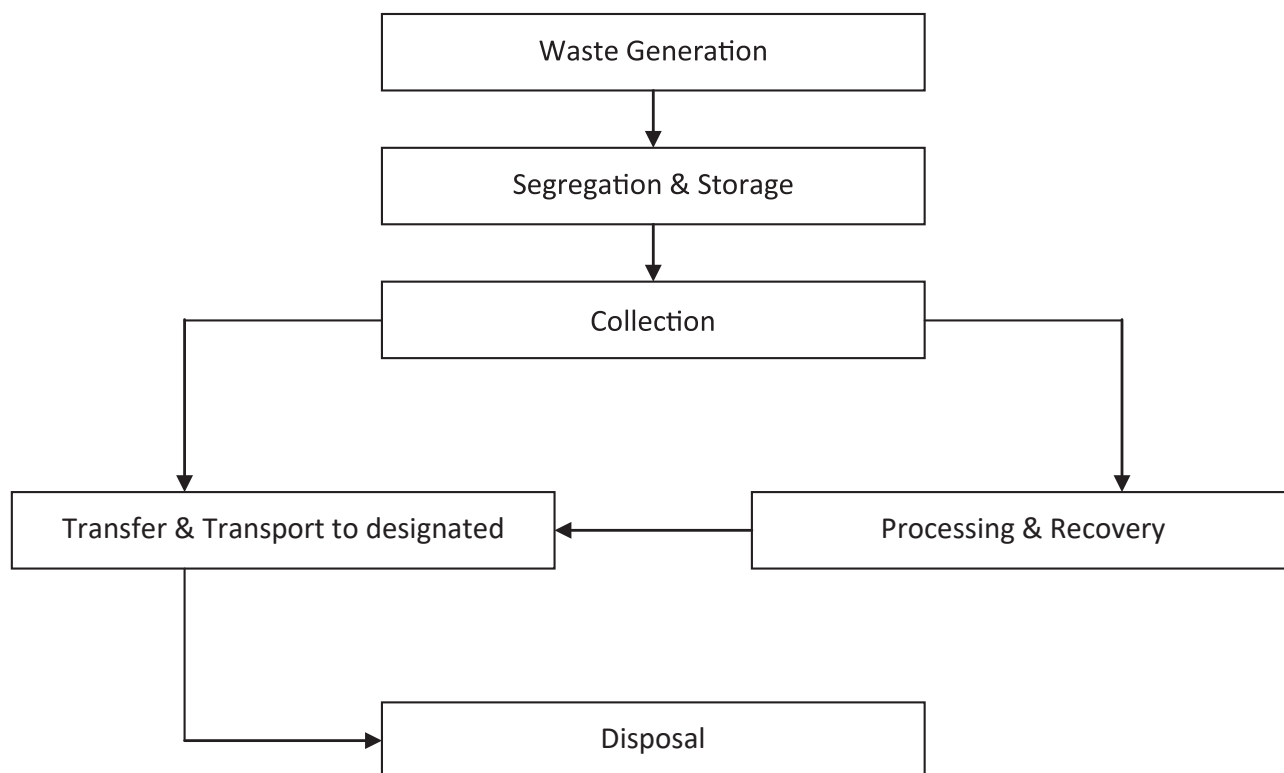
Solid Waste Monitoring & Management

NRL has developed and implemented procedures to identify, manage and dispose off solid waste materials generated in an environmentally safe manner.

Disposal of dispensary waste material and expired medicine	NRL-SOP-DIS-002
Solid Waste disposal	NRL-SOP-ADM-003
Sanitation management	NRL-SOP-ADM-004
Laboratory waste handling and disposal procedure	NRL-SOP-QCL-001
Solid Waste management	NRL-SOP-HSE-031
Procedure for cleaning and maintenance of storm water channel	NRL-SOP-HSE-035
Disposal of waste material through incinerator	NRL-SOP-OKR-033
Collection, Recovery, and Disposal of solid waste	NRL-SOP-MT3-011
Procedure for the disposal of empty drum	NRL-SOP-WHS-007

Hazardous solid waste are kept separate from non-hazardous waste and are disposed off as per the recommendation in MSDS or as suggested by HSEQ Steering Committee as per following:

- a) Oily Sludge – (Incinerator / Microbes Treatment / Sold out)
- b) Non-Hazardous / Wastes (Land Fill)
- c) Toxic & hazardous wastes are disposed off to appropriate concrete pits sites after identification.



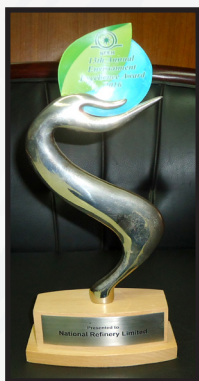
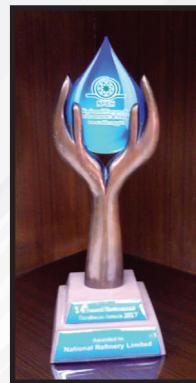
AWARDS



Group photo of 9th Fire Safety Award Winner 2019



NFEH 16th Environmental Excellence Award 2019





Honors

S. No.	Certification / Award	Period
1	Certification of BS-OHSAS 18001: 2007 Occupational Health and Safety Management System	17th Consecutive year 2003 - 2019
2	Certification of ISO 14001: 2015 Environmental Management System	17th Consecutive year 2003 - 2019
3	Certification of ISO 9001: 2015 Quality Management Systems	13th Consecutive year 2007 - 2019
4	Annual Environment Excellence Award National Forum for Environment & Health (NFEH)	16th Consecutive year 2004 - 2019
5	ACCA-WWF Pakistan Environmental Reporting Award	2003, 2009 and 2010

Membership:

National Refinery Limited is member of the following industry association(s) or trade body(ies):

- 1 Oil Companies Advisory Committee (OCAC)
- 2 Petroleum Institute of Pakistan (PIP)
- 3 Lubricants Business Society of Pakistan (LBSP)
- 4 Employers Federation of Pakistan (EFP)
- 5 Karachi Chamber of Commerce and Industries (KCCI)
- 6 Korangi Association of Trade and Industry Karachi (KATI)

Statement of **Compliance**

ANM Transformational Solutions (Pvt.) Ltd. being an independent assessor through NQA Certification carried out a 3rd party assessment of NRL for IMS (HSEQ) Management System requirements compliance and 1st Surveillance Audit of NRL for Environmental Management System ISO 14001:2015, Occupational Health and Safety Management System OH&SMS 18001:2007 and Quality Management System ISO 9001:2015.

The scope includes Manufacturing, Supply, Marketing, Sales and Export of Wide Range of Petroleum Products (Motor Gasoline (MOGAS), Kerosene (SKO) , Jet A-1 , JP-8, EURO II grade High Speed diesel Oil, Furnace Oil (F.O) , Liquefied Petroleum Gas (LPG) , Naphtha (For Export) , Asphalt Paving Grades, Lube Base Oil, Wax, Slack Wax, Rubber Process Oil, Extract Oil & Sulfur Granular (byproduct)) and Petrochemical Products (Benzene, Toluene, Xylene).

During Re-Certification audit, a competent team of ANM Transformational Solutions (Pvt.) Ltd. found that NRL has well established, implemented and maintained requirement contained in the Environmental Management System ISO 14001:2015, Occupational Health and Safety Management System OH&SMS 18001:2007 and Quality Management System ISO 9001:2015 respectively for the establishing a frame work of continual improvement through the following manner.

- The ultimate responsibility of ensuring the implementation of IMS (HSEQ) Management System lies with the IMS (HSEQ) Management Council.
- NRL establish, document, implement, maintain and continually improve its IMS (HSEQ) Management System in accordance with the international standard and determine how it will fulfill these requirements.
- NRL IMS (HSEQ) Policy statement within the defined scope it is well appropriate, documented, updated, maintained, communicated, publicly available, provide a frame work for setting and reviewing objectives and targets included a commitment to continual improvement, to comply with applicable legal and other requirement.
- NRL established, implemented and maintained procedures to identify environmental aspects, impact assessment, hazard risk assessment for all it routine and non-routines activities.
- NRL established and maintained the procedure for identifying and evaluating accessing the legal requirement compliance including permits that are applicable.
- NRL established and maintained IMS (HSEQ) objectives at relevant function and levels these objectives and targets are measurable, consistent with IMS (HSEQ) policy including the commitment to continual improvement. The defined roles and responsibilities, meantime frame by which these objectives are to be achieved addressed in the Management program.
- The roles, responsibilities, authorities and accountabilities of personnel who manage, perform and verify activities are well defined, documented and communicated in order to facilitate IMS (HSEQ) Management System. The availability of resources ensure by the Management for the effective implementation of IMS (HSEQ) Management System.
- A well-structured training mechanism has been implemented for the effective implementation of IMS (HSEQ) Management System.
- IMS (HSEQ) Management System information for internal and external communication with stakeholders in relation to, environmental aspect, pertinent OH&S, product, inquiries, contract, customer feedback, including customer complaints, NRL has proper implemented through effective procedural mechanism.



- The level of detail of the documentation sufficient to describe the IMS (HSEQ) management System and its parts works together, and to provide direction on where to obtain more detailed information on the operation of specific parts.
- NRL created and maintained documents in a manner sufficient to implement the IMS (HSEQ) Management System. Document and data control, traceability, identification, availability and disposal of obsolete version well managed.
- NRL establishing and maintaining documented procedures and Quality plan to cover situations where there absence could lead to deviation from IMS (HSEQ) Policy and objective.
- The developed emergency preparedness and response procedures suits its own particular need, include consideration of nature of onsite hazards, scale of an emergency situation / accident, internal and external communication plans, corrective and preventive action, testing drills, mock drills evacuation routes, evacuation maps and assembly area.
- The defined monitoring and measurement procedures are well maintain to monitor and measure IMS (HSEQ) Management System performance, data collected from monitoring and measurement analyzed to identify the patterns and obtain information used to implement corrective and preventive action. The procedure provide both qualitative and quantitative measure, monitoring of the extent to met IMS (HSEQ) objective, proactive measure of performance that monitor compliance with the IMS (HSEQ) Management System, operational criteria and applicable legislation and regulatory requirement.
- A well-defined procedure has been implemented in NRL with responsibility & authority for handling and investigation non-conformance / accident / incident. Taking action to mitigate any consequences arising from non-conformance / incident / accident. The initiation and completion of corrective and preventive action. Confirmation of the effectiveness of corrective & preventive action taken.
- Internal audit procedure has been proper implemented and maintained to meet the IMS (HSEQ) policy and objectives, review the results of previous audits, and provide information results of audits to management. This procedure covers the scope, frequency, methodologies and competences, as well as the responsibilities and requirements for conducting audits and reporting results.
- Management review conducted at planned intervals, to ensure its continuing suitability, adequacy and effectiveness, including assessing opportunities for improvement has been carried out by NRL management, output include any decisions and action related to possible changes to IMS (HSEQ) policy, objectives and other element consistent will the commitment to continual improvement.

This has been verified through audit that NRL has a proper and effective IMS (HSEQ) Management performance reporting system to ensure its adequacy, reliability, accuracy and recommended for continuation. This system is well incorporated in the business processes with a high level of commitment observed during audit process.

ANM Transformational Solutions through NQA Certification Ltd.

Glossary

LR1	Lube-I Refinery	AWT	Awareness, Training and Competence
FRE	Fuel Refinery	CAC	Communications, Consultation and
LR2	Lube-II Refinery		Participation
OKR	Oil Movement	MAM	Calibration, Monitoring and Measurement
OKT	Keamari Terminal	EVC	Evaluation of Compliance
UT1	Utilities	AUD	Internal Audit
FPR	Fire Protection	EPR	Emergency Preparedness and Response
MT1	Maintenance-I	TRR	Tracking of Regulations and other
TLW	Turnaround Planning / Local Manufacturing		Requirements
	/ Workshop / Auto shop	AAP	Agency Approvals for EMS & OHSAS
PGR	Power Generation	OCP	Operational Control
MEL	Maintenance (Electrical)	CCP	Contractor Control
MT3	Maintenance-III	AIA	Environmental Aspects & Impacts Analysis
INS	Instrumentation	EOT	Environmental Objectives, Targets and
HSE	Health Safety & Environment		Management Programs
TSR	Technical Services	HRA	Occupational Health & Safety Hazards
QCL	Quality Control		Identification and Risks Assessment
PPE	Production Planning & Economics	OTM	Occupational Health & Safety Objectives
PRJ	Project		and management Program
CON	Contract	RIP	Review of (HSEQ) Identified Projects
ENG	Engineering	NCR	Control of Non-Conforming Product
MBL	Management Block	QOB	Quality Objectives, Targets and Analysis of
DIS	Dispensary		Data
ISP	Inspection	CO2	Carbon Dioxide
SMS	Shipping, marketing & Sales	Db	Decibel-unit for measuring noise level
STR	Supply & Trade Relation	EPA	Environmental Protection Agency- Govt. of
WHS	Ware House		Pakistan
IMP	Import	IGPD	Imperial Gallons Per Day
LRU	Local Purchase	LTI	Lost Time Injury
ITS	Information Technology & System	MR	Management Representative
LCA	Legal & Corporate Affairs	MSDS	Material Safety Data Sheet
HUR	Human Resource	NEQS	National Environment Quality Standards
PER	Personnel	NOx	Oxides of Nitrogen
SCY	Security	SOx	Oxides Sulphur
SPR	System procedures	OH&SMS	Occupational Health Safety Management
DDC	Document Data Control		System
MRM	Management Review Meetings	OHSAS	Occupational Health and Safety
SRR	Structure, Roles, Responsibilities and		Assessment Series
	Accountabilities		
CPA	Corrective and Preventive Action		



Feedback Form

The performance evaluation data sheet assist us for further improvement regarding any aspect for this report.

You are requested to fill the questionnaire for each statement, please indicate your response with the respective rating given below and add your valuable comments / suggestions where appropriate.

SA = Strongly Agree, A = Agree, N = Neutral, D = Disagree, SD = Strongly Disagree

S. #		SA	A	N	D	SD
01	Reporting mechanism and presentation					
02	Understandability, readability, accessibility					
03	Completeness					
04	Credibility & communication					
05	Comprehensive navigation					
06	Integration with financial statements					
07	Environmental performance					
08	Compliance & no-compliance record					
09	Management commitment including environmental occupational health & safety vision, strategy and related policies.					
10	Application of guidance or standard					

Comments / Suggestions

Many many thanks for your time in answering these questions. Your answers / input will play a significant link for the improvement of this report.

Please Forward to

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National Refinery Limited
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Korangi Industrial Zone,
Korangi-Karachi
E-mail: mgrhse@nrlpak.com
Phone No. 92-21-5064981-87
Ext: 2559

Your Name: _____
Your Designation: _____
Organization: _____
Email: _____



National Refinery Limited