UPES Centre for Continuing Education

STUDY OF ECONOMIC IMPACT OF MAINTENANCE MANAGEMENT INEFFECTIVENESS WITH REFERENCE TO OIL AND GAS COMPANY

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A DISSERTATION REPORT SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR

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ABSTRACT

Maintenance is a critical element in the production process of oil and gas (O&G) industry. Maintenance management aims to assigning the most suitable maintenance strategy for equipment within the process to meet acceptable level of integrity and safety and gain high reliability and availability of asset without any unnecessary investment. A develop an integrated framework for strategic and operational maintenance policies in oil and gas industry is presented to satisfy the above statement.

Different methods and approaches will be utilised to achieve the aim and objectives of this research such as Analytical Hierarchy Process (AHP), fuzzy logic and mathematical programming. The outcomes of the proposed integrated framework illustrate high equipment effectiveness and a minimum maintenance spending.

This research explores the plant maintenance management system that has been used by giant oil and Gas Company. The system also used to manage the upstream operations for more than 100 plants of the company. Moreover, from the observations, focus group discussion with PMMS personnel and application through simulation (SAP R/3), the research reviews the step-by-step approach and the elements that required.

The findings show that the integrates the overall business strategy in upstream operations that consist of asset management, work management and performance management. In addition, maintenance management roles are to help operations personnel organize and plan their daily activities, to improve productivity and reduce equipment downtime and to help operations management analyze the facilities and create performance, and to provide and maintain the operational effectiveness of the facilities.

APPENDIX – II

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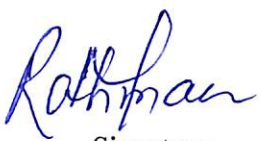

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APPENDIX-I

"Letter of Acceptance"

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Subject:-Willingness for Guiding Dissertation of **Najeeb Ur Rahman** SAP ID. **500063770.**

Dear Sir,

Najeeb Ur Rahman is registered for **MBA in Oil and Gas**, with the University of Petroleum & Energy Studies, Dehradun in the 2017-2019 batch.

I hereby give my acceptance to guide the above student through the Dissertation work **'Study of economic impact of maintenance management ineffectiveness with reference to oil and gas companies'**, which is a mandatory academic requirement for the award of the MBA degree.

Thanking You

Yours Sincerely

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF THE STUDY

While each sector of the business world is liable to fluctuation every now and then, there's perhaps no industry more unstable than oil and gas. As consumers, we see this phenomenon constantly. Almost every time we stop at the oil and gas station to top off our autos, we see that the price of a gallon has moved fundamentally since a week ago. Up 15 pennies, down 25, back up 40 the development never closes.

For industry insiders, these developments are a noteworthy reason for concern. At the point when the price of oil and gas changes drastically, it can massively affect the accomplishment of oil companies worldwide. Michael McDonald noticed that oil prices were on a downward slide for the majority of the year, and most investors and business leaders were looking at their revenues anxiously. They needed to stress over liquidity crunches and possibly even discount rebuilding to their business models.

Price volatility in the industry is a noteworthy issue, and there's just so much that companies can to do battle the problem. All things considered, if the price of gas is sliced down the middle starting with one year then onto the next, you can't actually lay off half your workforce and still maintain operations. Regularly, industry leaders must search for progressively innovative answers for trim their budgets and stay intact.

1.2 PROBLEM STATEMENT

This exploration exhibits an evaluation of the money related misfortunes brought about by support the executive's ineffectualness, discoveries which may show valuable to top administration. In another way, this examination shows that noteworthy money related benefit can be made by improving upkeep execution. Moreover, maintenance management inspecting might be reached out to the company's different plants and subsidiaries using the methods presented in this research. The consequences of these reviews can be summed up conveniently, for example, to be utilized as a manual for framework plans for improving support execution in the oil and gas organization.

This examination assesses the impact of upkeep the executive's incapability in order to persuade top administration of the need of being related with the procedure of support improvement.

To ensure that business model remains sustainable for the long take, it's important to development and mind the integrity of your assets all equipment still in great working condition. The essential procedures running smoothly and efforts are being taken to increase preventive or condition-based maintenance in oil and gas industry.

1.3 NEED FOR THE RESEARCH

The first step is usually to assess or assess your company's current processes and procedures for work planning, preparation, and scheduling. Registering assets and equipment and cleansing data periodically maintenance exact and effective are spare parts levels. They synced with physical counts regardless of whether maintenance process appears to run smoothly, there's always space for included efficiency somewhere.

Top-level executives in the oil industry always have an interest in better strategic planning. Engage with official sponsors to distinguish basic business issues. At that point, devise project plans to ensure business focuses on areas that will speed up maintenance and increase reliability. The development of dashboard KPIs, automated answering to key personnel, and other modern CMMS features can significantly help the success of these project plans.

Highly qualified, well-trained employees are an absolute must for handling maintenance effectively. Ensure workforce is skilled in the use of maintenance solutions that boost efficiency. Need to perform standard audits or influence a proceeding with education tracking resource to ensure that all of personnel have been raised to speed and there are no waiting drains on productivity.

1.4 OBJECTIVES OF THE STUDY

- To find out the operations training process including maintenance techniques followed in oil and gas industry
- To find out the economic impact of maintenance management based on organization strategic in oil and gas industry
- To study in detail about maintenance management performance system integrated in the oil and gas performance measurement system

- To assess the maintenance management to maximize the resource availability in order for allowing strategy flexibility

1.5 MAINTENANCE AND FACILITY MANAGEMENT

This exceptional issue was advanced during the second International Conference of Maintenance and Facility Management on the point of view that maintenance and facility management speaks to a complex business territory, involving various procedures and requiring the integration of a wide scope of abilities (extending from technical and management-related methodologies, to information and communication technologies, to management philosophies and strategies, and so forth.), so as to give an effective support of the customers. Along these lines, the result of this exceptional issue was intended to cover a complex arrangement of studies, adding to an expansive scope of themes, as the consequence of the intrinsic idea of the pretended by the maintenance or potentially facility management function inside most of businesses.

Lately, complexity has been expanding as per the patterns experienced by numerous parts of industry. Likewise, the developing requirements for usefulness of offices and industrial plants are forcing new challenging necessities to the maintenance and facility management departments. The explanation behind this pattern is at any rate triple.

In the first place, the complexity of kept up frameworks is becoming because of the improvement of the small scale electro mechanical technology and, as a result, of the expanding quantity of electronic and software gadgets in civil and industrial equipment.

Second, the effect of the hidden costs of maintenance on competitiveness and survivability in industry and administrations is winding up increasingly important: the proportion between hidden costs influencing the activities related performances (for example safe generation, safe equipment use, creation quality, booking unwavering quality, and so forth.) and straightforwardly budgeted costs (for example staff and extra parts costs, outsiders and administration related contracts costs, and so forth.) is expanding at a quick rate. Pay day. Plant Engineering and Maintenance, featured that maintenance budgets speak to, all things considered, 20% of the complete plant working budget, running from a couple of percent in light manufacturing, to high rates in equipment-serious industry (for example steelmaking, petrochemical, mining industry, and so on.) or in the supposed utilities area (for example electrical vitality, oil and gas, and so on.). Notwithstanding, hidden costs are viewed as more

valuable than the ones accounted in the maintenance budget, in that hidden costs are identified with the main factors driving the management consideration. As confirmation of this sentence, over half of the Aberdeen overview respondents. The benefit management benchmark report: advancing toward zero downtime positioned the need of boosting the creation capacity, expanding accessibility and improving flexibility among the best three factors driving the emphasis on resource management, while costs in the maintenance budget were positioned at a lower position.

The third reason (last, yet not least), is that maintenance and facility management practices are critical to effectively support the safety and eco-productivity paradigm (an applicable driving component is spoken to by administrative consistence, for example environmental health and safety; see once more. The advantage management benchmark report: advancing toward zero downtime. Despite the fact that this result appears to layout a responsive methodology, as opposed to an unequivocal proactive system towards safety and eco-proficiency, it likewise demonstrates the significance of maintenance and facility management as conceivably prominent players in satisfying the developing prerequisites of safety and eco-effective generation and items use.

From the hierarchical viewpoint, the maintenance and facility management function is changing its job in companies, going from situations as yet inadequate with regards to an administrative discernment (taking a gander at the maintenance and facility management as vital shades of malice), to enterprises where the function is considered as a vital weapon to support competitiveness and uphold operational greatness. This is genuine when capital escalated resources are included, yet additionally when framework trustworthiness is expected to ensure abnormal amounts of operational targets for safety, administration and quality. The last advance of this advancement can be pinpointed by examining the improvement of the physical or engineering resource management disciplines. These were as of late acquainted with imagine a way to deal with productive and monetarily proficient businesses by the best possible maintenance and activity of advantages through their life cycle.

This sort of change must be supported by further advancements and combination of the maintenance and facility management framework. Ideas, philosophies, strategies, methodologies and apparatuses must be incorporated and coordinated, to encourage effective choices for resources usage and profitability during their whole life cycle. To this reason, this

extraordinary issue goes for adding to the improvement of a kind of framework, by giving on-going research and field examines in the maintenance and facility management areas.

1.6 THE MAINTENANCE AND FACILITY MANAGEMENT FRAMEWORK

An on-going pattern, in characterizing maintenance, calls attention to a more extensive point of view of the subject itself, by considering likewise the engineering decisions and related activities for the streamlining of indicated ability, for example the capacity to perform a particular activity inside a scope of performance levels (for example creation capacity, quality, safety, eco-effectiveness and so on.). This methodology really incorporates the maintenance of technical frameworks (for example industrial plants, equipment's, offices and so forth.) and it goes a long ways past the traditional view, where maintenance was seen as the function responsible for fixing broken things. The extension is consequently expanded, in the light of the physical or engineering resource management viewpoint: management should cover each phase of the technical frameworks life cycle, from specification and obtaining to transfer, by likewise considering the business and monetary dangers and life cycle costing. For instance, maintenance should assume a job in decisions, for example, equipment replacement or plant/administrations structure, along these lines the unwavering quality and viability of technical frameworks would be upgraded, in this way improving the business productivity.

As a result, the maintenance and facility management framework needs to gather all the management philosophies, technical methodologies and ICT (information and communication technology) instruments, supporting engineering decisions and related exercises, for an effective administration conveyance. This goal can be accomplished by keeping an extensive vision of all maintenance and facility management viewpoints (for example procedure, policy planning, cost improvement, authoritative arrangements, work flow control, booking and execution exercises). Considerably progressively significant is the capacity to actualize a constant improvement procedure approach, just as business process re-engineering programs. The primary components reviewed above should be incorporated into a sound maintenance and facility management framework.

For sure, the technique should begin from the meaning of an all-inclusive strategy for molding the courses of activities ready to close the holes between real performances and target performances. A dream should along these lines be at first characterized, including:

- The management performances to accomplish;
- The current degree of performances;
- The organization of the performance holes, among present and arranged levels.

Likewise asset requirements should be characterized for giving a down to earth backing to the arranged improvement's activities. At long last, a kind of dashboard must be set-up, to give key performance markers, permitting a nonstop following of the accomplishment of the performances focused on level.

One further advance of the framework lies in policy planning and cost enhancement. Policy planning can be characterized as the determination and the modification of the policy blend (among time sensitive preventive, condition-based and restorative maintenance) to be connected to the technical framework (for example plant, equipment's, offices and so forth.). By expanding the old style point of view, just centred on the operational life, the policy planning stage should likewise include the decisions in regards to the foundation of the economic life of capital equipment and the ideal opportunity for their patching up/replacement. At last, policy planning should secure against resource disappointments or potentially performance misfortunes (for example safety, quality, generation capacity, eco-proficiency, and so forth.), by guaranteeing the activities cost improvement.

A follow up–firmly connected is the progression of maintenance association and framework engineering. This implies numerous heterogeneous exercises and decisions to convey the arranged policy. A business procedure examination is consequently required, recognizing key procedures and exercises inside the worth chain; allotting obligation of procedures and exercises to hierarchical units (for example unified or decentralized arrangements, inward or outer units, and so forth.); planning the asset requirements (for example team for assessments as well as preventive replacements, time for routine administrations, save parts stock and acquiring policy, and so forth.); giving responsibilities, assets and instruments to oversee extends; and designing ICT apparatuses to help maintenance and facility management exercises.

The last hierarchical advance covers with the requirements for work-flow control through planning, booking and execution. In fact, the work-flow of maintenance and facility management tasks needs to trade information and information identified with equipment

history, guarantees, administrative requirements and so forth. The mechanized maintenance management framework (CMMS) and the PC supported facility management frameworks or– by widening the fringes the endeavor resource management software frameworks are customarily committed to this end. Looking past, the incorporated maintenance management framework paradigm will rise, because of coordinating the different segments and subsystems (for example sensors, information procurement and communication frameworks, delicate registering modules for diagnostics, CMMS and venture asset planning (ERP) software arrangements, and so forth.), offering ascend to exhaustive management frameworks (additionally alluded as e-maintenance frameworks. PROTEUS–an integration stage for disseminated maintenance frameworks. At long last, ceaseless improvement and business process re-engineering additionally merit consideration as significant pieces of the framework. These methodologies are received to help the capacity to change for development, so as to misuse new mechanical chances and additionally modification of the earth where the technical frameworks work. Consequently, the persistent improvement approach crosses all the recently examined areas and it speaks to an influence to actualize all the maintenance methodology, given that it empowers effective changes either in the policy plan, the technical framework or potentially in the association.

1.7 OPTIMISATION OF MAINTENANCE STRATEGY

Maintenance theory has turned into a complex science that frequently has evaluation and implementation strategies that are indistinguishable on a basic level. As a result of the manner in which various companies bundle these strategies as administration contributions, it can show up as though they are contending. The outcome is that a considerable lot of the coherently solid and effectively reachable advantages of maintenance streamlining are not understood in light of the fact that the focused nature between administration companies regularly results in complex and over-convoluted implementation plans.

At AIE, we accept that up to 80% of maintenance improvement increases can be accomplished by 20% of the exertion that would be associated with the implementation of a formal unwavering quality focused maintenance process. This can be accomplished through a survey of the criticality hierarchy, at a facility with resultant updates to the frequency and the methodology of arranged maintenance exercises. It is no big surprise that facility's management is regularly incredulous about administration contributions to diminish maintenance costs.

There are, nonetheless, other progressively essential factors that offer low balancing natural product regarding cost decrease openings. Rather than adjusting maintenance action to the criticality hierarchy which is a fundamental precept of Maintenance Management, it is frequently the situation that prescribed maintenance practices from unique equipment manufacturers are expanded well past the warranty time frame for a wide scope of equipment. Such practices are intended to limit hazard to the OEM and not to improve money saving advantage of maintenance expenditure for the administrator of such equipment.

1.8 MAINTENANCE OPTIMISATION

In recent years, antagonistic economic situations have moved business center in industrial offices towards cost reduction and expanding the life of existing resources versus replacement projects and subsequently, maintenance expenditure and streamlining is by and by a concentration for management.

This balance sheet challenge oftentimes bargains business maintainability for momentary cost reductions, by conceding those working and additionally maintenance costs that have a generation sway for example shutdowns for basic maintenance or inspection.

There are a few disadvantages to such a system, that have been all around demonstrated previously, including, much of the time, conceded expenditure on maintenance escalates after some time and acquires higher future cost (in present worth) to redress the subsequent disregard. Moreover, deferral of maintenance exercises veering off from established industry practice expands the risk of impromptu plant downtime and the probability of incidents and accidents.

So also, for static equipment and structures, the deferral of fabric maintenance as well as expanded inspection intervals, conveys comparative results of higher future fix cost and risk of failure/loss of regulation incidents.

Occasions of significant accidents have generally prompted institutional changes in legislation and guideline. Rebelliousness to these measures or the improper use of risk based work forms, presents both business risks to the firm and the danger of individual obligation to official management. In spite of the way that numerous associations have embraced responsibility for resource honesty performance into their corporate administration structure

to guarantee consistence, when hard economic occasions emerge, the official choice of risk acknowledgment to accomplish momentary gains and keep up working margins frequently returns.

A main cost advancement mechanism over all businesses and ventures is effectiveness improvement and this has likewise been a key center zone for plant maintenance. The main, and apparently most solid idea in maintenance advancement today is RCM. The idea developed from a Federal Aviation Administration (FAA) program because of an acknowledgment during the 1960s that the carrier industry was not able assimilate the cost of keeping up the required degrees of reliability with the maintenance practices established at the time.

In light of the finding that the interim length between redesigns was frequently decoupled from the failure rate, the FAA pointed their maintenance advancement program at "control of reliability through analysis of factors that influence reliability".

Since the advancement of RCM during the 1970s, there has been broad refinement and development of thoughts and strategies on maintenance streamlining – and with it a blast of language, dialog gatherings and distributed writing frequently with clashing thoughts and definitions on the scientific classification of maintenance regimes. Consequently, a short explanation is all together before we take a gander at the patterns and implementation holes of a successful RCM program.

Scientific classification of maintenance regimes

As maintenance practices wound up directed and systematized, formal naming shows were produced for classifying these practices. Be that as it may, there is an absence of basic comprehension of the relationships and shared characteristics between these practices among driving institutions and this regularly prompts disarray among professionals. A generally utilized meaning of RCM is "a procedure that is utilized to decide the maintenance requirements of any physical resource in its working setting". Getting from the FAA's expressions of reference, this procedure basically includes isolating undertakings into classifications of fundamental and economic thought and after that to choose execution strategies that match life cycle cost contemplations of the segments and their failure modes (counting the result of failure).

Various assessment strategies and apparatuses have been formulated or adjusted throughout the years to help and saddle this procedure including failure mode and impacts analysis; danger and operability; peril identification; safety respectability level; fire and blast peril analysis; reliability, accessibility, viability and safety; tie; safety criticality components and qualitative risk assessment.

Exercises that fall in the fundamental class intelligently request a procedure that will dodge failure for example either preventive or prescient, the two of which are information driven procedures to distinguish, evaluate and oversee degradation rates and procedures.

Cost regimes of maintenance practices

The cost benefits of various maintenance regimes depend where such equipment positions on the criticality hierarchy. Maintenance improvement includes the balance of the immediate cost of maintenance spend versus the benefits of failure cost shirking against numerous metrics including, administrative fines in regard of safety and environmental impacts, reputational harm related with the societal impacts of failures, creation income misfortunes because of inaccessibility of bombed equipment and replacement cost.

On account of safety basic equipment, the cost of real mishap perils far exceeds the cost of industry best practices in preventive and prescient maintenance and thus, it should not be made do with maintenance practices.

In any case, for equipment on the lower levels of the criticality hierarchy, maintenance costs can end up similar or lower than fix/replacement costs.

An on-going industry survey distinguished the best three operational wasteful aspects as: - mismanagement of provider and contractual worker relationships, poor resource reliability and uprightness just as wasteful cost management.

Every one of the three of these issues has direct connects to maintenance strategies. The survey established that deficient information examination prompts the substitution of booked maintenance for prescient maintenance with the aftereffect of an excess in exercises and direct expenditure impacts.

Regularly, unsuccessful implementation of Maintenance Management is related with an absence of proper aptitudes; RCM procedures require staff who are gifted in information examination just as the theory and routine with regards to failure modes and mechanisms so

CHAPTER 2

INDUSTRY PROFILE

2.1 OPERATION & MAINTENANCE

Operation and Maintenance is a far reaching, specific bundle of administrations that begins with understanding the plant and its procedures, together with the objectives of the proprietor. Effective maintenance expands the 'up-time' of the offices the time the plant is accessible for creation. This increments working income and furthermore expands the benefit's profitable lifetime consequently decreasing both the customer's capital expenditure and environmental risks.

Many real international and national oil companies and different customers center around their center exercises and endow us with the Operation and Maintenance of their creation offices. Over years of experience gathered far and wide has empowered to build up an unmatched comprehension of how, when and where to apply the best operational techniques and pro maintenance technology.

Keep up an introduced base of a huge number of various bits of equipment and parts, for all creation facility segments; in numerous configurations experience incorporates working in extraordinary conditions, from the Arctic to muggy rainforests. Also, know the impacts items, for example, forceful high-corrosive oil and sulfur gas have on plant, equipment and parts. By constantly breaking down this information and applying it in our Operation and Maintenance practices we guarantee optimum performance at the most minimal conceivable cost.

2.2 BEST PRACTICES FOR OIL AND GAS COMPANY ASSET MANAGEMENT

Differentiate Locations, Equipment, and Components

When you've established your equipment hierarchy in your asset register, it's currently time that you choose a framework that enables you to move the locations of your indistinguishable equipment assets without later addressing whether their information is right. For example, if your bit of equipment is moved around or between different offices, it's savvy to dole out it a totally one of a kind arrangement of location information so as not to mistake it for another bit of indistinguishable equipment.

Notwithstanding explicit location information, it's additionally significant that you choose whether or not it bodes well for your organization to record action and costs against equipment in your asset register. As should be obvious from the above technique, this is generally just effective when managing high-esteem assets as well as equipment assets that move around a reasonable piece.

Finally, how about we investigate components and parts. Except if a particular segment or part falls into the category of being either high-esteem or moved continually, regarding them as isolated substances in your register will probably simply become confounding over the long haul. This implies parts and components should fall towards the base in the asset register hierarchy; however nitty gritty information with respect to purchase date, warranty, and maintenance should be kept and recorded, the report might be simpler to reference if all are incorporated into the equipment section.

Install Barcode and Label Solutions to Better Control LDAR

Gas and oil companies like yours need to manage a one-two punch with regards to your assets–most are a) high-worth and b) work under exacting regulatory measures. This implies issues, for example, spill recognition and fix (LDAR), specifically, can turn into a major issue if not controlled appropriately. Best Practices for Oil and Gas Industry Asset Tracking.

A standout amongst the most effective approaches to handle LDAR, explicitly, is by installing barcode names or asset labels that enable your LDAR experts to all the more effectively deal with their controlled procedure equipment. Via mechanizing this recognition procedure, your organization will dependably be set up to experience surveys in light of the fact that your barcode and marking framework will as of now have helped you to recognize, tag, and screen potential holes.

Wiping out these regulatory cerebral pains will safeguard you from bringing about strong fines or lost assets because of totally preventable holes.

Exploit Cutting-Edge Asset Tracking Software

Odds are you're now on top of things and have put resources into asset tracking software or some likeness thereof, yet on the grounds that you have that base secured doesn't imply that it's the best choice for your business' assets.

To guarantee that yours is, ensure that the software enables you to enter complex, far reaching information about your assets, including the locations, equipment, and components. Notwithstanding the hierarchy, likewise ensure that these particulars can be effectively modified continuously to reflect changes in maintenance schedules, reports on devaluation, and all other applicable information.

For the best in asset tracking security, pick software that incorporates GPS technology, particularly if your equipment assets move around frequently. Utilizing GPS capacities makes it with the goal that your most high-esteem assets are constantly locatable, regardless of whether a theft is in advancement.

In the oil and gas industry, keeping close tabs on each valuable organization asset is vital for your organization's main concern, also a need on the off chance that you need to get the maximum usable lifespan out of those costly assets. Following these prescribed procedures guarantees more noteworthy deceivability into each organization asset, asset locations, esteem, maintenance schedules, and all that you have to think about your most valuable physical assets.

2.3 MAINTENANCE MANAGEMENT OF OIL AND GAS FACILITIES

Oil and gas facilities run from both upstream and downstream assets to incorporate offshore structures, coastal tank ranch offices. Offshore structures may incorporate the run of the mill fixed offshore structures, monopods, guyed wire caissons to the more complex profound water assets including Floating Production and Storage Offloading (FPSO), Mobile Offshore Production Unit (MOPU), Tension Leg Platform (TLP) and semi-submersible structures.

Broadening operation offices past design life presents safety risks, business risks and operational challenges to the oil and gas industry. These risks influence critical business decisions and should be measured and oversaw as we make progress toward persistent operations of maturing assets. Maturing assets and equipment present expanded challenges in keeping up equipment trustworthiness and subsequently, should be overseen as needs be. These could be a result of an aggregate degradation and risks after some time, which incorporates:

- Degraded materials of development because of erosion related mechanisms;
- Erosion, wear, weariness or splitting mechanisms;
- 'Slow consume' degradation mechanisms;

- Obsolescence of equipment prompting potential absence of extras, mind-boggling expense of extras, and so on.;
- Normalization of aberrance related with human factors (for example tolerating corrupted conditions just like the new typical);
- Lack of information slanting to estimate future risks to safety and business coherence;
- Failure to record the precise status of safety basic components (SCE) after some time;
- Changes to engineering codes and gauges;
- Loss of technical skill (capabilities + preparing + experience) in the industry;
- Introduction of remote materials into the generation frameworks (for example Chemicals for Enhanced Oil Recovery (EOR), down hole sand solidification, compound tracers, off spec water infusion, and so forth.).

Assets are required to anticipate and comprehend the impacts of decay, or changing conditions related with life expansion and be set up to intercede to guarantee that this interest can be met without unfriendly impact on asset respectability and safety. Asset life augmentation (ALE) for a given design life expiry, alludes to a condition whereby an asset is moving toward its proposed design life. The principle maturing factors that should be viewed as when building up an ALE program are material degradation, out of date quality and hierarchical issues.

The status of the known degradation mechanisms appropriate for safety hindrances should be assessed and recorded. The reason for acknowledgment of deviations and management of progress (MoP) is checked on in as a defence for the new mode and time allotment for persistent operations. The engineering assessments everything being equal and in the long run alleviation measures against every working risk must be reported. OGPs must audit, assess survey all damage mechanisms or deformities that may affect the offices or individual working frameworks for the life augmentation period. This is commonly pertinent to damage or deformities where an impermanent MoC has been acknowledged because of a constrained time of utilization and this period has since been changed because of ALE contemplations. The OGP is then required to re-evaluate the reason for acknowledgment to check this is as yet substantial for the new period. Components or frameworks with a high result of failure, which are not accessible for inspection must be recognized, assessed, broke down, and qualified for life augmentation. It is required that OGPs assess the outcome if there should arise an occurrence of failure, screens signs of failure and have plans for repaying activities if

signs of failure are found. Most recent information identified with degradation and life expansion will be connected.

Operational setting

As the Asset ages, there is expanding challenge to keeping up equipment and installation uprightness, consistence with Regulatory requirements and improve economic hydrocarbon recuperation from exhausted fields. In that capacity, life expansion analysis and assessments must be founded on the arranged utilization of the offices during the life augmentation period. Changes to the operational conditions that can affect the productivity of asset abuse, the risk profile just as the performance of the hindrances because of maturing, must be considered. The potential changes to the operational conditions that impact the degradation of boundaries must be distinguished and utilized as reason for life expansion assessments.

In view of Norwegian Oil and Gas Recommended Assessment and Documentation for Service Life Extension of Facilities, Rev1, 2012 and operational information and requirements, the accompanying should, among others, be considered:

- reservoir consumption causing subsidence of the facility
- shallow gas identification and relief
- changes in climatic conditions bringing about changes to environmental loadings and working conditions
- Increased changes in liquid compositions that can antagonistically influence the erosion rates in specific frameworks
- Changes to the first design presumptions as gave in QRA and so forth.
- Well and penetrating factors
- Plans for expanded gas flow
- Need for new procedure or utility equipment because of changed flows, science, weight, infusion or chemicals
- Changes to the SCEs on the facility
- New methodologies to mimic damage and degradation.
- Changes to equipment use.

An asset life expansion program

The reason for the design and design life of offices with its related stage, wells, subsea frameworks and pipelines might be unique. At the point when offices are wanted to be utilized past design life, OGPs should characterize the life augmentation period for which the various pieces of the offices are intended to be utilized.

2.4 ALE FRAMEWORK

An ALE framework outlining the main tasks as a six (6) step process is proposed and provided.

Data and information

The collection of data and information is regularly the most challenging parts of initiating an ALE study. It is suggested that records be safely set inside an electronic database for the most part used to oversee asset integrity and reliability solutions. The accessibility and precision of information should be assessed for every facility considered. The information should establish design premise and specifications, design and as manufactured illustrations, design/(re-) analysis reports, inspection reports, maintenance and fix records and specifications. When these records have been gone along, data quality measures should guarantee the fitting data for screening. At times, the data investigation and drifting estimates give a superior portrayal of the data set and how this can be utilized effectively in an ALE program.

Gap assessment

Gap assessment is the second phase of an ALE procedure. Recognizing gaps can be separated to a few stages, which incorporates:

- Identify hazards and basic barriers.
- Check integrity and functionality of barriers.
- Assess current performance of hindrance against goal.
- Review noteworthy performance of barriers.
- Review current condition of maintenance and gaps.

The gap assessment will concentrate on the hindrance functions and the factors that impact the boundary elements. This incorporates technical, authoritative and operational elements. The gap assessment and recommendations are performed dependent on the real inspection

findings, underlying driver failure analysis reports, modification actualized on the equipment, terrible on-screen character list, history of incidents, maintenance report, redesign findings, reliability data, working and maintenance philosophy and any condition monitoring recommendation. Any life expansion recommendation must take the future technical condition, working parameters and method of operation into thought. The assessment should likewise incorporate survey of the anticipated creation profile, abusing collaboration with other related equipment to such an extent that key assets and framework foundation can be defended, streamlined or extended.

The recommendations from the gap assessment are to cover all the therapeutic activities important to avoid the risk related with extra technique, out of date quality identified with the equipment and extra parts, leftover life analysis and forecast of future failures modes and degradation mechanism particularly identified with maturing during the augmentation time frame. The benefits of applying new technology in tending to the gaps will be assessed. This could help mitigate or close gaps with less modifications or repaying measures. The Health and Safety Executive, UK (2013) KP4 Report laid out the accompanying safety management frameworks just like the barriers on the facilities that are not to be ruptured. They include:

- Structural integrity;
- Process integrity;
- Fire and blast;
- Mechanical integrity;
- Electrical, control and instrumentation;
- Marine integrity;
- Pipelines;
- Corrosion;
- Human factors.

Notwithstanding the previously mentioned the accompanying frameworks might be considered

- Cranes and lifting equipment
- Telecommunication facilities
- Subsea frameworks
- Life-sparing equipment

Oil and gas makers (OGPs) are to perform examinations and assessments to demonstrate and comprehend of how the time and maturing procedures will influence HSE, the facilities barriers including technical operational and authoritative viewpoints and asset abuse. They will likewise recognize measures required to mitigate the effect of the time and maturing forms.

Risk factors and assessments

Risk assessments must be performed to confirm that the facilities risk level is inside satisfactory breaking points in the time of life augmentation and As Low as Reasonably Practicable (ALARP). The standard of ALARP is in broad use in the oil and gas industry. The accompanying risk assessments will be performed dependent on the context characterized for life expansion:

- Accumulation of Operational Risk Assessments (ORA), as some of which might be decoupled in light of the fact that they have been considered in segregation and not in mix, conceivably bringing about obscure expanded risks
- Risk assessment of significant mishap risk, Quantitative/Qualitative Risk Analysis (QRA)
- Emergency readiness and reaction
- External condition
- Occupational safety, health and working condition.

Guaranteeing risks have been decreased to ALARP means adjusting the risks against the costs to further lessen it. The choice is weighted for health and safety in light of the fact that the assumption is that OGPs should actualize the risk reduction measure. It is normal that the most recent accessible technology and knowledge identified with analysis of real accidents is connected. The conservatism level and any suppositions made in risk assessments are to be surveyed and assessed for every single persistent operation. The powerlessness, real and expected effectiveness of the hindrance function, including technical, hierarchical and operational elements will be incorporated into the risk assessment.

The OGP risk network comprises of an outcome hub and a likelihood pivot. The outcomes are those of believable situations (thinking about the overall conditions) that can create from the arrival of a peril. The potential most pessimistic scenario outcomes, as opposed to the real ones (that may have happened beforehand), are utilized. In the wake of evaluating the

potential result, the likelihood on the vertical hub is resolved based on verifiable proof or experience that such outcomes have materialized inside the industry, the element or a smaller unit.

Maintenance management system

Effective inspection and maintenance are significant in guaranteeing asset integrity and reliability. In building up the maintenance management frameworks an underlying survey is required decide status and how the maturing procedures is shrouded in the current maintenance program. The audit is to assess the requirement for refreshing the integrity, reliability, powerlessness and outcome analysis for consistent operations later on. Experience and knowledge from archived failures and exercises educated will likewise be a piece of the assessment and be utilized to improve the maintenance management framework. On a fundamental level, the maintenance management framework should be inside an automated database with itemized history of the working, design, assessment, inspection and maintenance records open to all key staff.

Emergency preparedness

A survey of the present emergency reaction frameworks must be performed, including an assessment of how operational changes and new requirements will be met in the time of life extension. On the off chance that there is a change in working philosophy, HSE Case will be returned to. OGPs are to assess any reasonable operational or hierarchical changes to the facilities that will influence the emergency preparedness and reaction frameworks.

Authoritative and human factors

Human factors zone involves methods and knowledge which can be utilized to survey and improve the communication between individuals, technology and association to acknowledge efficient and safe operations. The factors should incorporate authoritative structure, competency or preparing requirements, and progression planning. Human factors analysis will be performed where changes are made or where broadened life challenges the established human, technology and hierarchical context. Authoritative framework is likewise a factor to be considered, which perspectives incorporate engineering design, contract and acquisition management. Engineering design and related obtainment exercises require an intensive and cautious thought of asset maturing and life extension factor. The risk from each

finding and the general potential (future) risks will be assessed before choosing the implementation of measures.

Assurance and verification

The OGP is to guarantee that experience on lifetime extension from different installations and working areas is connected to the examinations and assessments did for the application. Particular pertinent information will be incorporated into the application report. OGPs are to guarantee that the investigations and assessment work has been done as per the guidelines, the applicable organization benchmarks and have been confirmed by the fitting technical order specialist.

Occupational health

The OGP will assess the status of working condition factors that are applicable for life time extension, before the initiation of executing ALE. Factors that should be incorporate contemplations for substance/radiation introduction, lightning and ventilation, ergonomics, commotion/vibration contamination, material dealing with and storage, outside operations and convenience facilities.

The fundamental target of the assessment is to give a status of the working condition as per both technical and operational requirements. The assessment/assessment are fittingly founded on existing conditions at the facility, and if fundamental, catch up with new assessments and assessments as required. The operational risks of each from each finding and the future risks will be assessed before choosing the implementation of measures for improving working condition.

Engineering design

All assets are required to have design documentation accessible and open, which supports effective design at all phases of the asset life cycle and in connection to the management of maturing life extension. All engineering action to be embraced all through the foreseen administration life of an asset should appropriately address life extension contemplations.

Asset life extension for fixed offshore structures

Zettlemoyer gives a format to the asset life of fixed offshore structures. By and large, the principle wellspring of intrigue or ALE includes the jacket substructure which are basically

comprised of rounded steel segments welded together to frame a support framework. For fixed offshore structures, the jacket layout or support framework is considered as an auxiliary safety basic component (SCE), so the integrity should constantly unblemished.

The jacket format substructure is to be evaluated for ALE regarding extreme strength of the structure and weakness life assessments. The qualities for a definitive strength results are spoken to as far as a RSR (Reserve Strength Ratio). The RSR is the proportion of the base shear at collapse/base shear at the 100 Yr. environmental stacking (for example the design condition). Extreme strength analysis is additionally called a sucker analysis or collapse analysis and includes non-straight expository methods.

For new structures a RSR worth is commonly over 2.0. As stages work for quite a while, degradation because of corrosion, damage because of unintentional damage (vessel impact, dropped objects) is conceivable. Offshore structures are examined and irregularity management is performed to identify and fix damage dependent on seriousness levels over its operations. It is normal that the RSR might be undermined and diminished if damage is unmitigated.

For each working locale the acknowledgment criteria should be resolved as it differs from area to district for shifting degrees of environmental stacking. The operations for fixed offshore structures can be broadened if the stage on a fundamental level has more prominent than its base RSR values. For asset life extension, it is normal that all serious damage to structures has either been fixed or decreased to a reasonable condition, preceding the movement to ALE. Basically the topsides of the fixed offshore should be fittingly surveyed. This is commonly done by utilizing a risk based maintenance (RBM) program where irregularities are redressed because of seriousness levels. These topside RBM should be adjusted to different topsides programs including piping, equipment slips and vessels to guarantee that the maximum use can be made of designated assets.

CHAPTER 3

LITERATURE REVIEW

3.1 MAINTENANCE PERFORMANCE MEASUREMENT

Over the most recent couple of decades, manufacturing associations were compelled to move their business models from shut framework directions, to progressively open framework directions. This move was realized by intense aggressive powers, which made the costumer the focal point of hierarchical, operational and vital practices. The present manufacturing associations are required to work as open operational frameworks. In such frameworks, progressed operational manufacturing technologies are mixed with present day information and communication technologies to incorporate and facilitate operational assets, procedures, and exercises so as to create a surge of significant worth included operations went for catching and continuing an upper hand. With the expanding complexity, scope, and hierarchical job of operational propelled manufacturing technologies, the maintenance of these technologies is ending up basic to the capacity of the association to contend. In this context, operations management, particularly maintenance management, is taking on a more extensive hierarchical vital job.

Customarily, maintenance, with its multifaceted exercises, assets, estimation, and management, has been essential to manufacturing associations. Be that as it may, lately, the need to deal with the various aspects of maintenance all the more effectively has picked up added significance because of changing operational technologies, and the changing hierarchical job of maintenance. In the present open framework manufacturing associations, maintenance has a more extensive point of view. In such associations, the extent of maintenance has moved from a barely characterized operational point of view, to a hierarchical key viewpoint.

A few creators ascribe this move to the usage of further developed technologies (Swanson, 1997), expanded accentuation on safety, and new environmental legislations (Cooke, 2003). In such an operational situation, the job of the maintenance supervisor is basic. All things considered, maintenance chiefs are being approached to coordinate and direct the maintenance endeavours to meet hierarchical vital objectives efficiently and effectively (Alsyouf, 2007; Al-Najjar, 2007). In this manner, the requirement for these supervisors to get suitable formal instructive preparing, which consolidates the various aspects of their

expanding authoritative jobs, is winding up more significant than any other time in recent memory (European Round Table, 1999; Shrivastav, 2005).

Propelled by the expanding importance of the various features of maintenance management in the present open framework manufacturing associations, the target of this research is to efficiently look at the writing managing the various parts of current maintenance exercises, estimations and management. In particular, this research survey centers around performance measures, estimation, and management of the various parts of maintenance. With the end goal of this writing survey, a few electronic databases were used. All the while, articles distributed over the most recent 30 years are recognized, investigated, and grouped. This research exertion encourages following the development of performance measures and estimation, as identified with the significant maintenance hierarchical function, and its assets, exercises, and practices. Because of this point by point examination, bearings for future research are distinguished and verbalized.

3.2 ORGANIZATIONAL ROLE OF MAINTENANCE

Because of the changing authoritative job of maintenance, and the expanding complexity of manufacturing technologies, maintenance related costs have been on the expansion (Parida and Kumar, 2006). In manufacturing associations, maintenance related costs are assessed to be 25 percent of the general working cost (Cross, 1988a; Komonen, 2002). In certain enterprises, for example, petrochemical, electrical power, and mining, maintenance related costs may outperform operational cost (Raouf, 1993; De Groote, 1995; Eti et al., 2005; Parida and Kumar, 2006). All things considered, close consideration should be paid to maintenance performance measures, estimation and management so as to use the rare maintenance assets all the more effectively, and in the process improve generally speaking authoritative productivity and effectiveness.

So as to use maintenance performance estimation and management to advance positive and proactive hierarchical change, the maintenance performance management framework should be designed to follow and improve the various parts of the maintenance exertion. This procedure should be guided by the integration of basic achievement business factors, which are gotten from the in general authoritative technique (Tsang et al., 1999).

Notwithstanding the staggering benefits increased through effective performance estimation and management, and the way that associations utilizing incorporated balanced performance management frameworks will in general outperform their partners which don't (Parida and Kumar, 2006), ponders have demonstrated that 70 percent of each one of those frameworks implementation activities have fizzled (Bourne et al., 2002; Bourne, 2005). Indeed, even most exceedingly awful, in a survey of manufacturing associations led by Cholasuke et al.(2004), only 33% of the associations, with great maintenance management practices would in general understand the full benefits of their maintenance management activities. This drove a few researchers to advocate the use of more extensive and imaginative performance management approaches, for example, the Balance Scorecard and new hierarchical improvement instruments (Garg and Deshmukh, 2006).

Generally speaking, effective performance estimation methodologies can assume a significant job in concentrating individuals and assets on a specific part of hierarchical assignment (Waggoner et al., 1999). As indicated by Parida and Kumar (2006), coming up next are viewed as significant factors, advocating the implementation of a maintenance performance estimation process:

- measuring worth made by the maintenance;
- justifying speculation;
- revising asset allocations;
- health, safety and condition issues;
- focus on knowledge management;
- adapting to new patterns in operation and maintenance methodology; and
- Organizational basic changes.

In light of cautious and precise substance analysis of the explored articles, it was resolved that a portion of these articles contained some excess information. In this way, 156 articles were chosen for further analysis. Just 5 percent of broke down articles did not present measures. Then again, 70 percent of the articles, with measures, were bolstered by a model/framework.

Because of an engaged writing audit, 345 distinct measures rose, with an aggregate of 696 events reports the primary 37 measures, with multiple events. It is to be noticed that cost, with 40 events, was the most utilized maintenance performance measure (15 percent of

absolute events inside this gathering of measures). The most used estimates spoke to a few elements of maintenance performance, in particular technical, economic, safety, and human assets. The least used estimates gathering incorporated a few measures, for example, preparing/learning, aptitudes/abilities, work motivations, process performance, assets usage, maintenance capacity, consumer loyalty, representative fulfilment. While cost is a significant measure, future research should likewise concentrate on determining handy performance measures went for catching the human factor of the maintenance performance exertion.

The aftereffects of the substance analysis additionally demonstrated that the majority of the assessed research was gotten from handy applications. As it tends to be seen in, 137 contextual analyses identified with 32 distinct enterprises were recognized. In this context, the car, electrical/electronic, and substance were the most spoken to businesses. Future research should endeavour to incorporate the findings from the contextual investigations into down to earth implementations methodologies. The attributes of the industry should be analysed in endeavour to conceptualize industry explicit factors in connection to effective maintenance performance.

3.3 EFFECTIVE UTILIZATION OF MAINTENANCE RESOURCES

From the viewpoint of the maintenance chief, maintenance assets are limited, and generally beneath the level they should be. Generation stoppages, breakdowns, control stoppages, deficiency in labor, absence of materials (supply), request (external) and others business factors straightforwardly or in a roundabout way influences the degree of creation. This will in general make maintenance planning a dynamic and challenging procedure (Paz and Leigh, 1994). All things considered, the restricted limits and assets must be shared, as opposed to went after (Gits, 1994). Building up a maintenance-planning program is an iterative procedure that includes distinctive leaders, who may have clashing objectives. In inferring these objectives, maintenance directors, typically, attempt to accomplish numerous, and once in a while, clashing objectives, for example, amplifying throughput, accessibility, and quality, subject to the requirements forced on the generation plans (Labib, 1998). The writing focuses to the presence of tradeoffs among the various parts of performance (Silveira and Slack, 2001). Performance estimates won't have equivalent significance for an individual operation, along these lines they will in general be exchanged off against one another (Slack and Lewis, 2008). Along these lines, so as to tackle clashing objectives, for example, framework

reliability and benefit amplification, an association must build up fitting maintenance rules that manage:

- costs related with performing generation exercises;
- costs related with performing maintenance exercises; and
- The different costs related with equipment's failure and the subsequent intrusions to the creation plan (Weinstein and Chung, 1999).

When manufacturing associations contend in the worldwide market, they for the most part utilize a few focused needs, for example, cost, quality, flexibility, and other aggressive methods dependent upon their manufacturing forms capacities. Subsequently, the preparation and accessibility of manufacturing equipment's winds up basic, therefore making maintenance an essential piece of the manufacturing management process. This thusly can impact aggressive needs, and henceforth the accomplishment of the business system (Pinjala et al., 2006). Subsequently, it is crucial for maintenance supervisors to know about the hierarchical business procedure, as they deal with their maintenance assets.

The business methodology should drive the chose maintenance approach, models and strategies used. For example, a JIT operational methodology requires high machine accessibility. In this way, such operational condition should pressure the significance of preventive maintenance. Then again, absolute quality management (TQM) expects machines to be in a magnificent working condition (Chen, 1994). Subsequently, planned maintenance is expected to advance and bolster a TQM/CI operational direction. Generally speaking, it is essential to have an authoritative deliberate maintenance system to manage the key utilization of maintenance assets, models and methods (Jonsson, 1999).

There are numerous models, strategies, frameworks and methodologies accessible to encourage and bolster maintenance management of exercises, assets, and decisions (Garg and Deshmukh, 2006). In this context, a few new methodologies and strategies/strategies/technologies can be used. These incorporate among others, self-maintenance, electronic maintenance, integration of item and maintenance design, proactive maintenance dependent on wise units, life cycle reproduction for maintenance procedure planning, model-based maintenance, all out gainful maintenance (TPM), Reliability Centered Maintenance (RCM), Preventive Maintenance (PM), Condition Based Maintenance (CBM), and Continuous Maintenance (CM) (Takata et al., 2004). Subsequently, moving toward

maintenance management deliberately and methodicallly has turned out to be basic to settle on the correct decisions, particularly in capital-concentrated ventures.

The research focuses to solid linkages between business methodology and manufacturing maintenance strategies (Madu, 2000; Pinjala et al., 2006; Rosqvist et al., 2009). In that capacity, there is a requirement for an all around designed and executed authoritative framework to oversee maintenance and related performance angles from a vital viewpoint. As indicated by Alsyouf (2006), such a framework should have the accompanying attributes and capacities:

- assess the commitment of the maintenance function to the key business objectives;
- identify the shortcomings and strengths of the actualized maintenance procedure;
- establish a sound establishment for a thorough maintenance improvement procedure utilizing quantitative and qualitative data;
- re-assess benchmarking maintenance practice and performance with the best practice inside and outside a similar industry; and
- Track maintenance effect and demonstrating the linkages between operational a money related measures, comprehensively.

A portion of the significant factors, which should be considered in the street toward effective performance maintenance management, as recognized from the writing (Tsang, 1998; Kumar, 2006; Parida and Kumar, 2006) are featured in the accompanying:

- Measuring worth made by the maintenance;
- Justifying venture and amplifying asset use;
- Revising asset allocations, improving responsiveness;
- Health, safety and environmental issues;
- Focus on knowledge management and creating center abilities;
- Adapting to new patterns in operation and maintenance procedure; and
- Organizational auxiliary changes.

3.4 TOTAL MAINTENANCE AND INFORMATION SYSTEMS SUPPORT

The research investigated would in general underscore the significance of specific instruments and methods in connection to authoritative maintenance and its job (Goh and Tay, 1995; Ben-Daya and Duffuaa, 1995). Before, responsive maintenance methodologies

have brought about predictable, yet not really effective performance maintenance results (Azadivar and Shu, 1999). Imaginative maintenance approaches, alongside business integration endeavors at all levels and over all function/departments, have been upheld as significant factors to improving manufacturing competitiveness (Bamber et al., 2004). All things considered, all out beneficial maintenance (TPM) can drive and encourage a coordinated manufacturing management framework equipped for supporting the distinctive operational sub-frameworks. This coordinated maintenance management approach inside a manufacturing situation puts the maintenance function at the core of the manufacturing framework.

Integration can be encouraged by covering practices identified with manufacturing activities, for example, JIT and TQM with TPM (Miyake et al., 1995; Cua et al., 2001). Noteworthy help was found for a positive connection among's TPM and business performance, along these lines demonstrating that business performance of firms with TPM was fundamentally better than the non-TPM firms (Brah and Chong, 2004). In this context, the job of a coordinated information framework is basic so as to guarantee the accessibility of data required for genuine reliability-based maintenance plan enhancement (Sherwin and Jonsson, 1995). Information sharing practices, information traits, information technology use, cooperative establishment, time-related issues, procedures and exercises are altogether considered as basic elements of information integration (Uusipaavalniemi and Juga, 2009).

Information technology (IT) can be helpful in decreasing costs, and helping with giving administrations, which were infeasible previously (Concetti et al., 2009). IT can likewise be costly and inefficient both as far as time and cash (Ross, 2009). Consequently, it is fundamental that the software design, of the maintenance performance management framework joins the way of life and assets of the association for which it is planned (Davies, 1990; Pinjala et al., 2006; Hwang et al., 2007; Kans, 2008).

The research explored introduced modernized maintenance management frameworks that included a large number of the highlights expected to help the maintenance management and performance estimation framework (Labib, 1998, 2004). Nonetheless, commonplace software, normally, does not bolster significant highlights, for example, failure reports, which are explicit to generation functions. Additionally, the reasonable maintenance management software bolster will in general rely upon the maintenance system utilized (Kans and Ingwald, 2008).

Manufacturing associations, particularly little and medium-sized enterprises would benefit from having simple to-utilize devices and methods for deciding their maintenance management information technologies needs so as to have the option to pick the best arrangement accessible from off-the-rack choices (Kans, 2008). This may prompt framework design and advancement noteworthy investment funds.

A typical database can be a significant instrument for basic leadership in connection to maintenance management (Kans and Ingwald, 2008). Such a database should incorporate data from a few applicable operational hierarchical areas. Accordingly, it can shape a decent reason for fast outline of the current tricky areas and required activities. Applying the basic database procedure makes it conceivable to measure current exercises and potential areas of upgrades (Uusipaavalniemi and Juga, 2009). Besides, since such a database gives simple access to applicable constant and on-request data, it encourages the discovery of deviations at a beginning period, in this way staying away from pointless costs later on. The regressive data identification procedure guarantees that the dataset bolsters significant performance measures for maintenance monitoring and development (Kans and Ingwald, 2008).

3.5 MEASUREMENT, MEASURES, AND HUMAN FACTOR MANAGEMENT

Maintenance is a calculated hierarchical function, which is regularly coordinated into a generation procedure. In this manner, its productivity and effectiveness will in general be hard to gauge in outright terms. Subsequently, performance measures have been characterized in relative terms (values), in type of proportions of economic, technical or hierarchical measures (De Groote, 1995).

Before, working proportions were viewed as sufficient pointers of maintenance performance. In this context, most regularly utilized proportions included maintenance cost proportion to the plant zone, maintenance cost proportion to the quantity of individuals legitimately utilized, and maintenance cost proportion to the quantity of units delivered. The confinement of these proportions is that they were reliant on every particular plant for which they were created. In this context, explicit qualities for every industry have been recognized in the writing as requirements to the improvement of maintenance management frameworks. These requirements include: information frameworks support (Oelsner, 1979), degree of centralization of the maintenance departments (Ikhwan and Burney, 1994), technical complexity (Swanson, 1997). Along these lines, it is hard to analyze proportions of various plants or, so far as that are concerned, various associations. In this context, significant

correlations of maintenance performance effectiveness between different plants can't be completed without maintenance performance productivity benchmarks (Raouf, 1993; Yam et al., 2000; A ° hre'n and Parida, 2009).

Benchmarking is basic toward accomplishing world-class maintenance performance levels (Chen, 1994; Raouf and Ben-Daya, 1995; Madu, 2000). It is to be noticed that despite the fact that benchmarking is one of the key elements for the consistent improvement process (A° hre'n and Parida, 2009), just 17 of the dissected papers (11 percent), introduced, or even alluded to benchmarking methods in relationship with maintenance performance estimation.

The implementation of value improvement programs, current information frameworks, nonstop improvement programs, and the advancement of performance estimation frameworks, would in general advance the proliferation of maintenance performance measures and estimation (Cua et al., 2001; Bamber et al., 2004; Seth and Tripathi, 2006). Because of the expansion in the number and kind of measures, new methodologies for maintenance performance measures and estimation are required (Kumar, 2006).

The research has displayed a few ways to deal with a superior systematization and usage of maintenance performance measures. Conventional methodologies would in general build up a hierarchy with two arrangements of markers (Martorell et al., 1999), to be specific:

(1) Key markers, to be assessed occasionally; and

(2) Nitty gritty pointers, which are utilized for looking for the reasons for Deviations saw in the key markers.

Be that as it may, new imaginative methodologies will in general underline a progressively balanced perspective on maintenance performance measures, to be specific, equipment related performance, task related performance, cost related performance, prompt client effect related performance, and learning and development related performance (Kutucuoglu et al., 2001).

The CEN-European Committee for Standardization (2007), through the framework of the EN 15341 standard, introduced the maintenance performance estimates' order as far as economic, technical, and authoritative pointers. All the more as of late, Cabral (2009) ordered economical and technical measures in four gatherings, in particular time related factors, human exertion related factors, number of occasions, and cost related factors.

Qualified and well-prepared machine administrators and maintenance specialists are the main impetus behind any effective maintenance estimation framework. They gather the information (particularly in little degree robotized manufacturing plants with no programmed data collection), and they report events (Nakajima, 1988). The majority of the maintenance undertakings are dealt with legitimately by administrators rather than the on location maintenance group. In this manner, adaptable, co-employable and a mutual responsibility approach among generation and maintenance staff is required to advance administrator possession and free up maintenance faculty to perform all the more technically challenging maintenance works (Yam et al., 2000).

The human factor spoken to by maintenance specialists and other related staff is the foundation of the maintenance framework in any association. In that capacity, the effectiveness of the various features of the performance framework is particularly reliant on the competency, preparing, and inspiration of the general human factor responsible for the maintenance framework (Ljungberg, 1998). In this context, factors, for example, years of applicable work understanding on a particular machine, individual disposition, administrator reliability, work condition, persuasive management, preparing and proceeding with instruction, are for the most part significant factors, which will in general effect the effectiveness of the performance of the maintenance framework (Cabahug et al., 2004). Administrators are in direct contact with the maintenance exercises and endeavours. In this manner, they can pass judgment on the nature of the administration they get.

The nearby cooperation and coordination between the maintenance specialists and machine administrators is basic, as it impacts administration quality and, thusly, the degree of fulfilment with the rendered administrations. In this context, rehashed visits to fix equipment for a similar issue result in administrator disappointment (Ardalan et al., 1992). As in all quality arranged management programs, representative interest is basic for progress. The frame of mind, lead and character of maintenance faculty are basic to the effectiveness of the maintenance exertion (Goh and Tay, 1995; Arca and Prado, 2008).

The human assets part of maintenance has been assuming an expanding job in connection to operational condition safety (Rankin et al., 2000; Patankar and Taylor, 2000). Maintenance asset management delivers the issues identified with association, communication, critical thinking, and basic leadership (Taylor, 2000). Maintenance and safety are here and there

treated as discrete and autonomous arrangements of exercises (Raouf, 2004). In any case, some portion of the accidents in manufacturing situations is brought about by poor maintenance (Raouf, 2004). An incorporated methodology is the proper methodology for streamlining plant capacity, as safety and maintenance are not totally unrelated functions (Raouf, 2004; Liyanage, 2007).

On the off chance that an association stresses teamwork (like on account of the individuals who use TPM), the compensation structure should advance cooperation instead of undermine it (Bullinger and Menral, 2002). A wide assortment of compensation programs, which consider factors, other than rank, involvement and length-of-administration exist. These programs are been utilized in present day, creative associations. A few associations use pay-for-expertise programs to create multi-gifted representatives, pay-for-performance, advance objective sharing programs, and give rewards that are connected to bunch performance (Bullinger and Menral, 2002; Eti et al., 2006). Be that as it may, offering the "right" remunerates alone is probably not going to create continued strengthening. The intensity of such methods to keep up responsibility decreases with use (Eti et al., 2006). The present benefits become tomorrow's rights. Association and self-rule are the principle inspirations that actuate the human personality and drive human exertion (Eti et al., 2006).

CHAPTER 4

CASE STUDY

Aging electrical component

Facilities are designed regularly with a life length of 20–25 years. Nonetheless, it is getting to be normal for facilities, both on-shore and seaward, to be worked past its life range. While assets are designed for 20–25 years, equipment age diversely and experience the ill effects of various age-related failure mechanisms. Other than maturing, electrical, control and instrumentation equipment experience the ill effects of obsolescence. This is essentially because of inaccessibility of components and end of hardware/software support.

Situation

A downstream refinery experienced control issues with its two reactor and regenerator slide valves on its Residue Fluid Catalytic Cracker (RFCC) unit. The side effect, at first, showed as valve hunting. These continuously intensify to the point where the valves must be put on manual hand wheel control. While this activity temporarily ceased the valve hunting, it made control of the reactor and regenerator catalyst level troublesome as operators must be nearby to alter the valve opening physically. Left uncertain, the imaginable result of this situation was a procedure vexed and RFCC unit trip. This would likewise cause a cascade effect, bringing about the shutdown of different units, acquiring significant production misfortunes and HSE exposure.

Problem analysis

The problem was at first idea to be because of a failure of the HPU control module. Be that as it may, the problem was followed, inevitably, to a bombing DC power supply unit (PSU) which powers the control module. When the problem was distinguished, replacement of the power supply unit settled the issue. What should be noted from this apparently straightforward problem is that both reactor and regenerator HPU units had experienced a similar problem. After looking into it further, both power supply units were of a similar make and had been first installed (as a feature of the HPU units) at around a similar time. At the season of the occurrence, the power supply units were evaluated to be 10 years old. Maturing was credited as the reason for the problem, as inside a half year, another slide valve HPU had likewise experienced a practically similar problem.

There are a few failure mechanisms that are regularly found because of maturing. Tragically, a detail inspection of the power supply unit was not done to distinguish the maturing mechanism indicates basic maturing mechanism for essential regulation (piping, vessels, heat exchangers), structures, safeguarding frameworks and electrical, control and instrumentation Study.

Solution

The different failures inside a brief timeframe were a solid sign of an age related failure, instead of an arbitrary failure. Subsequently, a few moves were made:

- All HPUs with PSU of similar make and type were recognized.
- PSUs were supplanted (like-for-like replacement).
- A Preventive Maintenance (PM) plan was made in PMMS to supplant the PSUs like clockwork.
- Learning (failure mode, failure mechanism, failure correction) were incorporated into the expert preparing program for future simplicity of troubleshooting.

Because of the possibly high result of production misfortune from this failure, different components of the HPU were likewise examined. Other basic components, and conceivable single purposes of failure, were distinguished. These were stopped for future upgrades for the following asset refresh cycle. A similar exercise to this is performing a failure mode, effects and criticality analysis.

To guarantee these upgrades were actualized in the following conceivable opportunity, the equipment upgrade was stopped into the refinery's 5-year CAPEX plan. The site's Equipment Obsolescence Masterplan was likewise refreshed. This is normally surveyed on a yearly premise to manage generally speaking life cycle of maturing EC&I assets of an equipment obsolescence dashboard which records EC&I equipment asset, obsolescence status and medicinal arrangement.

This case study highlights several important aspects of managing aging assets:

4.1 OBSOLESCENCE STATUS OVERVIEW

Asset forecast life cycle

	Current/active product fully support	Obsolete and no supplier support upgrade planned	Limited support with spared available but not in manufacture	Purchase spares
System/equipment	√	√	√	√
Process control system	√	√	√	√
Emergency shutdown system	√	√	√	√
Fire and gas detection system	√	√	√	√
Human machine interface	√	√	×	×
Metering system	√	√	×	×
Sand monitoring	√	√	×	×
Compressor controls	√	√	√	√
Gas turbine controls A	√	√	√	√
Gas turbine controls B	√	√	√	√
Nucleonic profiler	√	√	√	√
Water injection monitoring panel	√	√	√	√
STRATEGY OF SUPPORT				
Most equipment supported	√	√	√	√
Safety controllers obsolete – solution in progress	√	√	√	√

Obsolete system, upgrade in progress	√	√	√	×
Upgrade of flow computers and database planned	√	√	×	×
Supporter by manufacturer	√	√	√	√
Supported by competent services supplier	√	√	√	×
Upgraded	√	√	√	
Upgrade planned	√	√	√	√
Supported by competent services supplier	√	√	√	√

Information is in the data. Valuable experiences can be acquired through data analysis. Equipment failure rate, for instance, will indicate whether an equipment is moving toward end-of-life. Notwithstanding, quality data is basic and data tidy up frequently is required before analysis should be possible.

Obsolescence management is fundamental for EC&I equipment. All equipment should be captured in an asset list and the maturing system should be obviously characterized. This could be through different way which incorporates replacement, upgrade, life extension (through provider expanded support), and life extension (with accessible extras) or raced to-come up short.

EC&I equipment normally will have shorter life-cycle than an asset in general design life. Hence, EC&I maturing system must be set up a lot sooner than different assets, for example, structures and mechanical equipment. With E&CI equipment, analysis down to the real segment level (for example PSU) should be finished. This may need to likewise incorporate supporting equipment, for example, interface modules, equipment communicators and workstations just as software.

Remediation of maturing asset can be based equipment criticality and additionally genuine equipment condition. There are different methodologies that can be utilized to determine

equipment criticality, for example, failure mode, effects and criticality analysis (FMECA), reliability availability and viability (RAM) analysis, and even layers of assurance analysis (LOPA), among others. Every approach puts an alternate spotlight on equipment reliability and integrity.

The human part of overseeing maturing asset should not be under-assessed. Knowledge is lost when individuals move or resign. Along these lines, knowledge maintenance is key in guaranteeing assets can keep on being managed securely and dependably.

ALE detailing requirements

As a base, OGPs should build up the accompanying in their accommodation of ALE Study Consent for Extension Report:

- Clarity on how the asset is to be worked during the extension period.
- Clarity on Fitness for Service to keep running up to Design Life, Remnant Life Assessment, and Life Extension necessity and Gap Closure prerequisite for the Asset

Economic Analysis is performed with the accompanying scenarios:

1. No Further Production Enhancement Action, for three (3) unique choices of Crude Oil Price.

2. Shortest Extension Period, for various alternatives of Crude Oil Price.

3. Longest Extension Period dependent on the longest leftover life of a discipline surveyed, for various alternatives of Crude Oil Price.

4. Three further scenarios of extension period in the middle of shortest and longest period for various choices of Crude Oil Price.

5. Sensitivity analysis for Capital Expenditure (CAPEX) and Operational Expenditure (OPEX) for an assortment of scenarios.

CHAPTER 5

RESEARCH METHODOLOGY

5.1 INTRODUCTION:

The Oil and Gas Recommended Assessment and Documentation for Service Life Extension of Facilities, gives great direction on the procedures, resources and methodologies utilized in the ALE way to deal with discover the "as may be" condition and re-capability for life extension and how to execute and archive. Safety basic elements (SCEs, for example, wells, subsea jacket structures, pipelines, risers, mechanical equipment and so on are to be qualified for the nonstop operations and asset life extension. Quantitative and qualitative assessments are commonly utilized for equipment where known degradation mechanisms are prevalent and where quantitative models exist to compute degradation, remaining margins and expectation of outstanding administration life. Quantitative analysis including probability of failure (PoF) is commonly utilized for structures, pipelines, position securing, and adaptable or steel catenary risers and so forth and requires string technical expertise and frequently authority software packages. Qualitative assessments is likewise conceivable however should be supported by effective data management and working historical data to make great engineering assessments.

5.2. RESEARCH METHODOLOGY

The nearby participation and coordination between the support professionals and machine administrators is basic, as it impacts administration quality and, in this manner, the level of fulfilment with the rendered administrations. In this research, rehashed visits to fix equipment for the same problem result in administrator dissatisfaction. As in all quality organized administration programs, agent support is basic for progress. The frame of mind, direct and character of support work force is basic to the adequacy of the upkeep exertion.

An intensive study was directed and one of the authors as of late undergone industrial connection and spent almost 6 months focusing on productivity improvement activities at the research for the oil and gas industry.

The method followed in this exploration comprises of the examination of authority reports, the perception of activities at the oil and Gas Company and meetings with company workers. For that reason, a questionnaire was orchestrated and used to distinguish dysfunctions in the current support framework. A measurable apparatus was likewise used to assess the level of likeness between the upkeep frameworks and support the board viability as demonstrated by different components.

Upkeep the board ineffectualness produces a critical monetary misfortune for the company. This examination does not investigate the effect of upkeep the executive's incapability on security, wellbeing and the environment. For reasons of classification, the company name isn't referenced.

5.3. SOURCES OF DATA

Observation, focus group discussion and simulation application were used to gather the primary data that identified with oil and gas applications. The observation was focused on the oil and gas operations and in the interim the focus group discussion was directed among the Maintenance engineers. Moreover, the discussion was directed well on the past implementation, yet additionally focuses on the future plans and developments by means of telephone and internet conference.

5.4. SAMPLING

Primary data collected for the topic "Economic impact of maintenance management ineffectiveness with reference to oil and Gas Company" with systematic and exhaustive search of the research related to maintenance management was conducted. This research was conducted using oil and Gas Company was the economic impact maintenance by the management and we take samples accordingly towards the company. The samples collected from maintenance area of oil and gas company maintenance workers and techniques used by them and we analysed about 100 samples collected from based on the objective in the organization like maintenance area, maintenance supervisor, technology supervisor and taken samples from the in and around area of the industry. Also, another secondary data collects from the articles related to the maintenance management, internet, books based on the oil and gas company how the economic affects the maintenance management for the industry so we analyse the topic and discuss in findings.

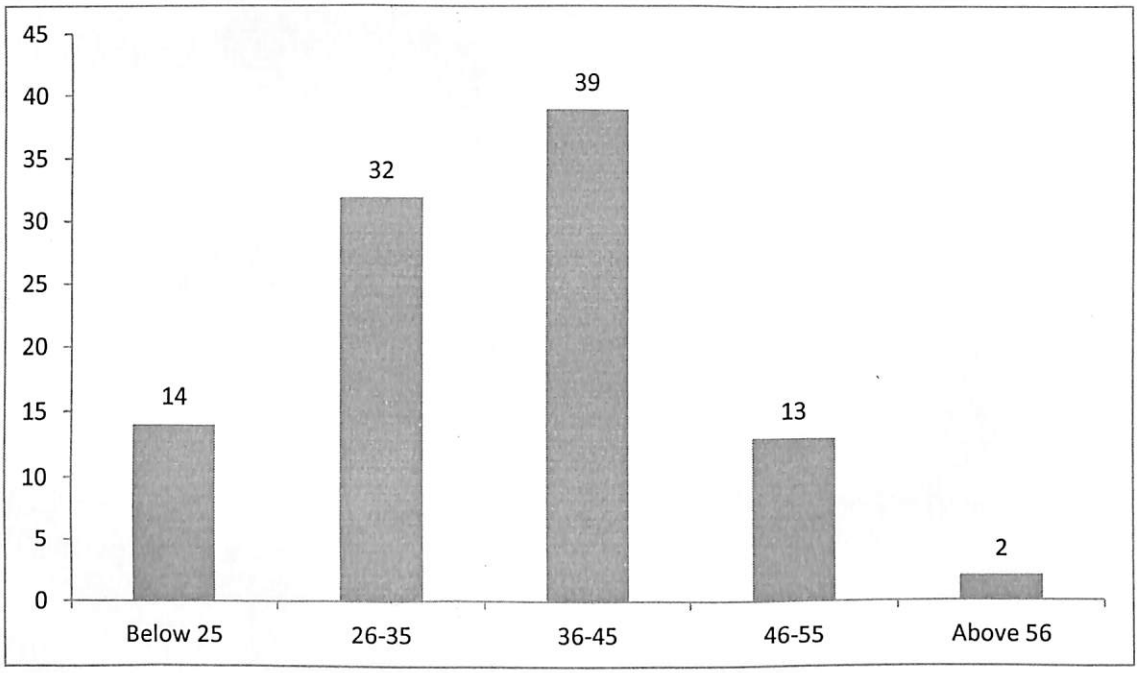
CHAPTER 6

DATA ANALYSIS AND SUGGESTION

Table 6.1: Age of the workers taken in survey

Particulars	Percentage
Below 25	14
26-35	32
36-45	39
46-55	13
Above 56	2
Total	100

Chart 6.1: Age of the workers taken in survey

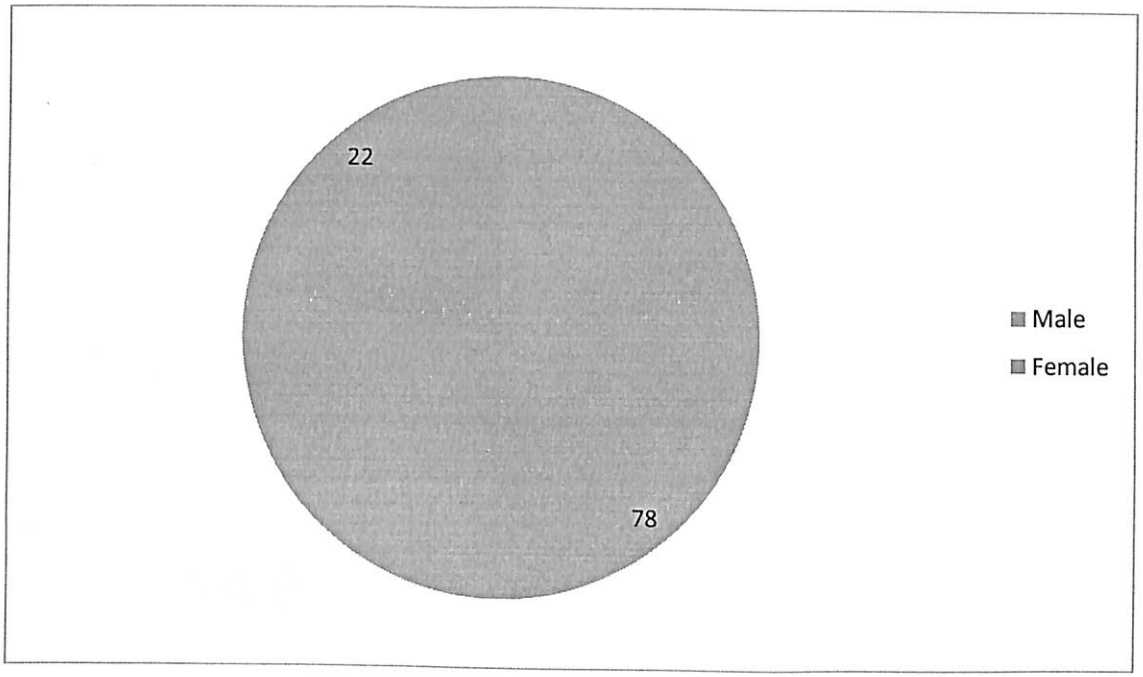


It is interpreted that 39% who were 36-45, 32% who were 26-35, and 14% were below 25, 13% whom were 13% and 2% were above 56 at the age of the workers taken in survey

Table 6.2: Type of Gender workers in a company

Particulars	Percentage
Male	78
Female	22
Total	100

Chart 6.2: Type of Gender workers in a company

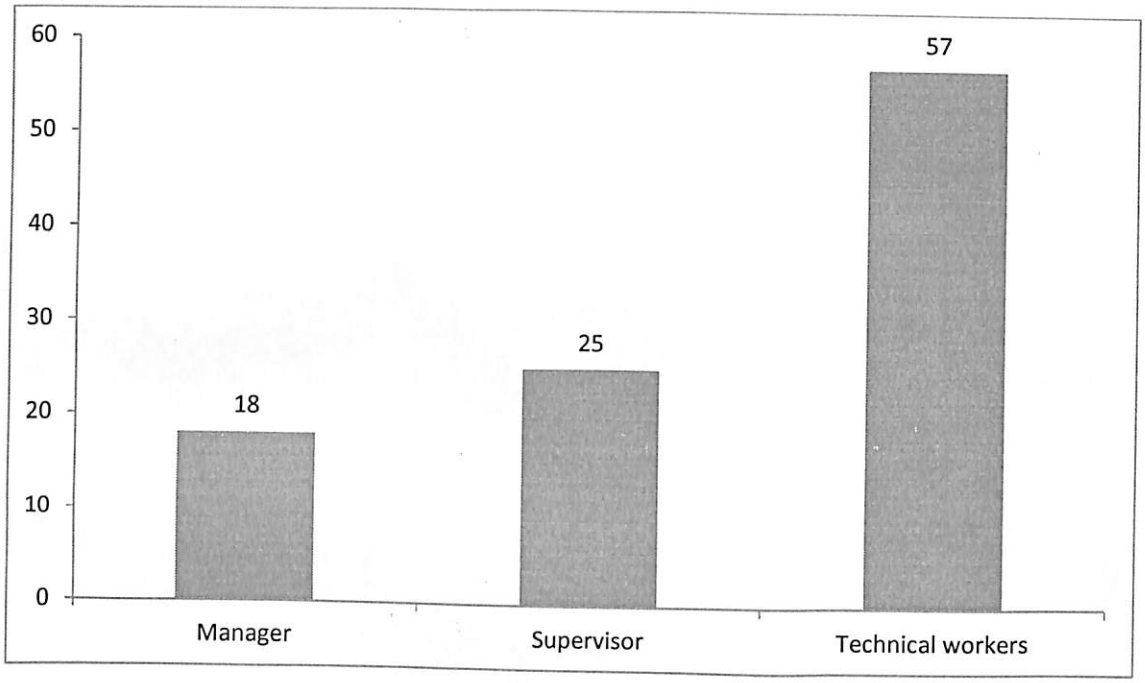


It is interpreted that 78% of them are male are workers in the oil and gas company and 22% of them are female workers in the oil and gas company

Table 6.3: Type of maintenance workers in the company

Particulars	Percentage
Manager	18
Supervisor	25
Technical workers	57
Total	100

Chart 6.3: Type of maintenance workers in the company

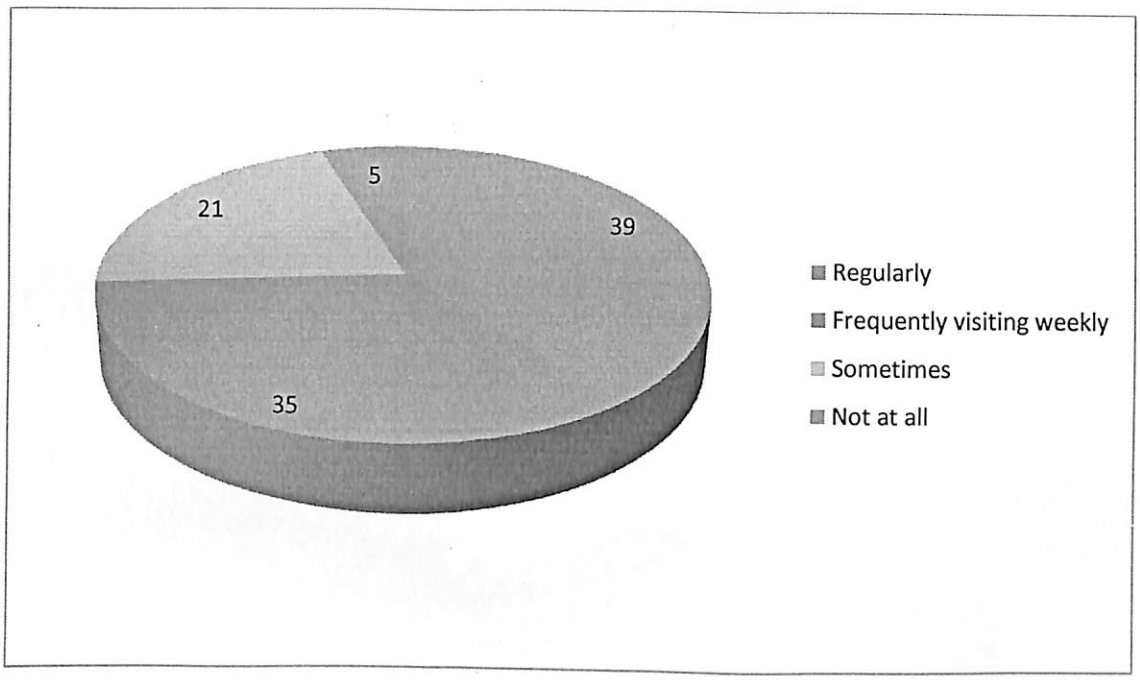


It is interpreted that 57% of them were technical workers who were maintenance workers in the company, 25% were supervisor who supervisors them and 18% were managers who manages them in the oil and gas company

Table 6.4: Maintenance workers visits the area for maintenance in a company

Particulars	Percentage
Regularly	39
Frequently visiting weekly	35
Sometimes	21
Not at all	5
Total	100

Chart 6.4: Maintenance workers visits the area for maintenance in a company

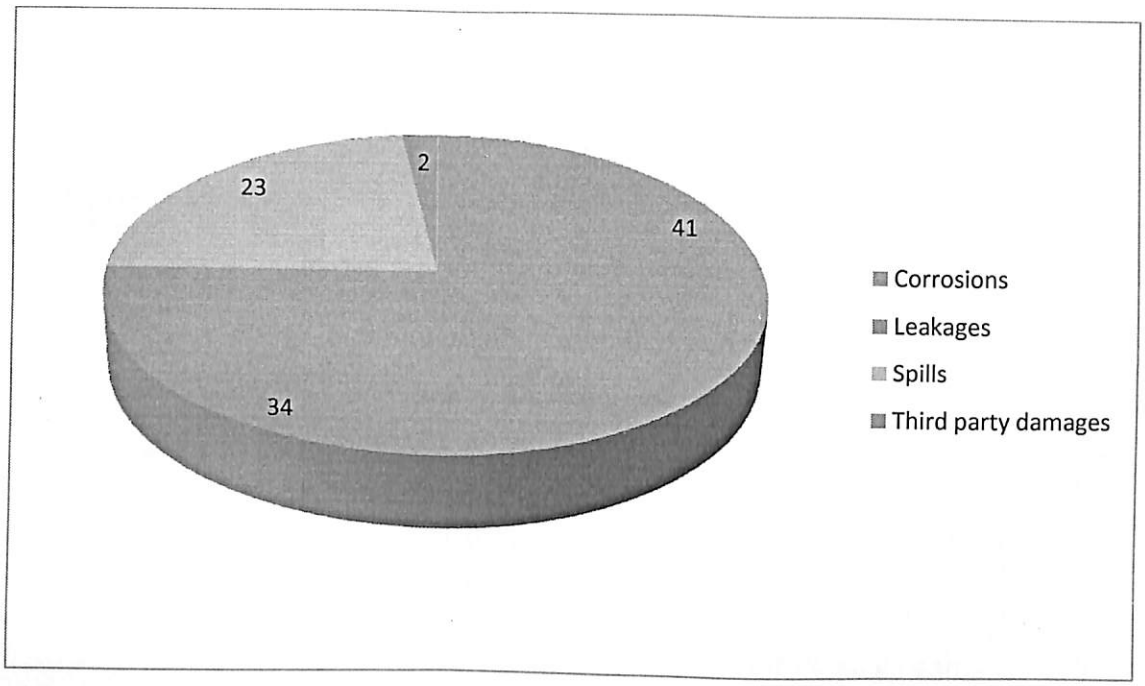


It is interpreted that 39% we regularly maintenance workers visits the area for maintenance in a company, 35% were frequently visiting weekly, 21% were sometimes visiting and 5% were not at all visiting the area for maintenance in a company

Table 6.5: Problems arise for maintenance

Particulars	Percentage
Corrosions	41
Leakages	34
Spills	23
Third party damages	2
Total	100

Chart 6.5: Problems arise for maintenance

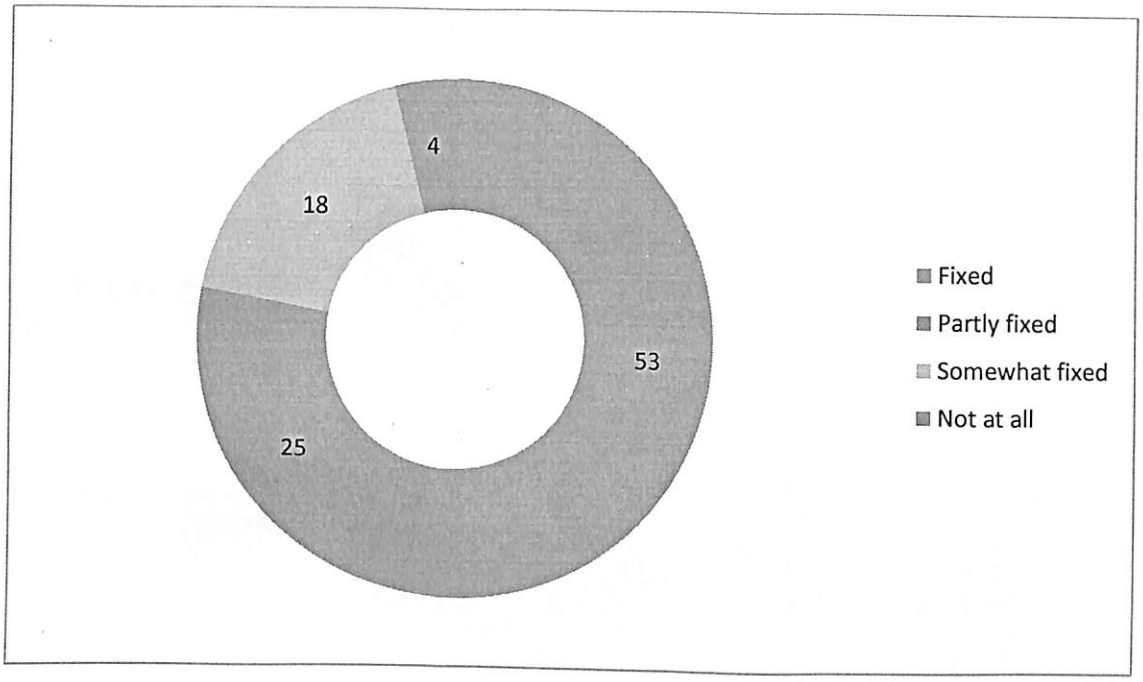


It is interpreted that 41% were corrosions problems arise for maintenance, 34% were leakages, 23% were spills and 2% were third party damages done problem and it arise for maintenance

Table 6.6: Problems are fixed for maintenance in a company

Particulars	Percentage
Fixed	53
Partly fixed	25
Somewhat fixed	18
Not at all	4
Total	100

Chart 6.6: Problems are fixed for maintenance in a company

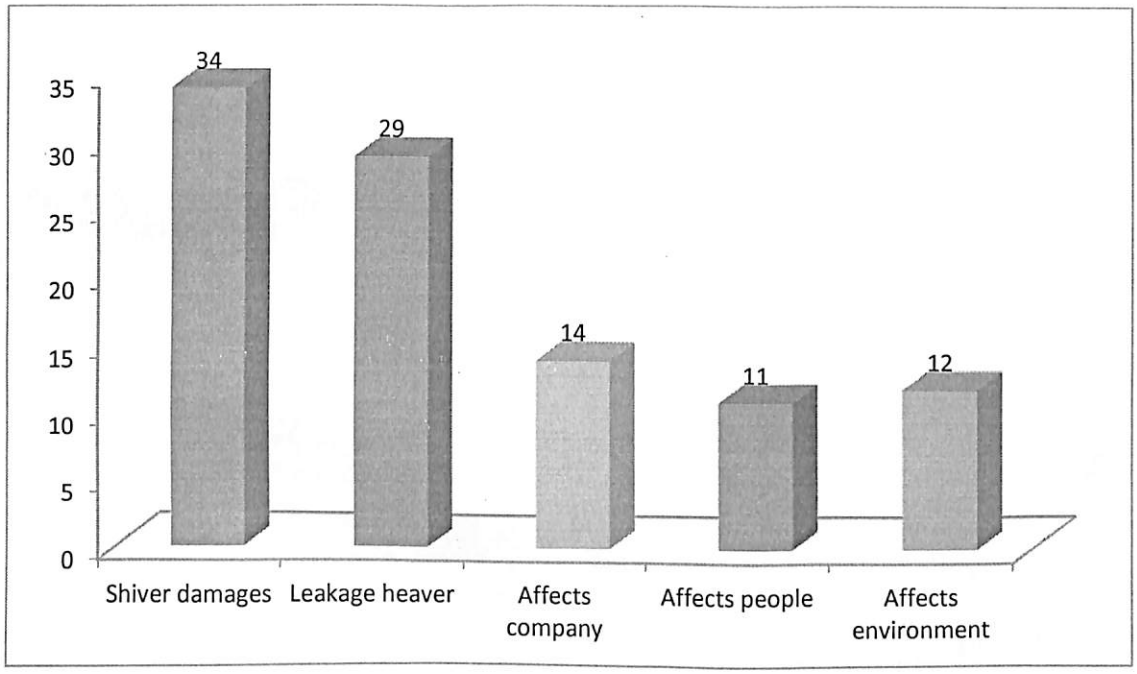


It is interpreted that 53% were fixed when problem arise for maintenance in a company, 25% were partly fixed, 18% were somewhat fixed and 4% were not at all fixed for maintenance in a company

Table 6.7: Future Problems arise when not fixed

Particulars	Percentage
Shiver damages	34
Leakage heaver	29
Affects company	14
Affects people	11
Affects environment	12
Total	100

Chart 6.7: Future Problems arise when not fixed

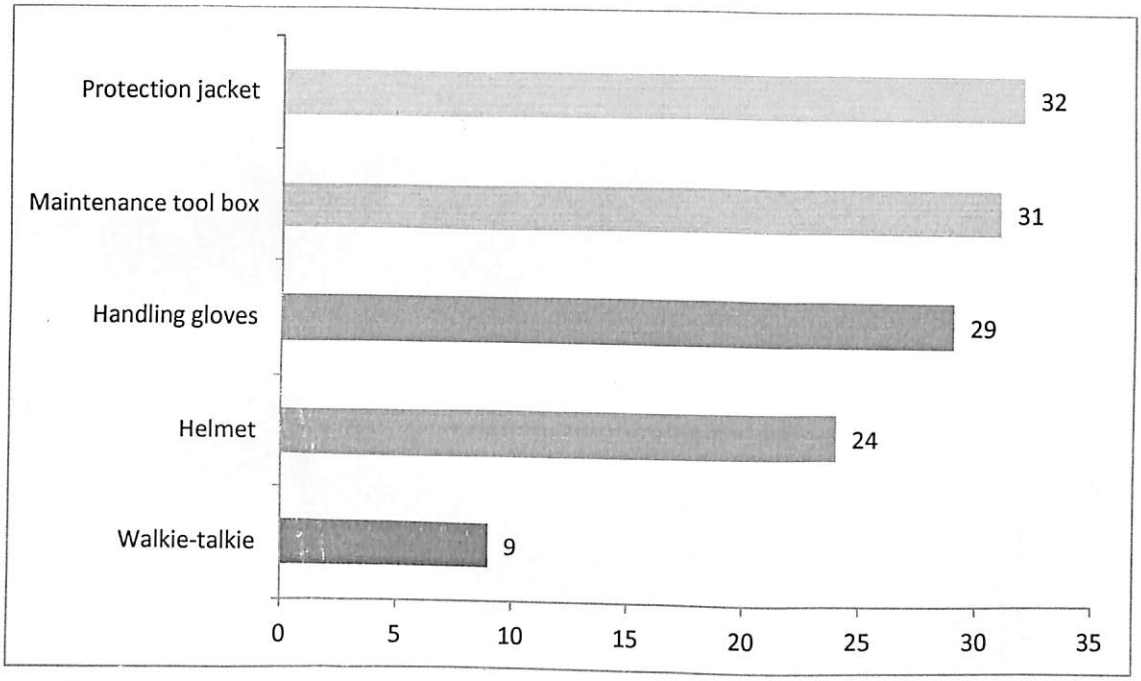


It is interpreted that 34% were shiver damages future problems arise when not fixed, 29% were leakage heaver, 14% affects company, 11% affects people, 12% affects environment when future problems arise when not fixed for maintenance

Table 6.8: Equipment provided for maintenance area

Particulars	Percentage
Protection jacket	32
Handling gloves	29
Helmet	24
Maintenance tool box	31
Walkie-talkie	9
Total	125

Chart 6.8: Equipment provided for maintenance area

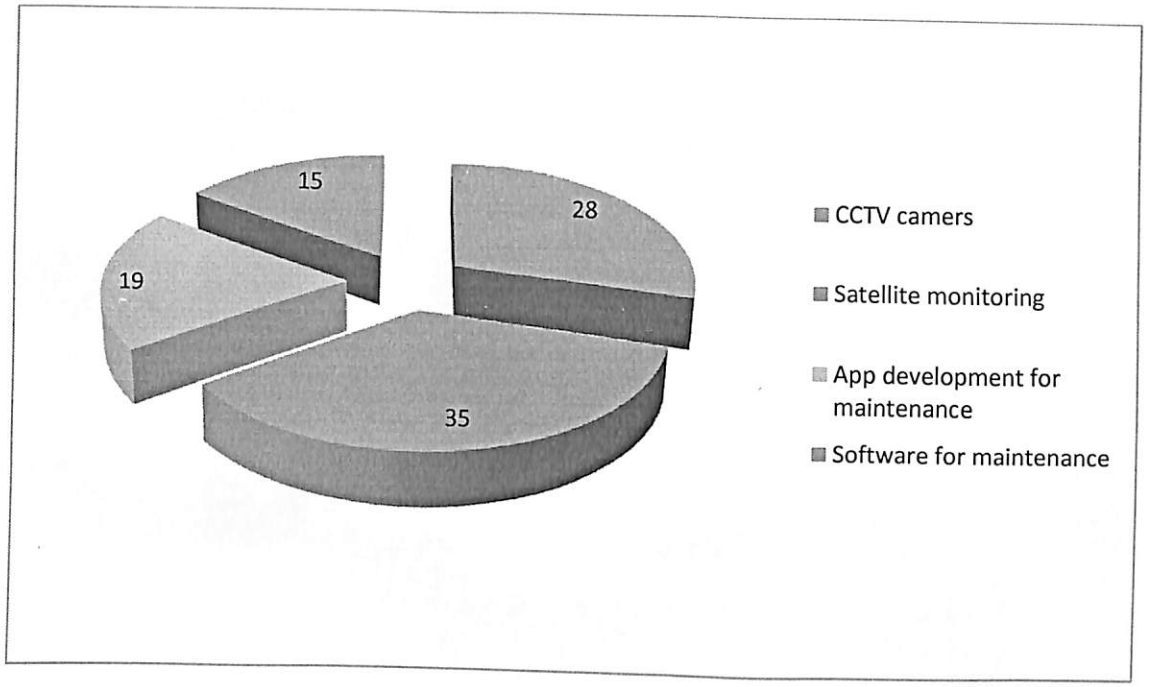


It is interpreted that 32% were from protection jacket given as the equipment provided for maintenance area, 31% maintenance tool box, 29% were handling gloves, 24% were helmet and 9% walkie-talkie provided equipment for maintenance area

Table 6.9: Technology maintenance provided in the maintenance area

Particulars	Percentage
CCTV cameras	28
Satellite monitoring	35
App development for maintenance	19
Software for maintenance	15
Total	100

Chart 6.9: Technology maintenance provided in the maintenance area

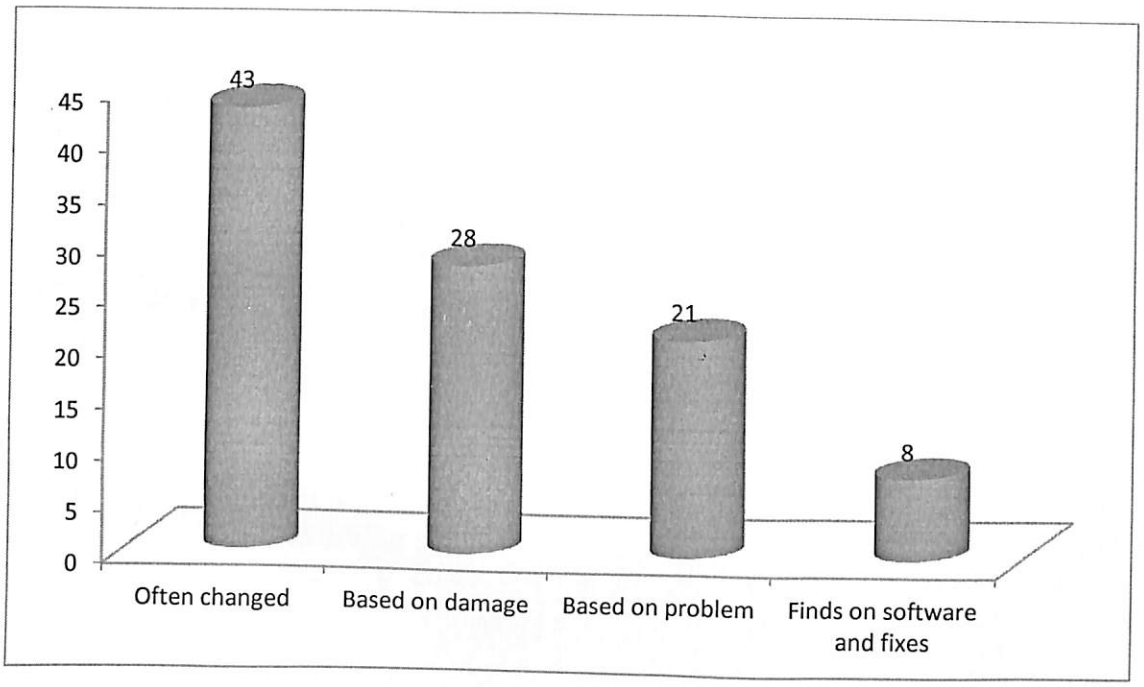


It is interpreted that 35% were satellite monitoring technology maintenance provided in the maintenance area, 28% were CCTV cameras, 19% were App development for maintenance and 15% were software for maintenance are the technology maintenance following in the company

Table 6.10: Parts changes when damages occur in maintenance

Particulars	Percentage
Often changed	43
Based on damage	28
Based on problem	21
Finds on software and fixes	8
Total	100

Chart 6.10: Parts changes when damages occur in maintenance



It is interpreted that 42% often changed the parts when damages occur in maintenance area, 28% based on damage parts are changed, 21% were based on problem and 8% finds on software and fixes the damage occur in maintenance

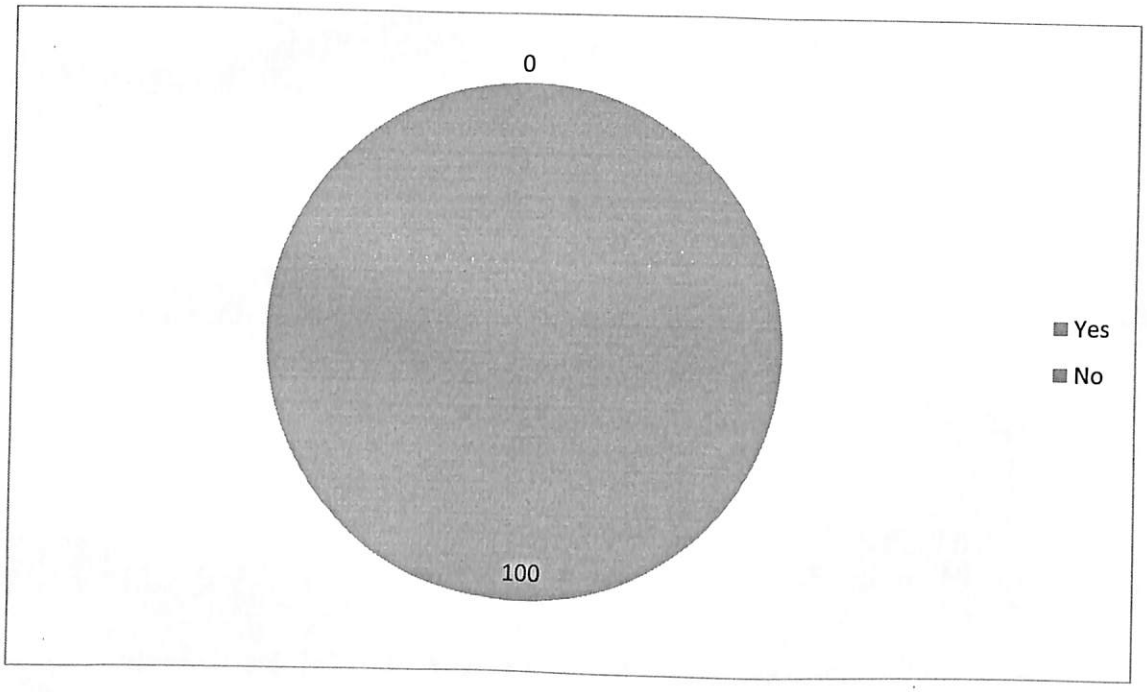
OBJECTIVE DISCUSSION

To find out the operations training process including maintenance techniques followed in oil and gas industry

Table 6.11: Operation training process and maintenance techniques provided for maintenance area

Particulars	Percentage
Yes	100
No	0
Total	100

Chart 6.11: Operation training process and maintenance techniques provided for maintenance area



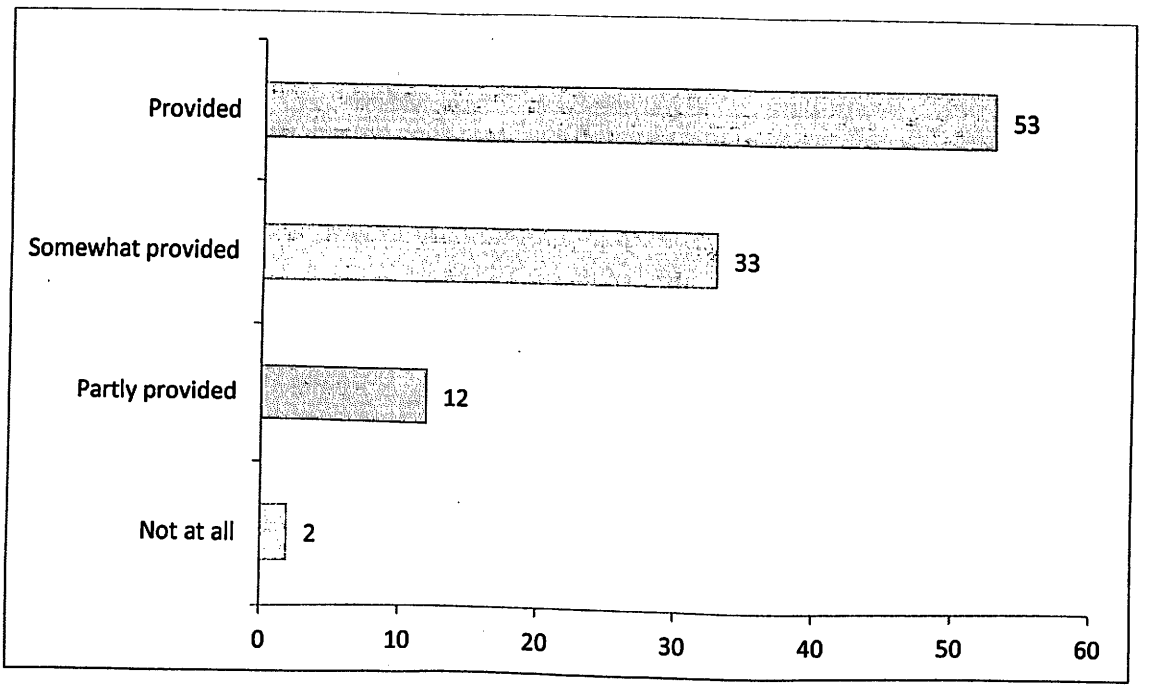
It is interpreted that 100% operation training process and maintenance techniques provided for maintenance area when the problem occurs

To find out the economic impact of maintenance management based on organization strategic in oil and gas industry

Table 6.12: Maintenance management provided in organization

Particulars	Percentage
Provided	53
Somewhat provided	33
Partly provided	12
Not at all	2
Total	100

Chart 6.12: Maintenance management provided in organization



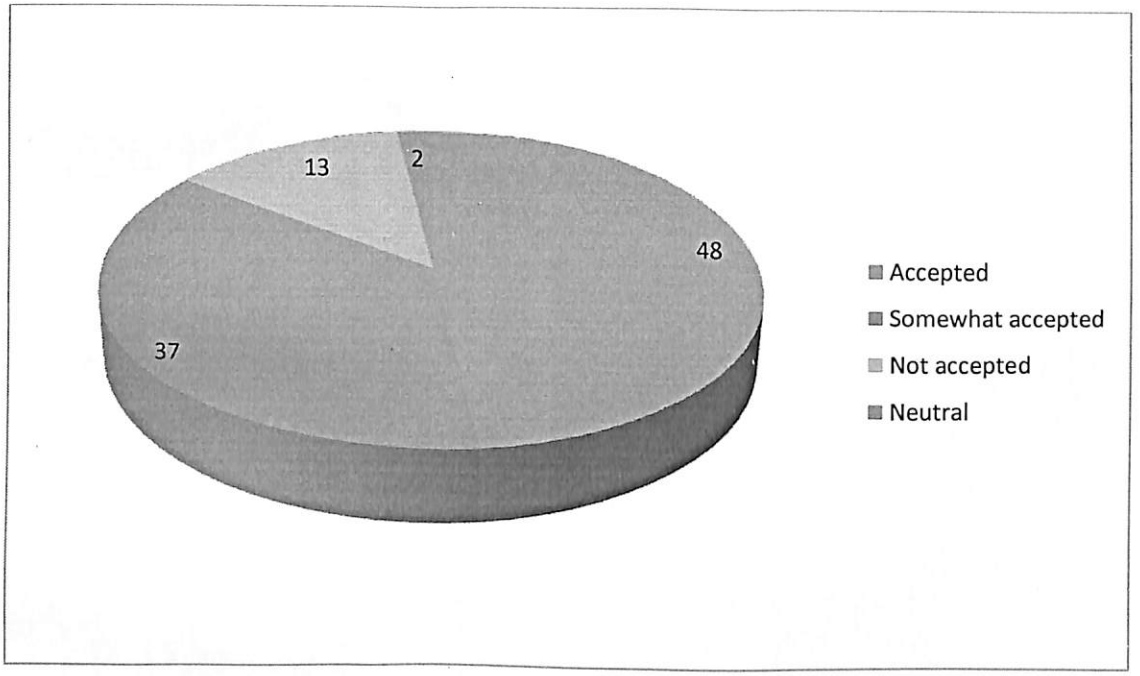
It is interpreted that 53% provided the maintenance management in organization, 33% somewhat provided, 12% partly provided and 2% not at all provided were the answers given from the maintenance management provided in organization

To study in detail about maintenance management performance system integrated in the oil and gas performance measurement system

Table 6.13: Performance measurement system followed in company

Particulars	**Percentage**
Accepted	48
Somewhat accepted	37
Not accepted	13
Neutral	2
Total	100

Chart 6.13: Performance measurement system followed in company



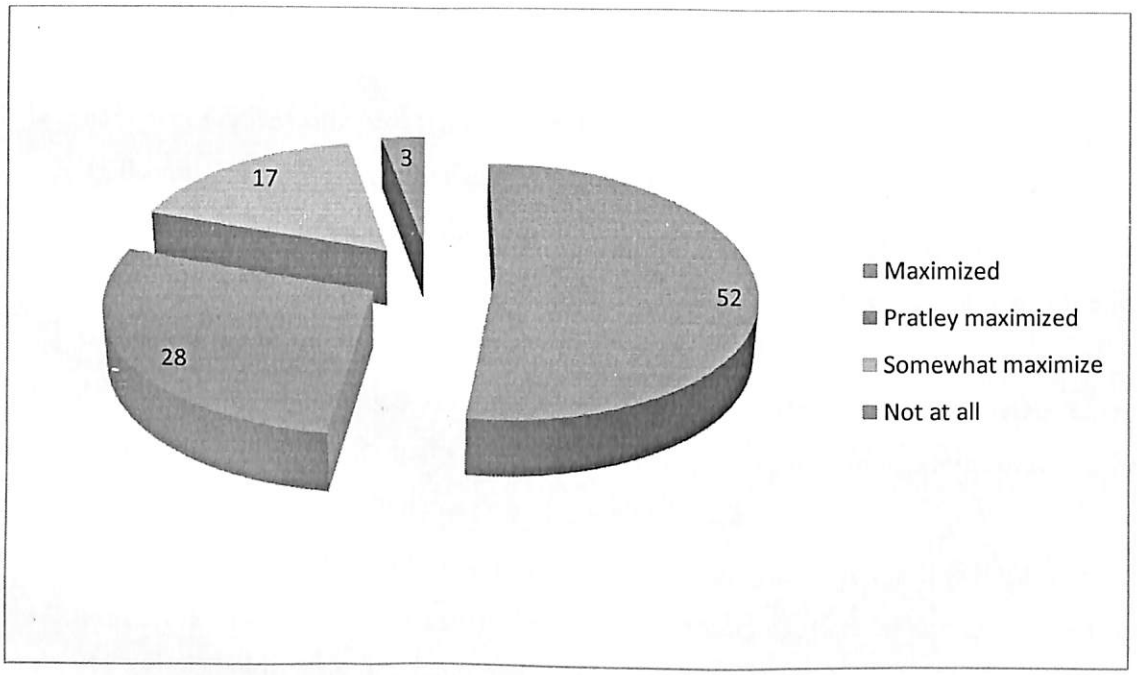
It is interpreted that 48% where accepted that performance measurement system followed in company, 37% were somewhat accepted, 13% were not accepted and 2% stands neutral but majority of them accepted that performance measurement system followed in company

To assess the maintenance management to maximize the resource availability in order for allowing strategy flexibility

Table 6.14: maximize the resource availability in order for allowing strategy flexibility

Particulars	Percentage
Maximized	52
Pratley maximized	28
Somewhat maximize	17
Not at all	3
Total	100

Chart 6.14: maximize the resource availability in order for allowing strategy flexibility



It is interpreted that 52% were maximized the resource availability in order for allowing strategy flexibility, 28% were given the answers that Pratley maximized the resource availability, 17% were answered that somewhat maximize and 3% stands that not at all provided the resource but we need to accepted that maximized the resource for the strategy flexibility

CHAPTER 7

FINDINGS AND SUGGESTION

7.1 Findings

- 39% who were 36-45, 32% who were 26-35, and 14% were below 25, 13% whom were 13% and 2% were above 56 at the age of the workers taken in survey
- 78% of them are male are workers in the oil and gas company and 22% of them are female workers in the oil and gas company
- 57% of them were technical workers who were maintenance workers in the company, 25% were supervisor who supervisors them and 18% were managers who manages them in the oil and gas company
- 39% we regularly maintenance workers visits the area for maintenance in a company, 35% were frequently visiting weekly, 21% were sometimes visiting and 5% were not at all visiting the area for maintenance in a company
- 41% were corrosions problems arise for maintenance, 34% were leakages, 23% were spills and 2% were third party damages done problem and it arise for maintenance
- 53% were fixed when problem arise for maintenance in a company, 25% were partly fixed, 18% were somewhat fixed and 4% were not at all fixed for maintenance in a company
- 34% were shiver damages future problems arise when not fixed, 29% were leakage heaver, 14% affects company, 11% affects people, 12% affects environment when future problems arise when not fixed for maintenance
- 32% were from protection jacket given as the equipment provided for maintenance area, 31% maintenance tool box, 29% were handling gloves, 24% were helmet and 9% walkie-talkie provided equipment for maintenance area
- 35% were satellite monitoring technology maintenance provided in the maintenance area, 28% were CCTV cameras, 19% were App development for maintenance and 15% were software for maintenance are the technology maintenance following in the company
- 42% often changed the parts when damages occur in maintenance area, 28% based on damage parts are changed, 21% were based on problem and 8% finds on software and fixes the damage occur in maintenance

- 100% operation training process and maintenance techniques provided for maintenance area when the problem occurs
- It is found that 53% provided the maintenance management in organization, 33% somewhat provided, 12% partly provided and 2% not at all provided were the answers given from the maintenance management provided in organization
- It is found that 48% where accepted that performance measurement system followed in company, 37% were somewhat accepted, 13% were not accepted and 2% stands neutral but majority of them accepted that performance measurement system followed in company
- It is found that 52% were maximized the resource availability in order for allowing strategy flexibility, 28% were given the answers that Pratley maximized the resource availability, 17% were answered that somewhat maximize and 3% stands that not at all provided the resource but we need to accepted that maximized the resource for the strategy flexibility

7.2 Conclusion

The findings demonstrate that maintenance management, work management and performance management are the center factors for performing the maintenance in oil and gas industry. Maintenance management is a multi-clients, multioffices, electronic brought together database management framework. The framework intends to helps association to more readily manage the allocation, conveyance, and gainful utilization of its assets. The framework encourages the management of assets with the objective of catching information on assets and tracking of the assets through the entire assets life cycle of enlistment, task or allocation, move, stock checking, maintenance and inevitably transfers or revealed lost. Maintenance management contains the plant asset structure and arranged preventive maintenance plan. Plant asset structure speaks to the spot at which a maintenance task is performed. It is a kind of data item utilized in SAP to speak to the functional part which an article can be installed, instead of the installed equipment, which speaks to the technical side. From that point forward, arranged preventive maintenance plan will be made to consequently produce maintenance orders when the maintenance task is performed.

Moreover, work management encourages the management of development, maintenance, and operations work demand via automating and streamlining the procedures required to start, track, design, gauge, timetable, build, and close work demand. By tracking and examining information, and disseminating it over the undertaking, these frameworks empower to expand the proficiency, exactness and speed of the entire work cycle. In maintenance management comprise work identification, pre-planning, planning, scheduling, work execution, and announcing and feedback. It is a work request creation and tracking framework design for asset PMO, caretaker, or temporary workers to manage work orders for their infrastructure.

Oil and gas makers are regularly headed to proceed with operations past its design facility and are required to work securely. There are numerous factors to think about when giving an asset life extension solution to maturing offshore or inland facilities. This section shows the key issues to consider and an endorsed philosophy follow in supporting asset life extension for a maturing facility. At all stages of the asset life extension, assets are required to fulfill the As Low as Reasonably Practicable criteria as a base for each discipline and demonstrate fitness for reason to meet its objectives and findings discovered that the maintenance are taken in the oil and gas industry for avoiding the future damages.

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