1. Cause

When the engine is running, the air in the crankcase contains the same types of gas (N_2-O_2-CO_2) in the same proportions as the ambient air, but there is also a heavy shower of coarse oil droplets being flung around everywhere.

If abnormal friction occurs between the sliding surfaces, or heat is otherwise transmitted to the crankcase (for instance from a scavenge air fire via the piston rod/ stuffing box, or through the intermediate bottom), “Hot spots” on the heated surfaces can occur. The “hot spots” will cause the oil falling on them to evaporate.

When the oil vapour condenses again, countless minute droplets are formed which are suspended in the air, i.e. a *milky-white oil mist* develops, which is able to feed and propagate a flame if ignition occurs. The ignition can be caused by the same “hot spot” which caused the oil mist.

If a large amount of oil mist has developed before ignition, the burning can cause a tremendous rise of pressure in the crankcase (explosion), which forces a momentary opening of the relief valves. In isolated cases, when the entire crankcase has presumably been full of oil mist, the consequential explosion has blown off the crankcase doors and set fire to the engine room.

In the event that a crankcase explosion has occurred, the complete flame arrester of the relief valves must be replaced.

NB: Similar explosions can also occur in the gear box and scavenge air box.

Every precaution should therefore be taken to:

A) avoid “hot spots”
B) detect the oil mist in time.

A. “Hot Spots” in Crankcase

Well-maintained bearings only overheat if the oil supply fails, or if the bearing journal surfaces become too rough (owing to the lubricating oil becoming corrosive, or being polluted by abrasive particles).

For these reasons, it is very important to:

- purify the lubricating oil correctly,
- make frequent control analyses *(see Chapter 708),*
- ensure that the filter gauze is maintained intact.

Due to the high frictional speed of the thrust bearing, special care has been taken to ensure the oil supply to this bearing.

Monitoring equipment is arranged to give an alarm in cases of low circulating oil pressure and/or high temperature of thrust bearing segments. Keep this equipment in tip-top condition. *(See Section 701-02).*

Feel over moving parts (by hand or with a “thermo-feel”) at suitable intervals (15-30 minutes after starting, one hour later, and again at full load, *(see Section 703-03).*

Section 702-01, is still the best safeguard against “hot spots” when starting up after repairs or alterations affecting the moving parts, and should never be neglected. *If in doubt, stop and feel over.*

B. Oil Mist in Crankcase

In order to ensure a reliable, and quick warning of oil mist formation in the crankcase, constant monitoring is obtained with an “Oil Mist Detector”, which samples air from each crankcase compartment.

The detector will give alarm and slow-down, *see Section 701-02,* at a mist concentration which is only a fraction of the lower explosion limit, LEL, to gain time to stop the engine before ignition of the oil mist can take place.

See also the special instructions from the supplier of the oil mist detector.

For CPP-plants with engaged shaft generator, an auxiliary engine will be started automatically and coupled to the grid, before the shaft generator is disengaged and the engine speed reduced.

2. Measures to be taken when Oil Mist has occurred

WARNING!

Do not *stand near crankcase doors or relief valves – nor in corridors near doors to the engine room casing in the event of an* ***alarm*** *for:*

a. oil mist

b. high lube oil temperature

c. no piston cooling oil flow, or

d. scavenge box fire

Alarms b, c and d should be considered as pre-warnings of a possible increasing oil mist level.
See also our Service Letters SL97-348/ERO and SL00-377/CEE.

1. Reduce speed/pitch to slow-down level, if not already carried out automatically, *(see Section 701-02), see above.*
2. Ask the bridge for permission to stop.

3. When the engine STOP order is received:
   - stop the engine
   - close the fuel oil supply.
4. Switch-off the auxiliary blowers and engine room ventilation.
5. Open the skylight(s) and/or “stores hatch”.
6. Leave the engine room.
7. Lock the casing doors and keep away from them.
8. Prepare the fire-fighting equipment.

Do not open the crankcase until at least 20 minutes after stopping the engine. When opening up, keep clear of possible spurts of flame. Do not use naked lights and do not smoke.

9. Stop the circulating oil pump. Take off/open all the lowermost doors on one side of the crankcase. Cut off the starting air, and engage the turning gear.
10. Locate the “hot spot”. Use powerful lamps from the start.

    Feel over, by hand or with a “thermo-feel”, all the sliding surfaces (bearings, thrust bearing, piston rods, stuffing boxes, crossheads, telescopic pipes, vibration dampers, moment compensators, etc.).
    See also point 14.

    Look for squeezed-out bearing metal, and discolouration caused by heat (blistered paint, burnt oil, oxidized steel). Keep possible bearing metal found at bottom of oil tray for later analyzing.

11. Prevent further “hot spots” by preferably making a permanent repair.
    In case of bearings running hot, *see Section 708-01 and Section 701-01.*

    Ensure that the respective sliding surfaces are in good condition.

    Take special care to check that the circulating oil supply is in order.

12. Start the circulating oil pump and turn the engine by means of the turning gear.

    Check the oil flow from all bearings, spray pipes and spray nozzles in the crankcase and thrust bearing *(Section 702-01)*.

    Check for possible leakages from pistons or piston rods.

13. – Start the engine.

    After:
    - 15-30 minutes,
    - one hour later,
    - when full load is reached:

– Stop and feel over.
– Look for oil mist.

Especially feel over (by hand or with a “thermo-feel”) the sliding surfaces which caused the overheating. *See Section 703-03.*

14. In cases where it has not been possible to locate the “hot spot”, the procedure according to Point 10 above should be repeated and intensified until the cause of the oil mist has been found and remedied.

    There is a possibility that the oil mist is due to “atomization” of the circulating oil, caused by a jet of air/gas, e.g. by combination of the following:

    – Stuffing box leakages (not air tight).
    – Blow-by through a cracked piston crown or piston rod (with direct connection to crankcase via the cooling oil outlet pipe).
    – An oil mist could also develop as a result of heat from a scavenge fire being transmitted down the piston rod or via the stuffing box. Hot air jets or flames could also have passed through the stuffing box into the crankcase.