Proven Delayed Coker Maintenance Practices

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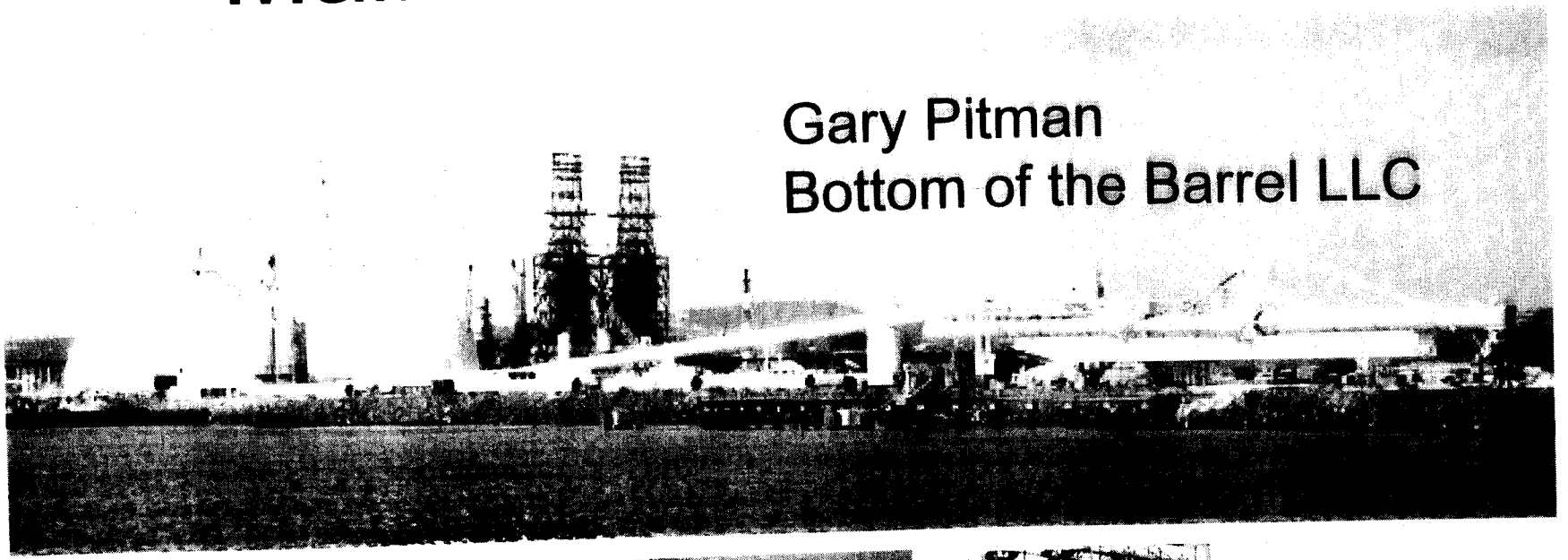
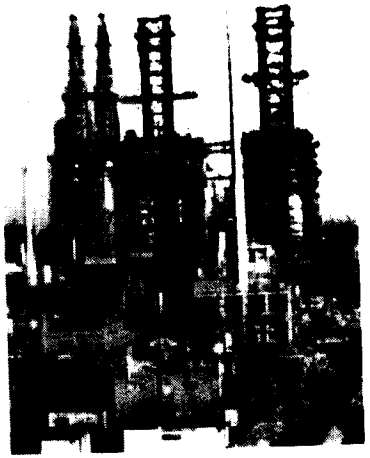
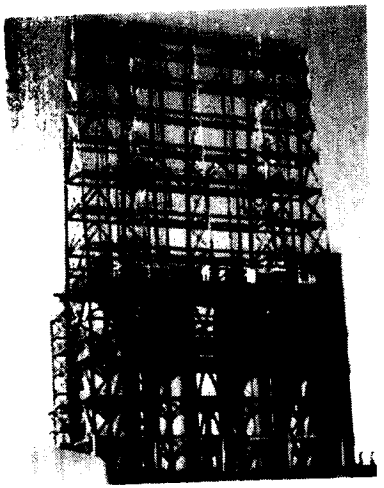
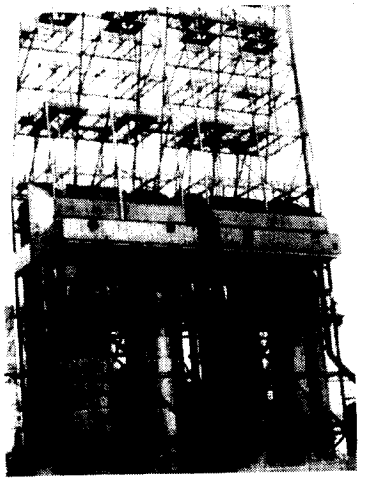








Outline of a proven Maintenance Practices for a Delayed Coker unit.

Operations:

- Operations Routine Duties
- Trouble Shooting Skills
- Unit Equipment Knowledge
- Condition Monitoring
- Unit Lubrication System
- Lubrication and Vibration Monitoring
- Total Productive Maintenance (TPM)
- Understanding the Cost of Lost Production
- Coker Commutation Committee

Routine Duties Matrix for Operations and Maintenance

Location	Task	Each use	Daily	Weekly	Monthly	Quarterly	Biannually	Yearly	As Needed	Operations	Maintenance
Entire Unit	Maintain pumps, motors, instruments, piping, etc.								X	X	X
	PMP for all rotating equipment										X
	Checklist unit PSVs to insure locked open							X		X	
	Maintain tool lockers , spare parts, supplies										X
Heater	Check & drain Fuel gas KO pot		X							X	
	Check & drain Pilot gas KO pot		X							X	
	Check fire box, burners, tubes, pressures, flows, etc		X							X	
	Clean Burner tips								X		X
	Blinds and or spools for decoking								X		X
	Pmp on fans and motors				X						X
Jet pump	Check lube and cooling system on pump and motor		X							X	
	Check balance line Delta-p		X							X	
	Pmp motor and Pump				X						X
	Flush suction collection strainer		X							X	
	Pull and clean suction strainer								X	X	X
	Drain jet tank cone section			X						X	
	Change out Jet pump or motor								X		X
	Change out Pacific Valve								X		X
									X		X
Blowdown	Clean btms pump suction basket									X	
	Check water/oil at pump suctions		X								X
	PMP level control systems horizontal drums				X						X
	PMP pumps in this area				X						X

Process Troubleshooting

- Immediately useful concepts and techniques for plant troubleshooting.
- This is intended to be a practical course rather than a design course.
- Nevertheless, many design issues are covered to provide the underlying understanding required for effective troubleshooting.
- The target audience is field engineers, operators, and plant troubleshooters.

Process Troubleshooting

- Distillation
- Heat Exchangers (condensers, reboilers, stab-in bundles, exchangers)
- Hydraulics
- Fired heaters
- Pumps
- Rotating machinery
- Control
- Vacuum Ejectors

Troubleshooting Logic Model

- **Observe Symptoms**
- **Categorize Symptoms**
- **Isolate the Cause**
- **Resolve the Problem**
- **Verify the Resolution**

Equipment Knowledge

Flowserve Rotary Joint

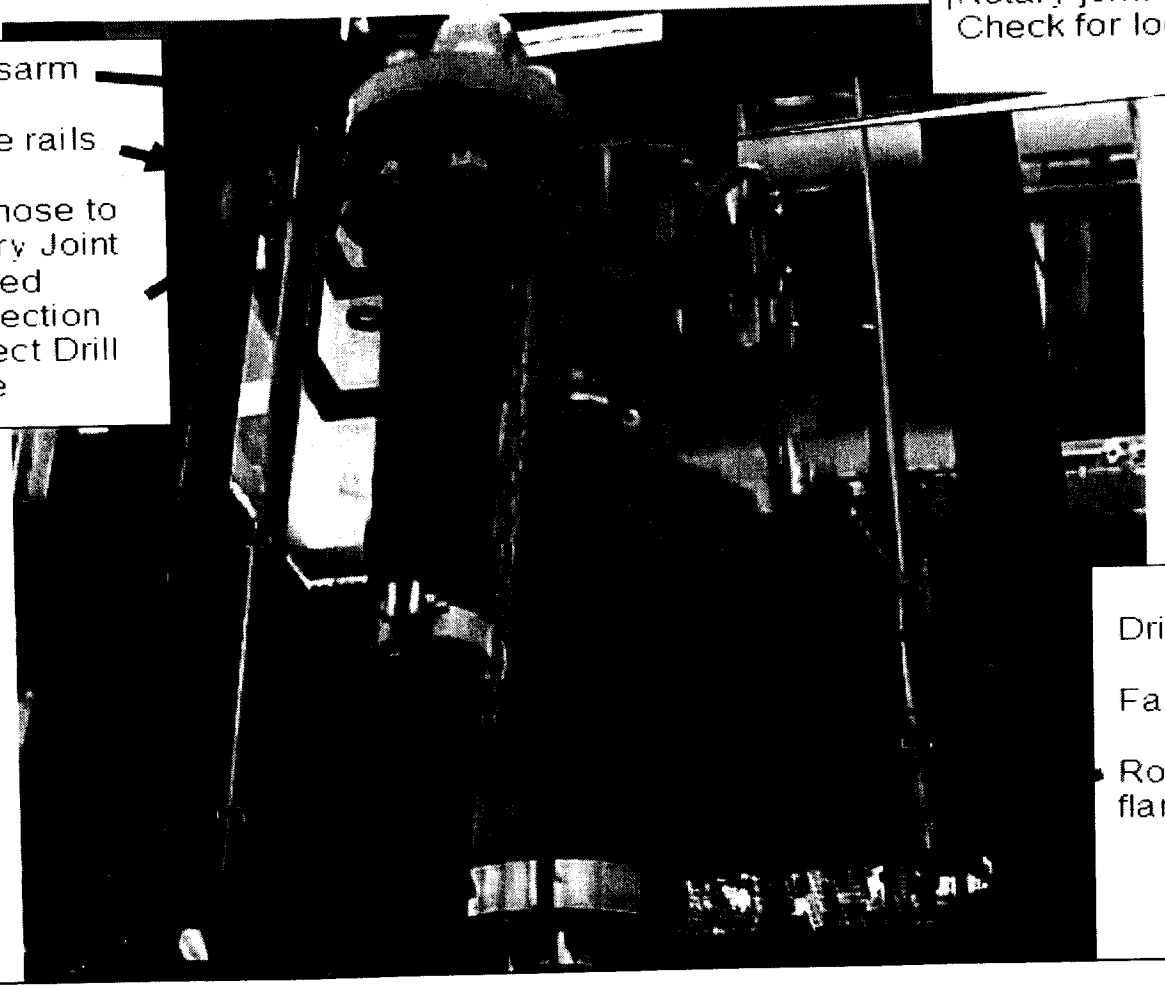
The rotary joint is designed to transmit high pressure cutting water to the combo-cutting tool
Operators have the duty to check the lubrication on the rotary joint and rotary air motor
The system also has an inline air filter and lubricator which will need to be checked and serviced
When checking the lubrication systems also visually check the cross arm mounting bolts

Rotary joint to cross arm connection
Check for loose bolts

Crossarm

Guide rails

Drill hose to Rotary Joint flanged connection
Inspect Drill Hose

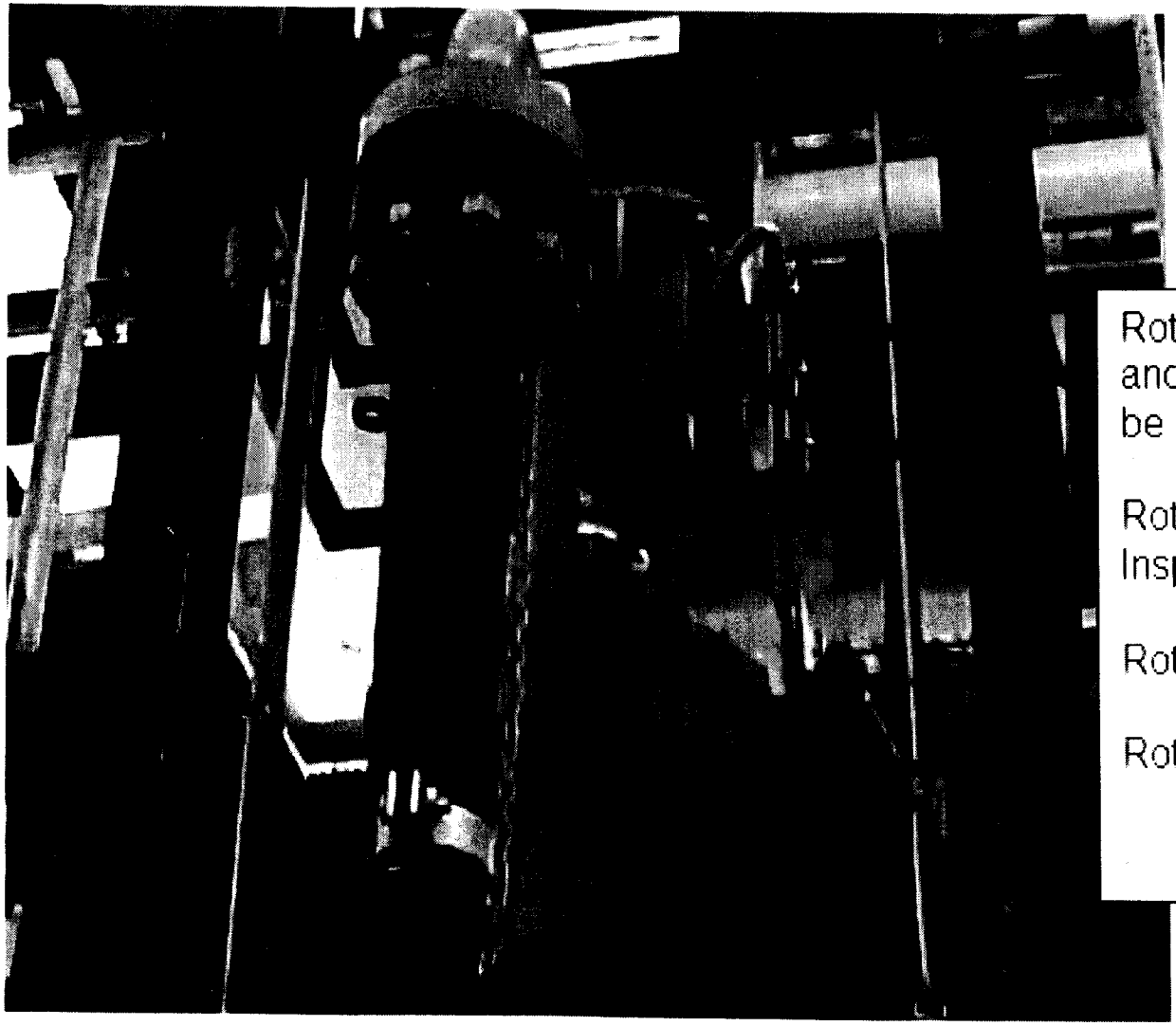


Drill hose safety chain

Fall arrestor cable

Rotary Joint to Drill Stem flanged connection

Equipment Knowledge

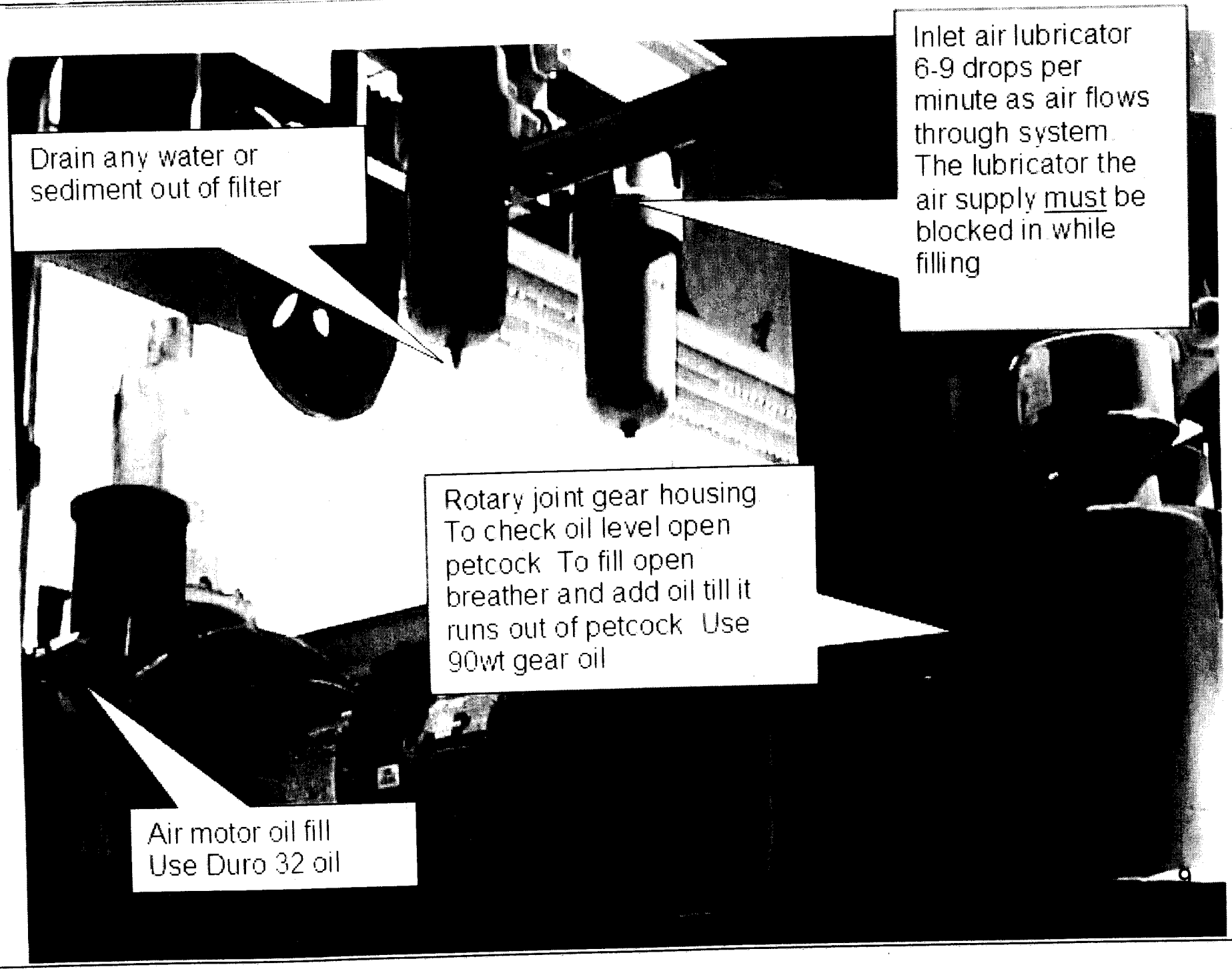


Rotary air motor inline air filter and lubricator Lubricator should be set to 6-9 drops per minute

Rotary air motor air supply Inspect Air Hose

Rotary air motor 12 5 hp

Rotary Joint gear box


Drain any water or sediment out of filter
Inlet air lubricator 6-9 drops per minute as air flows through system The lubricator the air supply must be blocked in while filling
Rotary joint gear housing To check oil level open petcock To fill open breather and add oil till it runs out of petcock Use 90wt gear oil
Air motor oil fill Use Duro 32 oil

Total Productive Maintenance (TPM):

Total Productive Maintenance is the use of operating personnel to perform:

- routine housekeeping,
- uncomplicated machinery adjustment,
- minor preventive maintenance, and
- basic troubleshooting

Outline of a proven Maintenance Practices for a Delayed Coker unit.

Maintenance:

- **Maintenance Work Guidelines**
  - **Tool and Equipment Staging**
  - **Jump Kit / Ready Boxes**
  - **Work Completion Critique**
- **Structure Work Guidelines**
- **Lock Out -Tag Out**
- **Preventive Maintenance Program and Training**
- **Reliability Centered Maintenance (RCM)**
- **Unit Spares and Inventory Control**

Coker Unit

Coke Drum BOTTOM HEAD BLADDER CHANGEOUT

The purpose of this procedure is to minimize the exposure to personnel when changing out a Coker bottom head bladder (force actuator).

To schedule this work: allow for 2 people 5 hours to prepare job.
5 people for 5 hours to do the job.
2 people for 2 hours to demob the work area.

Potential exposure sources that must be controlled are: the Coker process via the valves for the drum to be worked on, bottom head cart and hydraulics for ramp ring, lock ring, bolt lifting ring and head lifting rams as well as the proper hanging of the head halves. **A full Zero mechanical tag out** is the last page of this guideline.

NOTE: REVIEW AND USE THE STRUCTURE - WORK GUIDELINES FROM OPERATIONS PROCEDURES

A. Work Site Preparation

1. Equipment preparation can be done before drum is done being drilled. Insure we have a large enough maintenance window.

NOTE: We <u>MUST</u> have a operator assigned to work their unheading equipment at all times while this job is being preformed.

1. The new bladders (force actuator) are stored in the New Maintenance building. The bladder should be soap tested with 3 lbs of air pressure, there is a pressure regulator and valve set up in the Coker lean-to, contact our shop engineers or Forman for more information on how to do this.

B. Parts and tools needed to do this work.

	Stock numbers
new bladder	#1606515334
Safety bolts 36 each drum	#1643003229
Outer alignment bolts	#2201435001
Inner alignment bolts	#1643015330
R-57 Ring joint (**410 ss)**	#2957045517
2" slugger wrench	Portable quartz light on a short stand
2 3/8" slugger wrench	1 – 2" X 1" sling
2 3/8" socket for 1" drive & 1 1/2" drive	2 ea. Flashlights
1" male to ¾" female drive adapter	1 ea. Wire brush
2" socket for 1" drive)	1 ea. 2" combo
2 bolts to hang upper head -13 1/2" X 1"	Neverseez
Heavy support washers for bolts	2 - 18" pipe wrenches
1 5/16" combo wrench **Check this**	Penetrating oil (Penetro 90)
¾" drive impact	8lb short handled
1" drive impact	1 ea 4' x 4' x 1/2" plywood
1 1/2" drive impact	Steel wool
3 – sets of knee pads	¾ ton comealong
2 – 6' X 1" nylon slings	Inlet line jacking cart –
2 – ¾" combo wrenches	on 40' deck (check tire pressure)

C. Unit Preparation.

1. The bottom head cart movement lever should be **Caution tagged. This will identify control to be operated during procedure.**

2. Bottom head hydraulic remote station On & Off levers for main lifting rams and bolt lifting, ramp and lock ring should be **Caution tagged. This will identify control to be operated during procedure.**

3. Drum cleaned in the dome area then left with the stem and guide plate **covering Top head flange.**
4. Tugger dogged out and tagged.
5. TK valve should have the pin in the closed position; Coke drum process valves should be closed and tagged. These valves include – blowdown, overhead vapor, quench oil, anti foam, 40" isolation ball valve, and the 600# gate valve

D. Bladder change out.

1. With the bottom head on the cart remove the ramp shields (4) ¾" comb wrenches and the outer alignment pins (2) (head to drum flange) if these are bent or chewed up replace them at the end of the job.

2. Remove chute cover, bring bottom head under the drum and raise to headed up position. Use the holes where the alignment pins came out of to install the support bolts and heavy washers to secure the upper portion (cover flange) of the head.

3. Lower bolt ring and lock it in place for **personnel safety.** Also leave lift cylinders engaged. You may want to match mark the safety bolts with a paint stick so they go back in the same holes. Remove the N2 flex line that goes from the drum flange to the bladder nipple, **use great care** when working with this nipple because it is welded to the bladder and can crack easily.

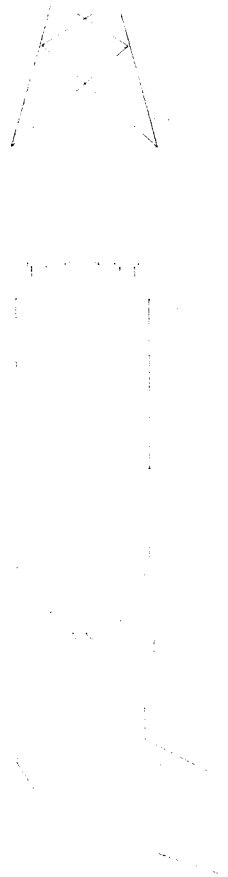
4. Remove the 36 safety bolts under the head. You may want to use the cart to lay on to remove most of the safety bolts, then remove the cart and get the last of the safety bolts out. This will allow you to separate the cover flange from the force ring.

5. Turn the chute cover under drum so that the lifting brackets are in line with the inlet line, this will be the North – South direction. Now you can lay the plywood down as a ram to roll the cart on. Take the 12" X 600# inlet line flange down to 4 studs, now you are ready to move the jacking cart under the drum and attach it to the inlet line.
   ** **NOTE** ** There is a sign on the cart that lets you know the comealong chain goes 9" from the bottom weld of the elbow.
   Remove remaining studs and lower the inlet line down with the jacking cart.
   ** **NOTE** ** **At this stage be <u>VERY</u> careful not to hit the bladder nipple when moving the inlet line out from under the drum.**

COKER EQUIPMENT PROCEDURES

STRUCTURE WORK GUIDELINES

To allow for more supervision of Area Work and Hot Work clearances, the structure has been divided into 6 working areas or zones. This procedure addresses recommended Hot Work discontinuation and zone evacuation during normal structure operating procedures. **However, as always, operators have the responsibility to error on the side of safety and evacuate their unit anytime conditions create additional safety concerns.**



Zone 1 Derricks: Defined as the area above the Top Deck roof, including the catwalks.

Zone 2 Top Deck: The area from the Cutting Deck roof down to the drum top tangents underneath the Cutting Deck.

Zone 3 Exterior Side of Drums: The area from the drum top tangents underneath the Cutting Deck down to the concrete deck above the Unheading Deck

Zone E Interior of Drums: Defined as the interior confined space entry of the Coke Drums.

Zone 4 Unheading Deck: Area between the Unheading Deck ceiling and the floor.

Zone 5 Structure below the Unheading Deck: The area immediately beneath the Unheading Deck to the ground.

A. General Guidelines

1. Every group, party or individual performing or taking part in any function on the structure shall be required to wear a radio and monitor a designated channel (usually the Coker channel.

2. Workers on the structure are required to be familiar with the structure schedule, and move out of affected areas at the designated times. Operations personnel will notify workers when work conditions change.

3. Workers who have departed the structure for extended periods (i.e. breaks, lunch) should check back in with operations before returning to work to ensure that conditions have not changed.

Structure evacuation horns are located on the Cutting Deck and Unheading Deck. The evacuation horns shall be sounded by operations to communicate the need for all non-operations personnel to depart the structure. When heard, all non-operations personnel should evacuate the structure in the most efficient means possible. Once clear of the structure area, workers must communicate with operations when they are clear and all personnel are accounted for.

Non Hot Work in Zone 3 is allowed throughout the drum cycles, unless otherwise directed by operations personnel due to abnormal conditions.

For status of Hot Work see the applicable section.

The "One Drum Away Rule" is defined as having at least one drum between the affected drum and the area where work is taking place, or a proper barrier between drums #2 and #3 during two-drum operation.

Lock Out for Coke Drum Bottom Head Work

10 Tags are needed

40' Deck

600# Gate Valve on working drum manifold, this isolates the Maze, cooling water, warm up (blowdown) and 140# steam to the Coke drum.

Isolation ball valve breaker on working drum.
Protects you from Coker Heater feed.

Tag Both Power levers on the Hydraulic panels, Main head lifting rams and bolt ring, ramp ring and lock ring, just as a caution to insure people know you are working with this system.

Top Deck

Blowdown Gate Valve on working drum.
Protects you from Coker blowdown section.

Overhead Vapor Wedge Plug Breaker.
Protects you from Coker fractionator

T K Ball Valve locking pin.
Protects you from drilling water.

Dog Tugger when stem is in drum and guide plate is down.
Keeps objects from falling in the drum.

Quench oil valve - Protects you from Quench oil system.

Anti Foam Valve - Protects you from Anti Foam system.

Lock out for Coker Heater Decoke and Pigging

21 Tags and 2 locks & cables are needed

Tag at each coil loop (4) on the Heater you are Decoking

Flow coil Block Valve

Flow coil Bypass Block Valve - 12 each of these

140# Emergency steam to Coil

600# Steam on 600# Steam manifold - 2 of these

Lock and Tag

Heater Isolation Valve in Pipe Rack

600# steam to Charge line

Tag

On 40' PSV oulet Block Valve for the heater that is being decoked

140# steam to PSV upstream side

600# steam at 600# steam letdown

140# steam block valves for Isolation ball valves - 2 of these

Preventive maintenance program for Coker hydraulics
30 day checklist

Date_____

==========Unheading Deck checklist==========

Power unit checklist

Oil level in sight glass	( )
Hydraulic leaks	( )
Hydraulic pump #1	
pressure reading normal 1500psi	( ) psi
no unusual noise or vibration	( )
Hydraulic pump #2	
pressure reading normal 1500psi	( ) psi
no unusual noise or vibration	( )
Return filter indicator	( ) psi
(max pressure 15psi requires filter change	
Check for leaks on pressure or return headers	( )

Hydraulic skirt lifting devices checklist

Check control valve, flow divider and pilot	( ) drum #1
Operated checks for leaks and operation	( ) drum #2
	( ) drum #3
	( ) drum #4

BOTTOM HEAD
PMP / HEAD UP INSPECTION RECORD

COKE DRUM # _____
DATE _____
JOB ORDER # _____
INSPECTED BY _____

CHECKPOINTS

1. Check drum & head flange gasket surface conditions. Note any high spots, gouging, dings, scratches. Repair any imperfections that may inhibit positive sealing of the gasket.
   Drum flange _____
   Head flange _____
2. With the head sitting on the cart, check the alignment of the bolt holes between the force ring and the head flange in three locations. This check is to be made using a special brass plug gauge. Note the following: Are the bolt holes directly in alignment? If not, how far are they out of alignment (angularly & radially)?
   A._____ B._____ C._____
3. If a misalignment is found in step 2, then measure the extended length of the two inner alignment pins. Straighten or replace bent/missing pins.
   West pin_____East pin_____
4. Count & record the number of missing and/or broken safety bolts. Replace all broken/missing bolts. Maximum allowable missing safety bolts is 3 in a 90° segment. If bolts cannot be replaced, contact Engineering.
   Total # of broken/missing safety bolts _____
   Total # replaced _____
5. Do a visual inspection of the top & bottom ramps. They should be clean and free of any burrs. Clean up as required and note any problems.

PMP for Grayloc Connector

A. Check and if required, replace damaged washers, Truarc snap rings, or retainer clips associated with the trunnion pins (2) or hinge pins

1)To replace washers, snap rings, or pins, first relieve pressure off the trunnion or pivot arm spring assembly using a " C " clamp (or clamps) . The 12" clamps are located in the 40 ft. Coker maintenance tool box.

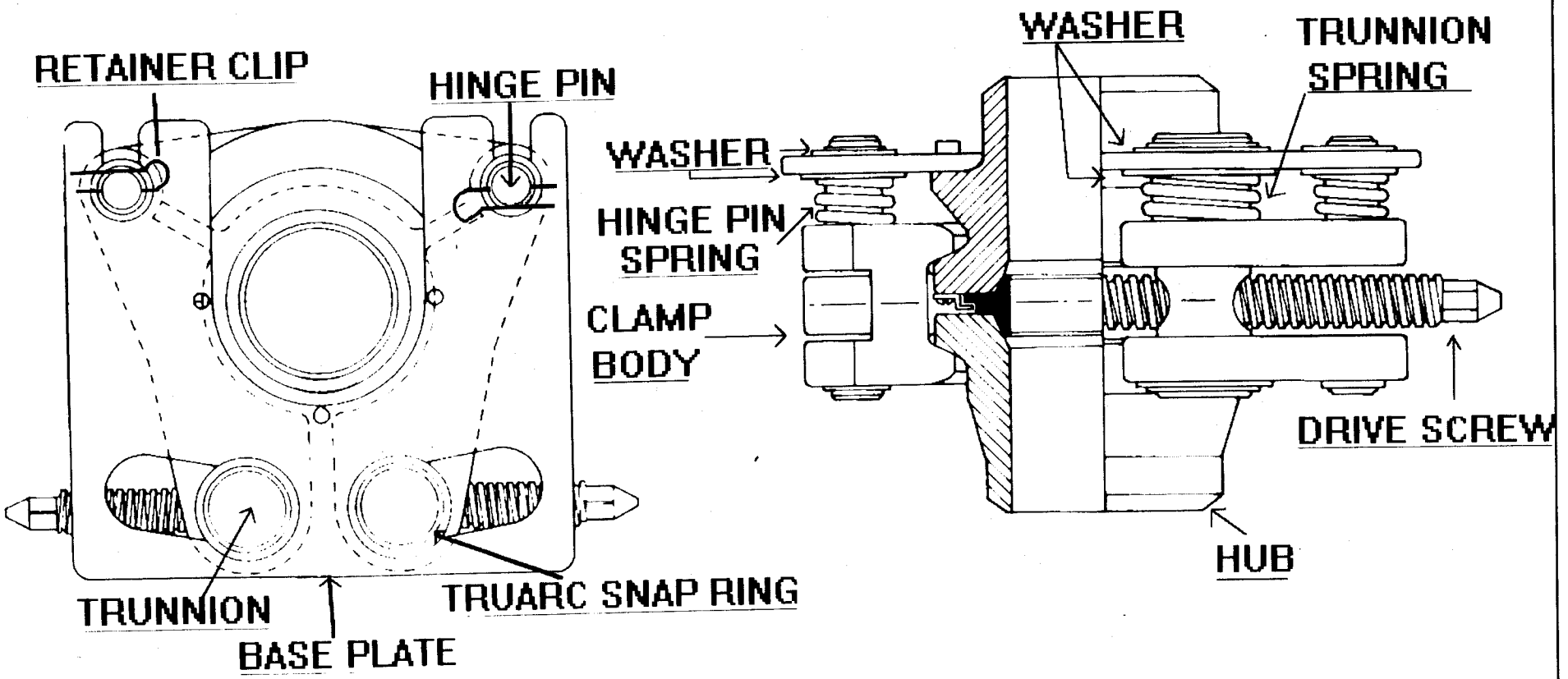
B. Grayloc Connector seal ring and hub sealing surface (ring seat) should be checked for uniformity and freedom of burrs and scratches. Clean all lubricants and foreign matter from the hub seating surfaces.

1)Remove scale, rust, burrs or minor scratches from a ring seat by lightly polishing with a crocus cloth around the seat circumference. Polish at least 1/3 of the seat circumference to insure uniform blending in of the reworked area.

2) If the seal ring requires replacement, first remove the three round head machine screws that retain the seal ring to one of the hubs.

C. Fill out Grayloc clamp PMP check off list for history input.

PMP for Grayloc Connector



Preventive Maintenance (PM):

PM is divided into two categories:

Minor PM is basic maintenance and is simply the act of performing the fundamental equipment service (lubrication, cleaning, routine adjustments, etc.) essential to assure the operation of the equipment.

- The activity is quite simple with just a few machines, adequate downtime, and sufficient funds.
- A problem begins to occur when there are a lot of machines with no organized program to schedule and control the work tasks.
- The solution is to implement a minor Preventive Maintenance program to be certain that the machinery basics are addressed in a timely and efficient manner.
- Such a program becomes the minimum requirement but does nothing to anticipate potential failures.

Preventive Maintenance (PM):
PM is divided into two categories:

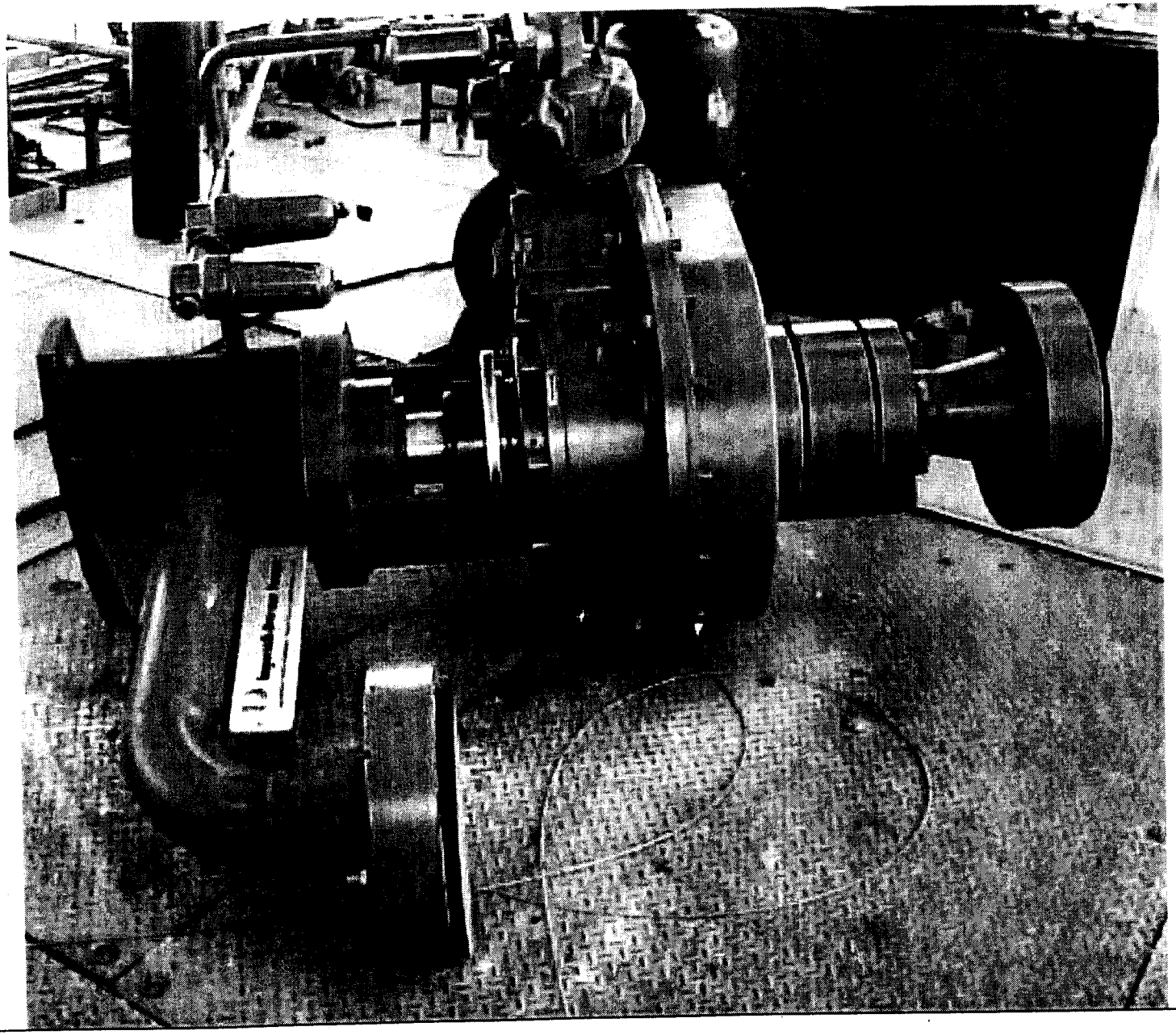
Major PM not only includes Minor PM but also begins to address potential failures. With this option, machinery is scheduled out of service so that more involved tasks can be performed.

- Based on run hours or some equivalent time factor, components such as bearings, shafts, sensors, gears, piping, etc., are replaced in anticipation of potential failure in the near future.
- The time factor is usually determined through experience and is statistical in nature.
- With this practice, it is possible to replace components that are still in good condition as well as run the risk of introducing a problem through improper maintenance.
- As a result, cost can sometimes increase without the benefit. However, both Minor and Major PM are critical to assuring equipment reliability and a combination of the two is frequently practiced.

Reliability Centered Maintenance (RCM):

RCM is a strategy for examining manufacturing assets (machinery and process) in a systematic manner to establish expectations, limitations, and priorities with the final objective of identifying for each piece of equipment the cost effective measures necessary to maintain reliable performance.

Unit Spare Parts and Storage



Maintenance Programs and Terminology

When faced with the challenge of improving maintenance, it is helpful to be aware of the existing programs and terminology that are presently in use. This article summarizes these issues.

Firefighting:

Some operations have developed through the years with very little attention given to the proper care of the machinery and company assets. Fundamentally, little to no maintenance is conducted and the machinery operates until a failure occurs. At this time, appropriate personnel are contacted to assess the situation and make the repairs as expeditiously as possible. Hence, the expression of "putting out the fires" or "firefighting" developed.

Advantages:

1. Low routine cost to support maintenance activities.
2. Low spares inventory cost.

Disadvantages:

1. Poor equipment reliability.
2. Extended equipment downtime.
3. Higher cost per repair due to inability to plan properly.
4. Potential litigation should an injury occur and/or extensive property damage and injury to others because of poor maintenance.

Where the damage to equipment is not a critical factor, plenty of downtime is available, and the values of the assets are not a concern, the firefighting mode may prove to be an acceptable option. Of course, one must consider the additional cost of making repairs on an emergency basis where soliciting bids to obtain reasonable costs may not be applicable.

Due to market competition and environmental/safety issues, the trend is toward an organized and efficient maintenance program as opposed to firefighting.

Preventive Maintenance (PM):

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of introducing a problem through improper maintenance. As a result, cost can sometimes increase without the benefit. However, both Minor and Major PM are critical to assuring equipment reliability and a combination of the two is frequently practiced.

Predictive Maintenance (PdM):

PdM is the monitoring and detection of machinery problems before they actually occur. This action costs more up front than PM because of the additional manning, tooling, and education required to establish a Predictive Maintenance program. However, it offers increased equipment reliability and sufficient advance information to improve planning, thereby reducing unexpected downtime and operating cost. Vibration monitoring, lubricant analysis, infrared thermographic surveys, motor current analysis, etc., are typical predictive techniques. These methods identify imminent bearing failures, shaft misalignment, balance problems, imminent motor failures, poor electrical terminations, etc. There are many techniques on the market with more being developed each year. A comprehensive PM and PdM program is the ultimate approach to assure machinery reliability.

Advantages:

1. Assures equipment reliability.
2. Assures maximum machinery availability.
3. Assures that assets are maintained in optimum condition at maximum value.
4. The cost of spare parts inventory can be reduced in some cases because of the ability to forecast failures sufficiently in advance to secure parts on an as needed basis.
5. Can be used to assist in troubleshooting complex rotor dynamics issues.
6. Evaluate the quality of equipment prior to purchase.
7. Assures the quality of new equipment installation.
8. Assures the quality of equipment repairs.
9. Evaluate the condition of used machinery prior to purchase
10. Minimizes the potential for litigation due to equipment failure

Disadvantages:

1. The cost of supporting a PdM program is signification but hopefully offset by the advantages.
2. The quality of PdM service is not assured. Many companies with in-house programs do not obtain the full benefit of PdM due to inadequate funding, training, tooling, etc PdM contractors vary considerably in capability. Being of technical nature, it is very easy for the inexperience to award contracts to firms that cannot deliver quality service.
3. Predictive Maintenance techniques do not always detect imminent failures.

Reliability Centered Maintenance (RCM):

RCM is a strategy for examining manufacturing assets (machinery and process) in a systematic manner to establish expectations, limitations, and priorities with the final objective of identifying for each piece of equipment the cost effective measures necessary to maintain reliable performance. The process tends to be matrix based and starts with the creation of an equipment list if one does not already exist. The following seven questions are then applied to each selected asset:

1. What are the functions and associated performance standards of the asset in its present operating context?
2. In what ways does the asset fail to fulfill its functions?
3. What causes each functional failure?
4. What happens when each failure occurs?
5. In what way does each failure matter?
6. What can be done to prevent each failure?
7. What should be done if a suitable preventive task cannot be found?

In short, RCM takes an overall view of the entire scenario (machinery and process) and through a series of deliberate questions, obtains answers down to a detailed level. Once it is determined exactly what must be monitored, why, and how frequently, a decision is made as to the most appropriate monitoring technique. This monitoring technique may well fall into the realm of Predictive Maintenance (PdM). It can be simple (listen, smell, etc.) or more complex (vibration, oil analysis, infrared thermography, etc.). Although RCM references PdM techniques, it does not address detail in this field. Instead, RCM is a method to govern the application of Predictive Maintenance. In other words, PdM is where "the rubber meets the road."

The precise moment that the concept of RCM started may not be entirely clear. However, the roots trace to frustrations encountered with aircraft failures. Specifically, some failures could simply not be controlled through Preventive Maintenance (PM) techniques, fostering the development of alternative approaches. By the late 1950's, the size and complexity of the commercial airline fleet had grown significantly, further compounding the task. By 1960, the U.S. Government had become rather serious about the issue and promoted the formation of a task force consisting of representatives from both the Federal Aviation Administration and the airlines to investigate the capabilities and limitations of PM. The result of this effort was the establishment of the FAA/Industry Reliability Program. The task force developed a propulsion system reliability program and each airline, in turn, developed reliability programs in specific areas of maintenance. According to John Moubray in his book entitled *Reliability Centered Maintenance*, the outcome of the study revealed the following:

- Scheduled overhaul has little effect on the overall reliability of a complex item unless the item has a dominant failure mode. The study clearly showed that Preventive Maintenance alone would not always guarantee reliability.
- There are many items for which there is no effective form of scheduled maintenance.

In the early 1970's, the U.S. Government requested United Airlines to issue a report on the methods employed by civil aviation to prepare maintenance programs for aircraft. The title of this report was *Reliability Centered Maintenance*. Hence, at this point, the expression seemed to be fully recognized and accepted.

Reliability Based Maintenance (RBM):

RBM is a maintenance strategy based on integrating the benefits of Preventive Maintenance (PM), Predictive Maintenance (PdM), and Proactive Maintenance in a manner that eliminates machinery failures, thereby assuring that the maintenance effort produces *capacity* rather than being a burden. The intent is to redirect maintenance from being considered a "necessary evil" to being productive and a positive asset to the operation. RBM is a trademarked expression attributable to Forrest Pardue at Computational Systems, Inc (CSI). As with RCM, the initial use of the RBM expression seems to be a bit nebulous. However, the overall objective is similar to RCM, but with a definite focus on the manufacturing sector.

The expressions RCM and RBM tend to be used loosely and are frequently interchanged. It is the author's opinion that RCM favors a broader perspective by addressing a specific questioning process that sets the stage for further action. Both approaches lead to condition monitoring as the end result. Without PdM neither approach would be successful. Hence, PdM is the common denominator.

RCM versus RBM:

As a rule, with large complex operations, the initial application of RCM provides superb guidance as to where to place the effort and funding. With simpler operations, RCM may not be required and the direct application of Reliability Based Maintenance (RBM) and PdM is sufficient. Namely, a quicker and better return on investment can be achieved by eliminating the RCM step. For example, a very large oil refinery with thousands of employees would clearly benefit from RCM to bring the proper focus to the project. The additional cost of RCM for a small plant of a hundred employees or so would probably not be justified. The reason is that, with just a few personnel, the necessary information to make the right decisions is more easily available and RCM would tend to complicate the issue. Certainly, it makes good business sense to keep the use of Consultants to a minimum. Either way, a disciplined approach to surveying the situation is prudent.

Condition Based Maintenance (CBM):

Condition Based Maintenance is the practice of performing machinery maintenance based on the results of measurements taken to monitor the health of the machine. This approach is contrary to the pure Preventive Maintenance approach of dismantling the machine and replacing parts based on operating hours alone. Predictive Maintenance (PdM) techniques are employed in this approach.

Proactive Maintenance:

Proactive Maintenance is the practice of applying all available maintenance technologies in a prudent manner to assure advance notice and control over the machinery to maximize reliability and minimize cost.

Total Productive Maintenance (TPM):

Total Productive Maintenance is the use of production and operating personnel to perform routine housekeeping, uncomplicated machinery adjustment, minor preventive maintenance, and basic troubleshooting. The objective is to shift the burden of routine maintenance from a limited number of costly, highly trained technicians to the individuals most closely aligned to the daily operation of the equipment. With proper training and a receptive attitude, the approach is successful and yields a good return on investment. It is not a substitute for professional maintenance. Due to firmly entrenched workplace attitudes, it often challenging to convert an organization to TPM. A far better approach is to establish TPM during startup of a new facility.

Terminology provided by SpectraQuest who provides vibration related PdM consulting services to assess facility condition and implement PM practices and training.