1. Running Difficulties

Running Difficulties – *See also 'Supplementary Comments' in this Section*

Difficulty	Point	Possible Cause	Remedy
Exhaust temperature rises	1	Increased scavenge air temperature owing to inadequate air cooler function.	*See Section 706-02: The section entitled 'Evaluation of Records', point 3, 'Air Cooler Synopsis'.*
a)all cyl. ★)	2	Fouled air and gas passages.	Clean the turbine by means of dry cleaning/water washing. Clean the blowers and air coolers, *see Section 706-03*.
			Check the back pressure in the exhaust gas system just after the T/C turbine side. ★)
	3	Inadequate fuel oil cleaning, or altered combustion characteristics of fuel.	*See Chapter 705* ★)
	4	Wrong position of camshaft (Maladjusted or defective chain drive).	Check $p_{max.}$ Check camshaft with pin gauge. Check chain tension.
b) single cyl.	5	Defective fuel valves, or fuel nozzles.	★)
	6	Leaking exhaust valve	Replace or overhaul the valve. ★)
	7	Blow-by in combustion chamber.	★)
	8	Wrongly adjusted, or slipped, fuel cam.	Check the fuel pump lead.
Exhaust temperature decreases,	9	Falling scavenge air temperature.	Check that the raw water system thermostat valve is functioning correctly.
a) all cyl.	10	Air/gas/steam in fuel system.	Check the fuel oil supply and circulating pump pressures. Check the function of the de-aerating valve. Check the suction side of the supply pumps for air leakages. Check the fuel oil pre-heater for steam leakages.
b) single cyl.	11	Defective fuel pump suction valve.	Repair the suction valve.

Running Difficulties *(Continued) – See also 'Supplementary Comments' in this Section*

Difficulty	Point	Possible Cause	Remedy
	12	Fuel pump plunger or puncture valve sticking or leaking.	Replace the fuel pump or the puncture valve.
	13	Exhaust valve sticking in open position.	Replace the exhaust valve.
Engine r/min decrease	14	Oil pressure before fuel pumps too low.	Raise the supply and circulating pump pressures to the normal level.
	15	Air/gas/steam in the fuel oil.	*See point 10.*
	16	Defective fuel valve(s) or fuel pump(s).	Replace and overhaul the defective valve(s) and pump(s).
	17	Fuel index limited by torque/scavenge air limiters in the governor due to abnormal engine load.	*See Section 706-01.*
	18	Water in fuel oil.	Drain off the water and/or clean the fuel more effectively.
	19	Fire in scavenge air box.	*See Chapter 704.*
	20	Slow-down or shut-down.	Check pressure and temperature levels. If these are in order, check for faults in the slow-down equipment.
	21	Combustion characteristics of fuel oil.	When changing from one fuel oil type to another, alterations can appear in the r/min, at the same pump index.
Smoky exhaust	22	Turbocharger revolutions do not correspond with engine r/min.	Some smoke development during acceleration is normal; no measures called for. Heavy smoke during acceleration: Fault in governor limiters setting.
	23	Air supply not sufficient.	*See reference quoted under point 1.* Check engine hall ventilation.
	24	Defective fuel valves (incl. nozzles).	*See point 5, and Section 706-05, (incl. Plate 70618).*
	25	Fire in scavenge air box.	*See Chapter 704.*
	26	Governor failure/erratic regulation.	*See Item 2 'Supplementary Comments'.*

2. Supplementary Comments

Item 1, 'Difficulties when Running' gives some possible causes of operational disturbances, on which the following supplementary information and comments can be given.

Point 6

A leaking exhaust valve manifests itself by an exhaust temperature rise, and a drop in the compression and maximum pressures.

In order to limit the damage, if possible, immediately replace the valve concerned, or, as a preliminary measure, lift the fuel pump roller guide, *see Section 704-04*.

Point 7

In serious cases, piston ring blow-by manifests itself in the same way as a leaking exhaust valve, but sometimes reveals itself at an earlier stage by a hissing sound. This is clearly heard when the drain cock from the scavenge air box is opened. At the same time, smoke and sparks may appear.

When checking, or when cleaning the drain pipe, keep clear of the line of ejection, as burning oil can be blown out.

With stopped engine, blow-by can be located by inspecting the condition of the piston rings, through the scavenge air ports. Piston and cylinder liner become black in the area of blow-by. Sludge, which has been blown into the scavenge air chamber, can also indicate the defective cylinder. *See also Section 707-03.*

Since blow-by can be due to sticking of unbroken piston rings, there is a chance of gradually diminishing it, during running, by reducing the pump index for a few minutes and, at the same time, increasing the cylinder oil amount. If this is not effective, the fuel pump index and the p_{max} must be reduced until the blow-by ceases.

The pressure rise p_{comp}-p_{max} must not exceed the value measured on testbed at the reduced mean effective pressure or fuel pump index. Regarding adjusting of p_{max}, *see Vol. II 'Maintenance', Chapter 909*.

If the blow-by does not stop, the fuel pump roller guide should be lifted, or the piston rings changed.

Running with piston ring blow-by, even for a very limited period of time, can cause severe damage to the cylinder liner. This is due to thermal overheating of the liner. Furthermore, there is a risk of fire in the scavenge air boxes and scavenge air receiver, *see also Section 704-01*.

In case of severe blow-by, there is a general risk of starting troubles owing to too low compression pressure during the starting sequence.

Concerning the causes of blow-by, *see Chapter 707*, where the regular maintenance is also described.

Points 10 and 15

Air/gas in the fuel oil system can be caused by a sticking fuel valve spindle, or because the spring has broken.

If a defective fuel valve is found, this must be replaced, and it should be checked that no fuel oil has accumulated on the piston crown.

Points 12 and 16

If, to obtain full load, it proves necessary to increase an individual fuel pump index by more than 10% (from commissioning test value), then this in most cases indicates that the pump is worn out. This can usually be confirmed by inspecting the plunger. If the cut-off edge shows a dark-coloured eroded area, the pump should be sent for repair. This can usually be done by reconditioning the bore, and fitting a new plunger.

Point 26

If the fault lies in the governor itself, the special governor instruction book should be consulted.

External influences can also cause erratic regulation. For instance:

- main chain drive wrongly tensioned (Woodward governor),
- falling oil pressure to the governor (Woodward governor),
- lack of control air pressure (Woodward governor),
- sluggishness in the regulating gear,
- firing failure,
- unbalance in the load distribution between the cylinders, *see Section 706-02*.

See Section 703-02.

3. Check during Running

Check 11 A: Chain Tighteners

Check the chain tighteners for the cam shaft drive and the moment compensators (if installed). The combined chain tighteners and hydraulic damping arrangements should be readjusted, when the red-coloured part of the wear indicators is reached. *See Vol. II, Maintenance, Chapter 706.*

Check 12: Shut Down and Slow Down

Check measuring equipment.

Check 13: Pressure Alarms (Pressure Switches)

General:
The functioning and setting of the alarms should be checked.

It is **essential** to carefully check the functioning and setting of pressure sensors and temperature sensors.

They must be checked under circumstances for which the sensors are designed to set off alarm.

This means that sensors for low pressure/temperature should be tested with falling pressure/temperature, and sensors for high-pressure/temperature should be tested with rising pressure/temperature.

Checking:
If no special testing equipment is available, the checking can be effected as follows:

a. The alarm pressure switches in the lubricating and cooling systems may be provided with a test cock, by means of which the pressure at the sensor may be decreased, and the alarm thereby tested.

b. If there is no such test cock, the alarm point must be displaced until the alarm is given. When the alarm has thus occurred it is checked that the pressure switch scale is in agreement with the actual pressure. (Some types of pressure switches have an adjustable scale).

Then reset the pressure switch to the preselected alarm limit, which should cause the alarm signal to stop.

Check 14: Temperature Alarms (Thermostats)

See also Check 13, 'General'.

Most of the thermostatic valves in the cooling systems can likewise be tested by displacing the alarm point, so that the sensor responds to the actual temperature.

However, in some cases, the setting cannot be reduced sufficiently, and such valves must either be tested when the service temperature has been reached, or by heating the sensing element in a water bath, together with a reference thermometer.

Check 15: Oil Mist Detector

Check the oil mist detector.

Adjustment and testing of the alarm function is effected in accordance with the instructions given on the equipment, or in the separate Oil Mist Detector instruction book.

Check 16: Observations

Make a full set of observations, including indicator cards, *see Plate 70603 'Performance Observations' and Section 706-04*. Check that pressures and temperatures are in order.

Check the load distribution between the cylinders, *see Section 706-02*.