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Maintenance Operations and its Management in Oil Industry in Kuwait

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Abstract

The maintenance in oil area need to undertake entire shutdowns together with generic refinery turn-around, unit shutdowns on a full accountability foundation and Scaffolding services. The in-house equipment and equipment: the in-house Maintenance workshop facility ought to be completely outfitted with lathe machines, shaping machine, hole spindle lathe machine, horizontal boring machine, radial drilling machine, pipe threading machine, valve lapping machine, mechanical seal lapping machine, welding computing device and all sorts of specialized warmness exchanger re-tubing gear and tools. Maintenance operations in this zone face many troubles in management, price and technical problems. This study aims to study the and count the failures occurred in equipments of Kuwait Oil Company (KOC) in 2019, and study the maintenance strategies used in petroleum industry in the Kuwait state, a maintenance programs or steps will be suggested and investigated in order to improve the maintenance operations. Availability of devices are calculated depending on downtime of the devices at KOC. The data were collected about failures frequency occurred for the KOC company equipments. Most of oil equipments have good availability but in the case of KOC four devices have availability less than 90% which means more failure and downtime, the company adopted a Zero S/D PM Strategy or Philosophy which decreasing failures by 75% and improve the availability of KOC devices. Planning and management of maintenance and monitoring operations in any company decreasing failure frequency of equipments and so downtime of equipments which improves the equipments availability.

Keywords: Oil sector, Maintenance, Availability, KOC, Downtime and failures

1 Introduction

Oil grew to become the solely count on the minds of the Kuwaiti authorities and human beings since 1913. The first negotiations on Oil have been headed through Sheikh Mubarak Al Sabah and the British Consul General in the Gulf Sir Percy Cox. A sure duration of time surpassed and the Kuwait Oil Company used to be established. It commenced its works in Bahra area to the north from Joun Kuwait. The preliminary geological survey commenced with the drilling of the first exploratory nicely in 1936. However, this properly did no longer supply hopes for business production; therefore, the search persevered elsewhere. In 1938, in Burgan region, which was once the different site, the drilling operations led to discovering a sand nicely with oil at a depth of 3700 feet. Production exams confirmed that this website online was once noticeably encouraging. This nicely was once follows by using eight different wells drilled between 1938 and 1942 AD. Hopes for oil had been confirmed. Due to the Second World War, the manufacturing stopped till November 1945. The oil manufacturing was once resumed at a fee of thirty thousand barrels per day. Commercial shipments commenced in June 1946. The explorations developed and commercial enterprise thrived. The corporation brought to drilling and extraction new things to do such as refining crude oil and consequently its endeavor accelerated quite (Stevens, 2008; Al-Azmi, 2014). The Kuwait Petroleum Company grew to be the founding contributor in the International Organization for Power Development. During the equal year, (1980), the Kuwait Oil Company carried out exploration and survey operations in wild and calcareous areas as nicely as drilled wells and developed

fields and produced oil and natural gas. The Kuwait National Petroleum Company used to be accountable for refining and manufacturing fuel and advertising the petroleum merchandise in the neighborhood market. The Petrochemical Industries Company performed the manufacturing and advertising of fertilizers and petrochemical products.

The National Petroleum Company succeeded all through the yr 2010 in signing two contracts that are very 14 Sheikh Ahmed Al Abdullah and Ali Al Nahimi reducing the inauguration ribbon for the first stage of the Al Khafanji Field improvement vital with regard to herbal fuel for a complete price estimated at 373 million dinars. The first challenge was once signed with Dailem International Ltd for organizing the fourth fuel manufacturing line at the gasoline liquefaction plant of the Al Ahmedi Port refinery (Stevens, 2008; Al-Azmi, 2014). A number of different maintenance approaches, on occasion referred to as techniques or philosophies, are presently handy for utility in all manufacturing methods. The necessary traits of these upkeep strategies are pretty similar, however their focuses are different. Reliability-centered upkeep (RCM) originated in the aviation industry, and is centered on tools reliability (Tétreault, 1995). Total productive upkeep (TPM) originated in the meeting line industry, and is centered on enhancing the exceptional of humans and tactics (Tétreault, 1995). Business-centered protection originated in the procedure industry, and focuses on performing inexpensive preservation to acquire enterprise dreams (Brune, 2003). Maintenance of bodily property has been wanted ever due to the fact that human beings started out constructing them. The want for protection administration was once brought on via an

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expand in the number, size, and complexity of assets, and the extended specialization of protection duties to be performed. All upkeep tactics or techniques use a quantity of fundamental sorts or methods for every asset of the complete system. Alsharhan and Nairn (1997) mentioned the important strategies that can be utilized to the protection of the factors of a technical system. The 4 methods that are most frequently used are highlighted as follows: Operate to failure (OTF) – gear is run till a failure occurs, when a substitute is normally performed. This tactic is frequently the cheapest, on account that the full layout lifestyles of the thing is utilized. But it is now not proper exercise when the outcome of failure is severe, such as loss of lifestyles or a most important launch of detrimental substances. Time-based upkeep (TBM) – alternative or cleansing is carried out at predetermined time or utilization intervals. This tactic is regularly used for easy aspects that show off a particular wearout failure mode with a slender failure distribution. A downside is that solely phase of the beneficial existence of aspects is truly utilized. Condition-based preservation (CBM) - some parameter that shows the circumstance of the tools is measured constantly or periodically, and alternative is carried out when the circumstance is no longer acceptable. Fault-finding protection (FFM) - periodic tests are carried out to decide whether or not the back-up equipment, redundant equipment, or protecting gear is nonetheless wholly functional. If not, restore or alternative is carried out (Alsharhan and Nairn, 1997).

2 Literature Review

Many papers discussed in deep the maintenance operations in oil and gas plants. Elwerfalli and Munive (2016) explored the present literature on the improvement and functions of CBM in the oil and fuel industry. The latest literature reinforces the truth that the function of CBM is imperative to the smooth, uninterrupted, environment friendly and secure jogging of oil and fuel facilities. A new methodology for enhancing TAM scheduling of oil and fuel plant life used to be introduced by using Elwerfalli and Munive (2016).

If we limit downtimes and screw ups number, the reliability of the device will be expanded and so greater manufacturing low charges and extra reliability are achieved. Maintenance has many varieties and it can be preventive or predictive and it is aimed at making use of information of engineering and protection competencies to make sure multiplied overall performance and discount in their charge of failure. Furthermore, this protection ought to consist of periodic examination in phrases of ordinary stroll via to spot exchange in working conditions, sounds or temperature; it additionally consists of inspection programs, lubrications amongst others. A high quality preventive preservation application will assist pick out symptoms of gear that is about to fail. When accomplished in many instances base on the tools method of that device, it ought to forestall a catastrophic failure. Faults recognized all through preventive upkeep are resolved throughout corrective protection that wants the gear to be shutdown in most instances (Olose, 2016). As phase of the MRP program, deliberate inspections on pipelines, vessels and constructions by way of equipped inspectors need to be finished primarily based on their preservation strategies. These ought to consist of degree one and two inspections for corrosion on pipelines, vessels and structures. The goal right here is to make certain equipments' reliability and availability (Olose, 2016). Mitchell (2018) furnished the technicians and engineers with some realistic recommendation and guidelines that can be used in the subject for widely wide-spread servicing, or when some 'on the job' gadget graph challenges occur, mainly in heavy gear and

distinct functions the usage of large ability direct power compressors used in oil industry.

Telford et al (2011) explored the current literature on the improvement and purposes of CBM in the oil and fuel industry. The current literature reinforces the truth that the position of CBM is indispensable to the smooth, uninterrupted, environment friendly and protected jogging of oil and gasoline facilities. The complicated and built-in nature of the oil and fuel services require precise and carefully organized CBM packages with real-time situation monitoring statistics recording, analysis, and choice making to facilitate an correct grasp of the crucial preservation intervals. This in flip can promote optimized utilization of plant gear with greater stages of sure bet and safety.

Many companies are investigating the broader implementation of automation to limit the range of personnel required and the dangers they are subjected to in a bid to enhance affectivity and minimize human error and risks. There is additionally an enlarge in un-manned facilities, mainly in far flung locations. These two traits will inevitably enlarge running costs. From an funding perspective, the uncertainty in furnish potential that buyers will be searching to low fee of manufacturing and renovation operations to make sure the protection of their funding (Treadgold, 2010) Due to these traits and challenges, oil and gasoline businesses are searching to optimize manufacturing (Elgsaeter et al., 2010) and enhance asset integrity administration (Rahim, 2010). A high-quality protection application is an integral and big aspect of operations with many benefits, including; the discount of downtime due to surprising tools failure, which improves reliability and maintainability, growing tools availability and utilization. Optimizing upkeep additionally improves the beneficial lifestyles of equipment. Proactive or preventative renovation (PM) techniques are a fundamental aspect of a superb renovation program.

The PM method recognized as condition-based renovation (CBM) presents a dynamic appreciation of gear situation whilst in operation and is used to predict failure in mechanical structures thru fault prognosis from circumstance monitoring indicators the usage of diagnostics and prognostics (Heng, 2009). CBM techniques are presently a essential focal point of protection and protection administration lookup due to the aforementioned traits and challenges, improved complexity in industrial applied sciences (Swanson, 1997), and advances in circumstance monitoring strategies that encompass the use of on-line structures (Oberholster, 2009).

3 Methodology

The methodology followed in this study is about is accumulating the required records from actual oil manufacturing strategies and oil enterprise methods and on the whole from the Kuwait Oil Company (KOC) preservation operations which will encompass all renovation operations for tanks, pumps, pipelines and different services used in the manufacturing of crude oil and associated operations (Al-Azmi, 2014). From the company's figures and data, KOC's personnel numbered 7, ninety four till the cease of fiscal 12 months 2012. About 80.2% of Kuwaitis versus a goal of 49.4% per annum. (This wide variety does now not consist of clinical and nursing staff). Kuwait Oil Company (KOC) launched the Mobile Training Center in cooperation with an American organization specializing in oil and gas, as properly as oil subject offerings and complete assignment integration. KOC has additionally prepared a management improvement application in cooperation with the greatest American universities specializing in enterprise administration so that contributors can be recognized with the brand new

administration structures and current using abilities (Almunaifi, 2017).

4 Data Collected

The current applied maintenance technique followed in KOC is Reliability Centered Maintenance (RCM) which applied for critical/semi critical rotating equipment. The Availability values calculated for direct indicator of the asset performance are presented here. Increased maintenance focus on the less available equipment will be helpful to reduce production loss, thus improving the operation efficiency (KOC, 2109).

Table 1: EK-I, Equipment Failures % (KOC, 2019)

Table 1. ER-1, Equipment 1 an	•
Equipment name	Percentage of failure
Heater	19%
CB CRU	17%
Recycle Pump	14%
Manturbo CRU	11%
RUSTON Turbine	9%
VSM Pump	7%
DSL Train	5%
Wash water pump	5%
Effluent water dispatch pump	3%
Air compressor	2%
Desalted feed pump	2%
LP wet separator	2%
Effluent water feed pump	2%
HP wet separator	1%
Transit pump	1%
HP dry separator	1%
LP dry separator	0.4%
LP test separator	0.2%

5 Results and discussion

The availability of KOC equipment by assuming that such equipments work for 8 hours daily which means 2920 hours in

the year. Depending on this assumption and data collected the availability of KOC equipments can be calculated and tabulated in table 2 below. Figure 1 shows the availability of studied devices at KOC company in 2019. It can be noticed that the availability of oil company (KOC) is high for most of them with exclusion of four devices that are: heater, CBCRU, Recycle Pump and Manturbo CRU. To improve their availability, the maintenance plan suggested by the KOC is Zero S/D PM Strategy or Philosophy which is Preventive Maintenance carried out by minimizing the Production Cut or in other word maximizing the "Facility up Time" with prime focus on Safety, Reliability & Integrity of Plant Equipment, Figure 2 shows the flow chart of this PM philosophy (KOC, 2019). If such plan is followed the availability of such devices will be improved to be more than 95%.

Table 2: EK-I, Equipment availability hours (KOC, 2019)

Equipment name	Availability (hrs/year)
Heater	2365.2
CB CRU	2423.6
Recycle Pump	2511.2
Manturbo CRU	2598.8
RUSTON Turbine	2657.2
VSM Pump	2715.6
DSL Train	2774
Wash water pump	2774
Effluent water dispatch pump	2832.4
Air compressor	2861.6
Desalted feed pump	2861.6
LP wet separator	2861.6
Effluent water feed pump	2861.6
HP wet separator	2890.8
Transit pump	2890.8
HP dry separator	2890.8
LP dry separator	2909.3
LP test separator	2914.2

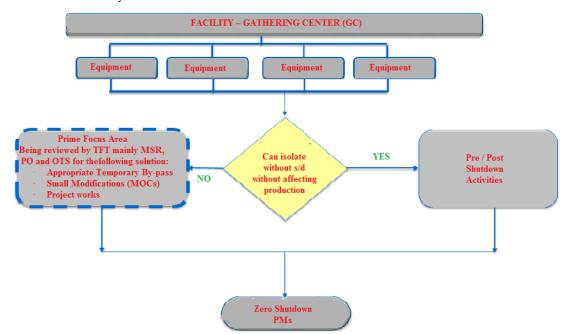


Figure 2: Zero S/D PM strategy of KOC (KOC, 2019)

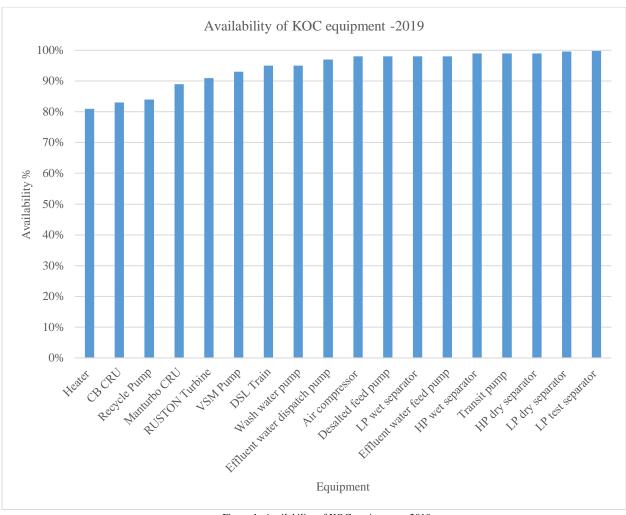


Figure 1: Availability of KOC equipments -2019

6 Conclusions

This study concentrated in the failures occurred in one of most important oil company in Kuwait, and the protection elements dealing with oil manufacturing zone in Kuwait and concentrates on KOC. The manufacturing methods face many troubles and equipments uncovered to many working stipulations which might also reason failures. Such screw ups influences the manufacturing quotes and in most of instances may also stopping the manufacturing process. In this find out about the CB compressor is studied, its operation, failure rate, its results on the universal machine and its disasters are investigated and analyzed. The moves recommended with the aid of the protection group are studied, analyzed and evaluated. A counseled preservation layout is cautioned through this learn about inclusive of a complete factors for all elements of CB compressor protection necessities which will minimize failure price of GCs equipments by means of 75% and enhance equipments availability to extra than 95%.

Ethical issue

Authors are aware of, and comply with, best practice in publication ethics specifically with regard to authorship (avoidance of guest authorship), dual submission, manipulation of figures, competing interests and compliance with policies on research ethics. Authors adhere to publication requirements that submitted work is original and has not been published elsewhere in any language.

Competing interests

The authors declare that there is no conflict of interest that would prejudice the impartiality of this scientific work.

Authors' contribution

All authors of this study have a complete contribution for data collection, data analyses and manuscript writing.

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