DESIGN, MANUFACTURING, SUPPLY, INSTALLATION SUPERVISION, COMMISSIONING, STARTUP & PERFORMANCE TESTING OF NEW CENTRIFUGAL COMPRESSORS AND MODIFICATIONS OF EXISTING TURBO COMPRESSORS TRAINS

Tender No. PROC-FC/CB/PROJ/QADIRPUR-4261/2019 PRE-BID CLARIFICATION No. OGDCL-QP-4261-005



Sr. No.	Bidder Query	OGDCL Response (25-03-2019)
AA	Following information's are still needed after site visit (13-03-2019)	
i	A detailed drawing of the gas turbine rotor and shaft end	Not available with OGDCL. Successful Bidder to corrdinate with Turbine OEM during detailed engineering phase as already mentioned in the tender.
ii	A torsional analysis of the gas turbine rotor after planned upgrade	Upgrade activity is under contract signing between Turbine OEM and OGDCL. However, any such information, Bidder may ask directly from the OEM (SOLAR contact person already nominated) as OGDCL already asked SOLAR to provide relevant
iii	If possible more information's about the planned upgrade on the SOLAR gas turbine	Bidder to ask specific information in this regard.
DD I	Kindly provide the clear details of existing Lube Oil Systemincluding Grade Category,Pressure to Compressor,Temperatue and Quantity of Lubricating Oil.	Shell Turbo T-46 is used as lube oil. P&IDs already provided in the tender also uploaded in clarification. Furthermore, please see attached document for further information.
CC	Upgraded Mars 100-16000 Engine is mentioned in Attachment-1 of Compressor Date Sheet(0220-DS-1701-0). Pleaseclarify that whether the existing Engine will be upgraded. If, it is to be upgraded, pleaseprovidethe following documents of the upgraded Gas Turbine: - Environment data of design point performance (ambient temperature, ambient humidity and barometric pressure) - Corresponding power-rotation speed curve of Gas Turbine design point performance - P&ID Diagram - Instruments details - I/O list - Shaft head size - Logic diagram - Dynamical model of Gas Turbine Rotor - General Layout Drawing with Height of Center.	Upgrade activity is under contract signing between Turbine OEM and OGDCL. However, any such information, Bidder may ask directly from the OEM (SOLAR contact person is nominated and informed through Clarification 1) as OGDCL already asked SOLAR to provide relevant data/information to all prospective bidders.

6.1 GENERAL DESCRIPTION

Refer to the Lube Oil System Schematic (149291) when reading this section.

The lube oil system includes the lubricating oil system and the serve oil system.

The lube oil system includes the lubricating oil system and the serve oil system. The systems serve a distinct and separate function, and they are fundamentally The systems Both systems are supplied oil from the main lube oil reservoir, and interrelated. Both systems are supplied oil from the main lube oil reservoir, and interrelated. supplied both utilize certain common components.

The lubricating oil system provides oil for the engine, accessory gearbox, gear unit, and driven equipment bearings.

The servo oil system generates high pressure servo oil flow to operate the The servo on now to operate the electrohydraulic fuel control actuator, servo valves, and actuators for the engine electronyuland, servo valves, and combustor bleed valve and the variable inlet guide vanes.

_{6.1.1} Petroleum Lubricating Oil

The selection of a qualified lubricating oil ensures the proper lubrication and long The selection and components. Petroleum lubricating oil, ISO VG 46 (S215), is the oil to be used for your installation. Petroleum lubricating oil is used for normal operating service in the turbine engine and accessories, the output drive assembly, operating and the driven equipment. Refer to Solar Specification ES 9-224 for other qualified oils which may be used for your installation.

!\ CAUTION

Before changing from one lubricating oil type to another, contact Solar Turbines Customer Services.

Petroleum oil consists of refined paraffinic petroleum oil with suitable additives to meet the physical and chemical requirements in Table 6.1.1. Petroleum oil shall not contain additives that are degradable below 284°F (140°C), or are water-separable. Additives shall remain uniformly distributed throughout the oil at all temperatures above the pour point up to 284°F (140°C). ISO VG 46 (S215) oil is suitable for use in cold to moderate climates. Pour point of the oil shall be 11°F (6°C) below ambient temperature.

NOTE

Petroleum lubricating oil is suitable for preservation of the engine and components for a period of up to 90 days. Contact Solar Turbines Customer Services for special instructions for preservation if storage, shipping, or down-time longer than 90 days is expected.

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Petroleum oil operating temperature limits of 26°F to 110°F (-3°C to 43°C) um oil operature limits of 26°F to 110°F (-3°C to 43°C)

Ambient air temperature limits into engine of 100°C

Ambient air temperature limits into engine of 125°F to 180°F (52°C b)

	82°C). Table 6.1.1 Petroleum Oil Physical and Chemica ITEM	ISO VC 46 M OF
ASTM	Viscosity at 104°F (40°C) SSU (cSt - mm²/s) Max	1 = 5 (00.6)
STD	Viscosity at 104°F (40°C) SSU (cSt - mm²/s) Mi	n 46.0 (6.04)
D445		390 (199)
D445	- · · · · · · · · · · · · · · · · · · ·	450 (232)
D92	Point COC, I	+15 (-9.5)
D92	Pour Point, °F (°C) Max	Class 1b
D97	Pour Point, °F (°C) Max Copper Corrosion at 212 °F (100°C), 3 hours Copper Corrosion at 212 °F (100°C), 3 hours	0.20
D130	dealization (Total Acid) 1403	Pass
D664	Rust Prevention, Procedure B	rass
D665 D892	Foam Limits, Millimeters Wax Sequence 1 Sequence 2	25/0 50/0 25/0
D943	Sequence 3 Oxidation Resistance, Min No. of Hours to 2.0 Neutralization Number	2000
D1298	Specific Gravity, 60/60°F (15/15°C)	0.86-0.88
D1401	Emulsion Test	40-40-0 (60)
D2788	Zinc, Weight %, Max	0.005
D1744	Water, Weight, Parts Per Million, Max	200 (0.02 wt. %)
D1947	Load Carrying Capacity, lb/in., Min	1000
D2155	Auto Ignition Temperature °F (°C) Min	590 (310)
D2266	Wear Preventative Characteristic, Scar Diameter, Millimeters max (167°F [75°C] 1200rpm, 88.1 lb [40kg], 1 hour)	0.90
02270	Viscosity Index, Min	90
	Sediment Volume % Max	0.005

NOTES:

(1) Viscosity Grade per ASTM Standard D2422

CAUTION

Solar equipment is not intended to operate above Solar equipment operating oil temperature limits into

The oil selected must have a pour point at least 11°F (6°C) below the minimum temperature to ensure flow at startup. Before engine etc. The oil selected must be resure flow at startup. Before engine startup, oil subject in the entire lubrication system shall be at least 11°F (6°C) at ambient or at the last of ambient temperature in the entire lubrication system shall be at least 11°F (6°C) above the temperature in Suitable heaters and auxiliary pumps may be used to ensure the starture of the star amble the system prior to startup.

amble at least 11°F (6°C) above the temperature in the Suitable heaters and auxiliary pumps may be used to ensure proper oil pour point. Suitable prior to startup. oil pour point the system prior to startup.

NOTE

The maximum startup viscosity is 375 SSU (80 mm²/s, or cSt). This is equivalent to grade S150 (C32) at 32°F (0°C).

6.1.3 Oil Service Life

NOTE

Analyze oil samples of new oil, before use. The results of the analysis can then be used as a basis for comparison in determining oil degradation during service life.

The service life of oil is limited by a viscosity change, an increase in Total Acid Number, or by the presence of water. Check the oil on a regular basis (once a month) for contamination and degradation. Degradation varies with each application. Actual limits must be determined by customer experience. The oil must be drained and replaced whenever any of the following criteria is met:

- Viscosity increases by 20%
- Viscosity decreases by 10% \
- Total Acid Number is 0.4 or greater
- Water content is 2000 parts per million or greater

6.2 FUNCTIONAL DESCRIPTION 6.2 FUNCTIONAL DESCRIPTION of the lube oil system. To follow is a functional description of the lube oil system. To follow the description or to determine prescribed limits or values in the follow the description or to the Lube Oil System Schematic (149291). The following is a functional description of the following of the description or to determine prescribed limits or values in the following with the description or to determine System Schematic (149291). To follow the following system. To follow along the following system.

6.2.1 General Lube Oil Flow

6.2.1 General Lube Oil 1.5.

The lube oil system provides oil delivered by the Main Lube Oil Pump Months (BP901-1, BP901-2) to the lube oil manifold. The oil is maintained to the lube Oil Pressure On the lube Oil Pressure Oil Pressur The lube oil system provides oil delivered in manifold. The oil is maintained to the Guide V. Assemblies (BP901-1, BP901-2) to the lube oil manifold. The oil is maintained to the Guide V. Tool V. It is supplied by the servo oil system to the Guide V. It is supplied by the servo oil system to the Guide V. It is supplied by the servo oil system to the servo oil system to the servo oil system to the servo oi The lube oil system. BP901-2) to the lube Oil Pressure is maintained a nominal engine inlet pressure by the Main Lube Oil Pressure Control Valve Control Actuator (L338), and fuel actuator (Date of the Control Valve Control Actuator (L338), and fuel actuator (Date of the Control Actuator (L338). Assemblies (Brook), anominal engine inlet pressure by the servo oil system to the Guide Vane Control Valve (PCV901). Oil pressure is supplied by the servo oil system to the Guide Vane Control Valve (PCV901), Bleed Valve Control Actuator (L338), and fuel actuator, causing of the control Actuator (L339), Bleed Valve Control Actuator (L338), and fuel actuator, causing of the control Actuator (L339), Bleed Valve Control Actuator (L338), and fuel actuator, causing of the control Actuator (L339), Bleed Valve Control Actuator (L338), and fuel actuator, causing of the control Actuator (L339), Bleed Valve Control Actuator (L338), and fuel actuator, causing of the control Actuator (L338), and fuel actuator, causing of the control Actuator (L338), and fuel actuator, causing of the control Actuator (L338), and fuel actuator, causing of the control Actuator (L338), and fuel actuator, causing of the control Actuator (L338), and fuel actuator, causing of the control Actuator (L338), and fuel actuator, causing of the control Actuator (L338), and fuel actuator, causing of the control Actuator (L338), and fuel actuator, causing of the control Actuator (L338), and fuel actuator, causing of the control Actuator (L338), and fuel actuator, causing of the control Actuator (L338), and fuel actuator, causing of the control Actuator (L338), and fuel actuator (L338), and fu a nominal engage of the control of t Actuator (L339), Bleed Valve Control actuator, causing the actuator pistons to move in response to electrical signals from the control system.

A small amount of oil also flows to the Air/Oil Cooler (HX901-1). The Temperature (TCV901-1) will divert most of the oil from cooler HX901-1 will divert most of the oil from cooler hx901-1 will divert most of the oil from cooler hx901-1 will divert most of the oil from cooler hx901-1 will divert most of the oil from cooler hx901-1 will divert most of the oil from cooler hx901-1 will divert most of the oil from cooler hx901-1 will divert most of the oil from cooler hx901-1 will divert most of the oil from cooler hx901-1 will divert most of the oil from cooler hx901-1 will divert most of the oil from cooler hx901-1 will divert most of the oil from cooler hx901-1 will divert most of the oil from cooler hx901-1 will divert most of the oil from cooler hx901-1 will divert most of the oil from cooler hx901-1 will divert most of the oil from cooler hx901-1 will divert most of the oil from cooler hx901-1 will divert most of the oil from cooler hx901-1 will divert most of the oil from A small amount of oil also nows to the Control Valve (TCV901-1) will divert most of the oil from cooler HX901-1 until Control Valve (TCV901-1) will divert most of the oil from cooler HX901-1 until Control Valve TCV901-1 Control Valve (TCV901-1) will diverse setting. Control valve TCV901-1 until oil temperature reaches a predetermined setting. Control valve TCV901-1 then oil temperature to supply oil to cooler HX901-1 in proportion to oil temperature. oil temperature reaches a predecedary oil temperature reaches a predecedary oil temperature reaches a predecedary oil temperature oil temperature gradually closes to supply oil to cooler HX901-1 in proportion to oil temperature gradually closes to supply oil to cooler HX901-1 in proportion to oil temperature gradually closes to supply oil to cooler HX901-1 in proportion to oil temperature gradually closes to supply oil to cooler HX901-1 in proportion to oil temperature gradually closes to supply oil to cooler HX901-1 in proportion to oil temperature gradually closes to supply oil to cooler HX901-1 in proportion to oil temperature gradually closes to supply oil to cooler HX901-1 in proportion to oil temperature gradually closes to supply oil to cooler HX901-1 in proportion to oil temperature gradually closes to supply oil to cooler HX901-1 in proportion to oil temperature gradually closes to supply oil to cooler HX901-1 in proportion to oil temperature gradually closes to supply oil to cooler HX901-1 in proportion to oil temperature gradually closes to supply oil to cooler HX901-1 in proportion to oil temperature gradually closes to supply oil to cooler HX901-1 in proportion to oil temperature gradually closes to supply oil to cooler HX901-1 in proportion to oil temperature gradually closes to supply oil to cooler HX901-1 in proportion to oil temperature gradually closes to supply oil to cooler HX901-1 in proportion to oil temperature gradually closes to supply oil to cooler HX901-1 in proportion to oil temperature gradually closes to supply oil to cooler HX901-1 in proportion to oil temperature gradually closes to supply oil to cooler HX901-1 in proportion to oil temperature gradually closes to supply oil to cooler HX901-1 in proportion to oil temperature gradually closes to supply oil to cooler HX901-1 in proportion to oil temperature gradually closes to supply oil to cooler HX901-1 in proportion gradually closes to supply oil to cooler HX901-1 in proportion gradually closes to supply oil to cooler HX901-1 in gradually closes to supply on to cooler HX901-1, oil flows through the Main Lube Oil Filters (FS901-1, From oil cooler HX901-1, manifold, then through various branch lines to supply manifold. From oil cooler HX901-1, on house through various branch lines to points of lubrication.

6.2.2 Lube Oil Pump Checks

NOTE

In the following two paragraphs, the selected Main Lube Oil Pump/Motor Assembly (BP901-1 or BP901-2), is the pump which has been selected on the control console. While the standby Main Lube Oil Pump/Motor Assembly (BP901-1 or BP901-2) is the other pump.

Therefore, in the following paragraphs, we will assume that pump/motor assembly BP901-1 is the selected pump/ motor assembly and that pump/motor assembly BP901-2 is the standby pump/motor assembly.

When the start cycle begins, the control system tests the Postlube Backup Lube 01 Pump (MP903) (Figure 6.2.1). If the pump MP903 pressure reaches 8 psi (55.1 kPa) the control system deactivates the pump MP903. When the pressure decreases by 1 psi (6.89 kPa), standby pump/motor assembly BP901-2 is energized.

If the standby pump/motor assembly BP901-2 pressure reaches 8 psi (55.1 kPa) the control system docation assembly BP901-2 when the control system deactivates the standby pump/motor assembly BP901-2. When the pressure decreases by 1 1 2 (20 Standby pump/motor assembly BP901-1) the pressure decreases by 1 psi (6.89 kPa), selected pump/motor assembly BP901-1 is energized. If the selected pump/motor assembly BP901-1 is energized. If the selected pump/motor assembly BP901-1 pressure reaches 8 ps (55.1 kPa), the control system. (55.1 kPa), the control system allows the engine prelube cycle to begin.

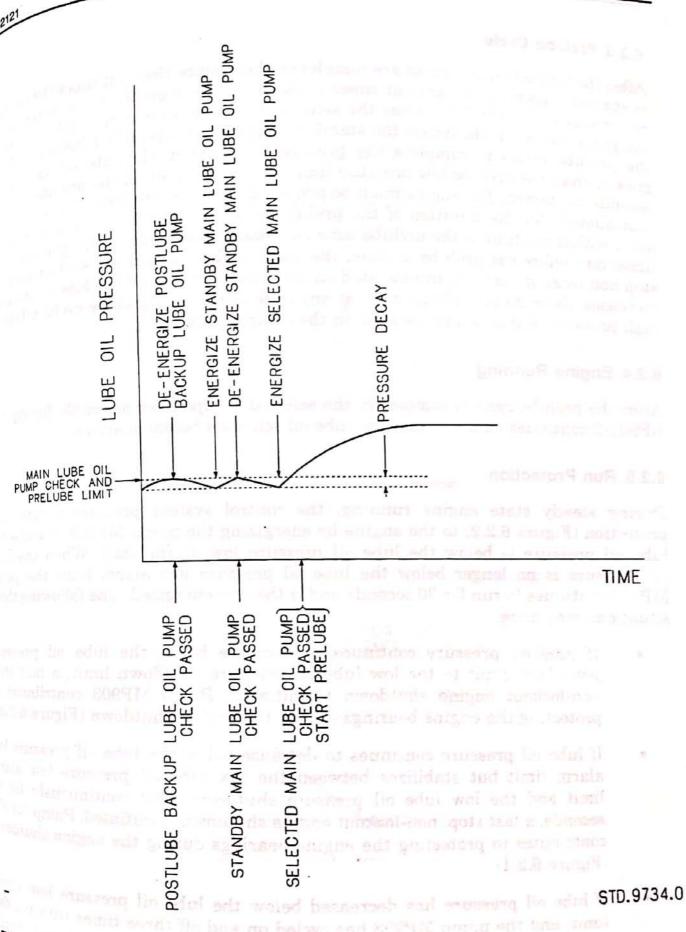


Figure 6.2.1 Postlube Backup Lube Oil Pump and Selected and Standby Main Lube Oil Pump Check

SECTION 9

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6.2.3 Prelube Cycle

6.2.3 Prelube Cycle

After the lube oil pump checks are completed, the prelube time out timer (10 second).

After the lube oil pump checks are completed, the prelube time out timer is the allowable time for the selected pump/motor assembly second. The prelube time out timer is the allowable time for the selected pump/motor assembly BPQ01-1 (unless the selected pump/motor assembly BPQ01-1). After the lube oil pump checks are completed, the produce time out timer (10 second) after the lube oil pump time out timer is the allowable time for the selected pump/motor assembly BP901-1 (unless the selected pump/motor assembly BP901-1 (unless the standby pump/motor assembly BP901-1 tall be assembled by BP901-1 tall by BP901-1 tall be assembled by BP901-1 tall by B After the lube oil pump time out timer is the difference of the selected pump/motor assembly appeared is started. The prelube time out timer is the difference of the selected pump/motor assembly appeared by a started. The prelube time out timer is the difference of the selected pump/motor assembly appeared by appeared by a started. The prelube cycle. When the lube oil perfect of a perfect of After the distance of the present of motor assembly Brook case the standard production of the pump check, in which case the prelube cycle. When the lube oil perform the pump check, in which case the prelube cycle to complete the prelube cycle) to complete the prelube of 8 psi (55.1 kPa), the prelube oil pressure the prelube low pressure limit of 8 psi (55.1 kPa), the prelube the prelube at a pressure above 8 prelube time than the prelube cycle. the pump check, in the pressure limit of 8 psi (55.1 kPa), the pressure limit of 8 psi (55.1 kPa), the pressure limit of 8 psi (55.1 kPa), the pressure in pressure above 8 psi (55.1 kPa). The engine must be presubed at a pressure above 8 psi (55.1 kPa) is started. The engine must be presubed timer (5 seconds). This the prelube cycle, the prelube low pressure in the prelube at a pressure above 8 psi (55.1kp.) greater than the prelube low pressure must be prelubed at a pressure above 8 psi (55.1kp.) seconds) is started. The engine must be prelube timer (5 seconds). This psi (55.1kp.) seconds) is started. The prelube time out timer (10 seconds). If the prelube time out timer (10 seconds). greater than the process of the prelube timer (5 seconds). This prelube times (5 seconds) is started. The engine must be processed to be prelube times (10 seconds). This prelube times continuously for the duration of the prelube time out timer (10 seconds). If the prelube times the prelube times of the prelube times done, the start is aborted and a probable times the prelube times of the prelube times the prelube times of the prelube times seconds) is started duration of the production o continuously for continuously for the prelube time of the prelube time occur within the time of the prelube is done, the start is aborted and a prelube failed times out before the prelube is done, the control console. If the lube failed fai occur within the prelube is done, the control console. If the lube failed failed times out before the prelube annunciated on the control console. If the lube oil pressure stop non-lockout alarm is annunciated any time during the prelube cycle, a lube the control console stop non-lockout alarm is annunciated on the during the prelube oil presente stop non-lockout alarm is annunciated on the control console. high-pressure alarm is annunciated on the control console.

6.2.4 Engine Running

After the prelube cycle is completed, the selected pump/motor assembly BP901-1 or BP901-2 continues running, and the lube oil schedule becomes active.

6.2.5 Run Protection

During steady state engine running, the control system provides normal run protection (Figure 6.2.2) to the engine by energizing the pump MP903 anytime the lube oil pressure is below the lube oil pressure low alarm limit. When the lube oil pressure is no longer below the lube oil pressure low alarm limit the pump MP903 continues to run for 30 seconds and is then de-energized. The following three situations may arise:

- If lube oil pressure continues to decrease below the lube oil pressure low alarm limit to the low lube oil pressure shutdown limit, a fast stop. non-lockout engine shutdown is initiated. Pump MP903 contributes to protecting the engine bearings during the engine shutdown (Figure 6.23).
- If lube oil pressure continues to decrease below the lube oil pressure lo alarm limit but stabilizes between the low lube oil pressure low alan limit and the low lube oil pressure shutdown limit continuously for f seconds, a fast stop, non-lockout engine shutdown is initiated. Pump MP9 contributes to protecting the engine bearings during the engine shutdon (Figure 6.2.4).
- If lube oil pressure has decreased below the lube oil pressure low als limit, and the pump MP903 has cycled on and off three times within a minute period, a fast stop, non-lockout engine shutdown is initiated. Pu MP903 contributes to protecting the engine bearings during the en shutdown (Figure 6.2.5).

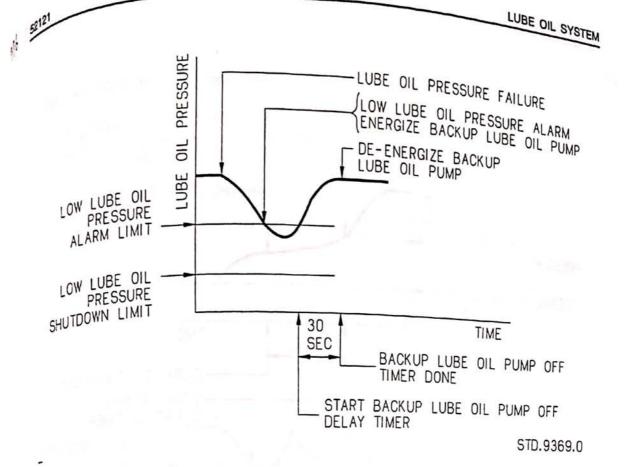
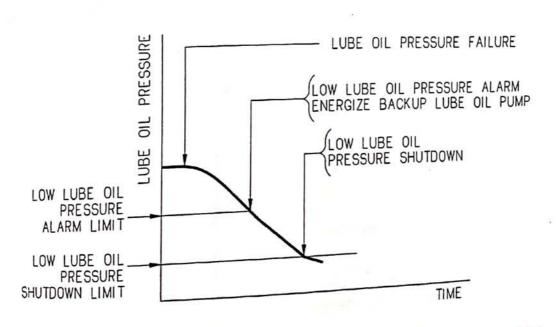


Figure 6.2.2 Run Protection - Normal



STD.9370.0

Figure 6.2.3 Run Protection - Lube Oil Pressure Below Shutdown Limit

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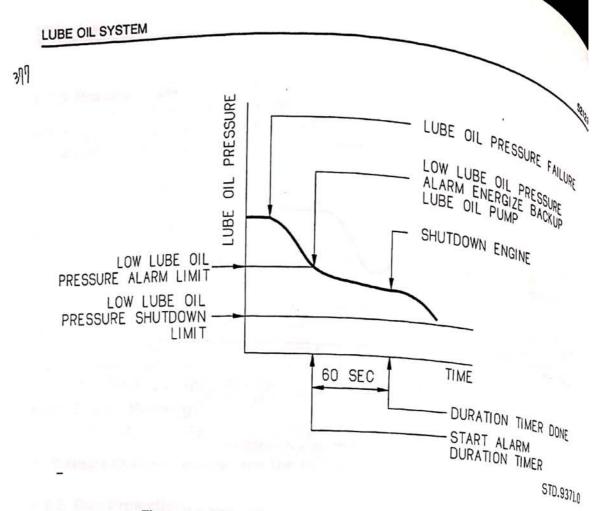


Figure 6.2.4 Run Protection - Lube Oil Pressure Stabilized Low

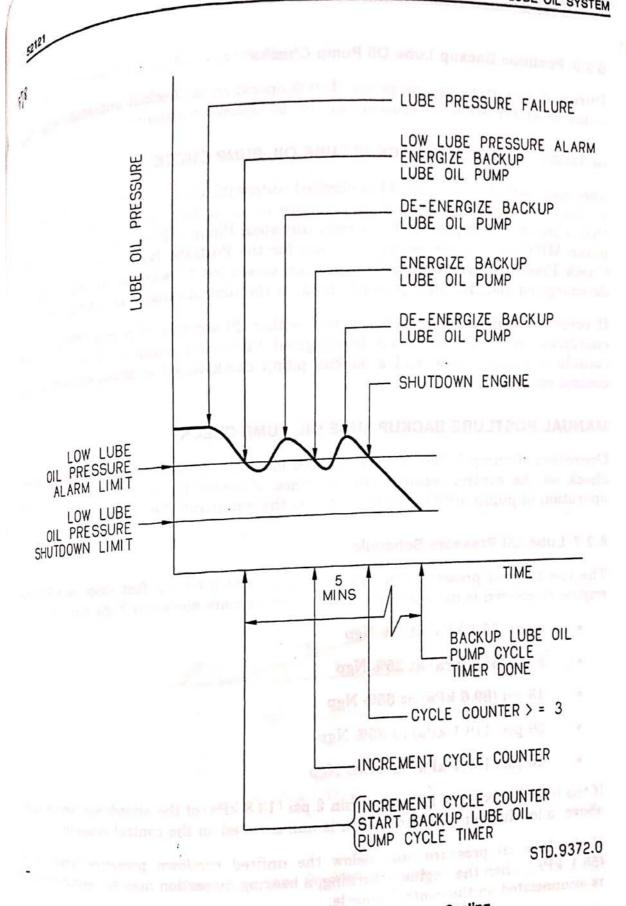


Figure 6.2.5 Run Protection - Lube Oil Pressure Cycling

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6.2.6 Postlube Backup Lube Oil Pump Checks 6.2.6 Postlube Backup Lubb MP903 operation is checked automatically. During engine running, the pump MP903 operation can also be checked manually. During engine running, operation can also be checked manually. During engine running, the pump also be checked manually, pump assembly MP903 operation can also be checked manually. AUTOMATIC POSTLUBE BACKUP LUBE OIL PUMP CHECK

AUTOMATIC POSILUDE MP903 is checked automatically each 24 hours, Every deposition of pump MP903 is annunciated on the control console, Every deposition of pump check is annunciated. Pump MP903 is encertified to the control console, indicate the control pump MP903 has been initiated. Pump MP903 is encertified to the control console, indicate the control pump MP903 is encertified to the control console, indicate the control pump MP903 is encertified to the control console, indicate the control console and the control contr The operation of pump MP903 is check is annunciated on the control console, indicated at 12:00 pm, a backup pump check is annunciated. Pump MP903 is energized at 12:00 pm, a backup pump MP903 has been initiated. Pump MP903 is energized where the control console in the control control console in the control The operation of pump check is an initiated. Pump MP903 is energized what a check of pump MP903 has been initiated. Pump MP903 is energized what a check of pump MP903 has made enough pressure for the Postlube Backup Lube Oil pump MP903 has made enough pressure for the Postlube Backup Lube Oil pump MP903 has made enough pressure for the Postlube Backup Lube Oil pump MP903 has made enough pressure for the Postlube Backup Lube Oil pump MP903 has made enough pressure for the Postlube Backup Lube Oil pump MP903 has made enough pressure for the Postlube Backup Lube Oil pump MP903 has made enough pressure for the Postlube Backup Lube Oil pump MP903 has made enough pressure for the Postlube Backup Lube Oil pump MP903 has made enough pressure for the Postlube Backup Lube Oil pump MP903 has made enough pressure for the Postlube Backup Lube Oil pump MP903 has made enough pressure for the Postlube Backup Lube Oil pump MP903 has made enough pressure for the Postlube Backup Lube Oil pump MP903 has made enough pressure for the Postlube Backup Lube Oil pump MP903 has made enough pressure for the Postlube Backup Lube Oil pump MP903 has made enough pressure for the Postlube Backup Lube Oil pump MP903 has made enough pressure for the Postlube Backup Lube Oil pump MP903 has made enough pressure for the Postlube Backup Lube Oil pump MP903 has made enough pressure for the Postlube Backup Lube Oil pump MP903 has made enough pressure for the Postlube Oil pump MP903 has made enough pressure for the Postlube Oil pump MP903 has made enough pressure for the Postlube Oil pump MP903 has made enough pressure for the Postlube Oil pump MP903 has made enough pressure for the Postlube Oil pump MP903 has made enough pressure for the Postlube Oil pump MP903 has made enough pressure for the Postlube Oil pump MP903 has made enough pressure for the Postlube Oil pump MP903 has made enough pressure for the Postlube Oil pump MP903 has made enough pressure for the Postlube Oil pump MP903 has made enough pressure for the Postlube Oil pump MP903 has made e at 12:00 pm, a back of pump MP903 has been for the Postlube Backup Lube Oil Pump MP903 has made enough pressure for the Postlube Backup Lube Oil Pump MP903 has made enough pressure for the Postlube Backup Lube Oil Pump pump MP903 has made enough pressure Switch (S322-5) to remain closed for 10 seconds, pump MP903 pump pump check on the control console is an appropriate that the control console is a superposition. that a check of P made enough pressure in closed for 10 seconds, pump Mp903 has made enough pressure Switch (S322-5) to remain closed for 10 seconds, pump Mp903 in Check Pressure Switch (S322-5) to remain closed for 10 seconds, pump Mp903 in Check pressure and the backup pump check on the control console is extinguished in check pressure and the backup pump check on the control console is extinguished in check pressure and the backup pump check on the control console is extinguished in check pressure and the backup pump check on the control console is extinguished. pump Mrs Switch (S322-b) to reach on the control console is extinguished de-energized and the backup pump check on the control console is extinguished

de-energized and de-energized within 20 seconds of pump MP903 being If pressure switch S322-5 is not closed within 20 seconds of pump MP903 being the pump MP903 is de-energized; the backup pump check on the carry If pressure switch S322-5 is not elected; the backup pump check on the control energized, then: pump MP903 is de-energized; the backup pump check failed is annunciated energized. energized, then: pump MP903 is deckup pump check failed is annunciated on the control console is extinguished; and a backup pump check failed is annunciated on the control console.

MANUAL POSTLUBE BACKUP LUBE OIL PUMP CHECK

Operation of pump MP903 can be checked manually by selecting the backup pump Operation of pump 1917 505 can be sequence of events for manually checking the check on the control console. The sequence of events for manually checking the operation of pump MP903 are the same as the automatic check above.

6.2.7 Lube Oil Pressure Schedule

The low lube oil pressure shutdown limits, at which time a fast stop, non-lockout engine shutdown is initiated, are listed below and are shown in Figure 6.2.6.

- 8 psi (55.1 kPa) at 0% Ngp
- 8 psi (55.1 kPa) at 25% Ngp
- 13 psi (89.6 kPa) at 65% Ngp
- 26 psi (179.1 kPa) at 85% Ngp
- 26 psi (179.1 kPa) at 110% Ngp

If the lube oil pressure falls to within 2 psi (13.8 kPa) of the shutdown limits listed above, a low lube oil pressure alarm is annunciated on the control console.

If the lube oil pressure falls below the unfired rundown pressure limit, 8 psi (55.1 kPa) when the craim of the control of the (55.1 kPa), when the engine is turning, a bearing inspection may be required alarm is appropriated on the control of the contr is annunciated on the control console.

The high lube oil pressure alarm limit, at which time a lube oil high-pressure limit alarm is annunciated on the control alarm is annunciated on the control console, is as follows:

25 psi (172.25 kPa) at 0% Ngp

 $_{
m 45~psi}$ (310.05 kPa) at 30% Ngp

45 psi (310.05 kPa) at 110% Ngp

There is a running region above 68.1 percent Ngp that allows a lower pressure of there is a running region above 68.1 percent Ngp that allows a lower pressure of there is a running region above 68.1 percent Ngp that allows a lower pressure of there is a running region above 68.1 percent Ngp that allows a lower pressure of the property of the control of the property of there is a running region of five seconds to accommodate transfers between the 15 psi (103.4 kPa) for a period of five seconds to accommodate transfers between the 15 psi (103.4 kPa) assembly BP901-1 or BP901-2 and the standby pump/motor assembly BP901-2. There (103.4 kPa) for a personal to accommodate transfers between the 15 psi (103.4 kPa) for assembly BP901-1 or BP901-2 and the standby pump/motor selected pump/motor BP901-2. selected BP901-1 or BP901-2.

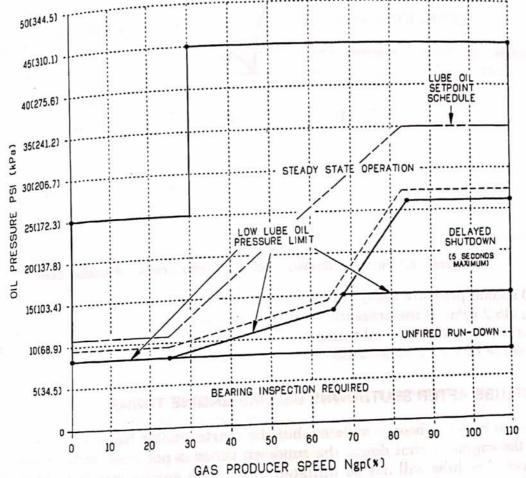


Figure 6.2.6 Lube Oil Pressure Schedule

percent large the rendewn timer is reset so the suggest as

6.11