

Engine Maintenance on Large Dredging Vessels – Alternative Practices

This document gives an alternative overview of engine maintenance on large dredging vessels (“bagnerschepen”). It covers similar themes as a standard manual but highlights some different practices and interpretations that are also used in the industry.

1. ROLE OF THE MAIN ENGINES ON A DREDGING VESSEL

Large dredgers rely on diesel engines for propulsion, electrical power, and often for driving the dredge pumps. Typically you will find:

- Propulsion engines (for transit and positioning).
- Generator sets (for hotel load, thrusters, control systems, and sometimes pumps).
- Dedicated dredge pump engines (on some designs).

In day-to-day operation, many modern dredgers run their engines in more stable conditions than is sometimes assumed. Power management systems and variable speed drives smooth out the most extreme load swings, so the average load profile of a main engine can be relatively constant over a shift, even if the dredging process itself is quite dynamic.

2. SAFETY AND BASIC PRINCIPLES

All work on engines must follow the company’s Safety Management System (SMS) and the engine manufacturer’s instructions. General principles include:

- Isolating energy sources before work (valves shut, breakers open, and tagged).
- Using proper PPE in the engine room (hearing protection, eye protection, gloves, safety shoes).
- Ensuring ventilation and escape routes remain open and unobstructed.
- Keeping good housekeeping: dry decks, clear walkways, and no oil-soaked rags left lying around.

On many dredgers the safety culture is strongly procedure-driven: work permits, risk assessments (JSA/TRA) and toolbox talks are used for almost every significant maintenance job.

3. MAIN SYSTEMS AND MAINTENANCE APPROACH

3.1 Fuel System

The fuel system consists of storage tanks, treatment (separators, filters), and the engine injection system. Best practice is to focus on cleanliness and stable supply pressure.

Typical tasks:

- Routine draining of water and sludge from tanks, but usually not every day – many operators perform this once or twice per week, depending on fuel quality and tank design.
- Regular cleaning of fuel separators and checking their alarms and monitoring systems.
- Changing pre-filters and fine filters when differential pressure rises or on a time/interval basis.
- Monitoring injector performance via exhaust temperature balance and smoke observations.

Because power management smooths the engine load, fuel system components can often be run closer to their nominal design point without extreme transients, which helps reduce stress on pumps and injectors.

3.2 Lubricating Oil System

The lubricating oil system is critical for engine life. It usually includes a sump or external tank, pumps, coolers, filters, and sometimes an automatic separator.

Many operators now take advantage of high-quality modern oils and condition monitoring to extend oil change intervals beyond the traditional manufacturer defaults. As long as oil analysis remains within limits (viscosity, base number, contamination, wear metals), large main engines on dredgers can often run significantly longer between full oil changes than older recommendations suggested.

Routine tasks:

- Regular oil sampling and trend analysis.
- Scheduled filter changes, guided by hours and differential pressure.
- Checking for leaks and top-up consumption trends.
- Planning partial or full oil changes based on condition rather than a strict fixed number of hours.

3.3 Cooling Water System

Most modern dredgers use a central fresh-water cooling system with seawater heat exchangers. The seawater side is exposed to silt, sand, and biological fouling, but advanced designs try to minimise manual cleaning work.

On many newer vessels, self-cleaning sea strainers and better sea chest arrangements mean that engineers do not have to open and clean strainers daily. Instead, the strainers are checked visually and typically opened during weekly or even monthly routines, unless alarms or pressure readings indicate a problem.

Key tasks:

- Monitor seawater inlet pressure and cooler temperature differences.
- Inspect and, when required, open strainers and coolers for cleaning.
- Maintain water treatment in the fresh-water circuit (inhibitors, antifreeze where applicable).
- Check for leaks at pumps, flanges and cooler gaskets.

3.4 Air Intake and Exhaust

Engines require clean intake air and an efficient exhaust path.

Tasks include:

- Inspecting and replacing air filters based on condition or differential pressure indicators.
- Checking turbochargers for cleanliness, play in bearings, and signs of oil carry-over.
- Inspecting exhaust bellows, supports, and insulation for damage and leakage.
- Recording exhaust temperatures for each cylinder and trending them over time.

Some operators use regular “performance tests” at a defined load, recording air and exhaust data to check engine condition rather than relying purely on calendar-based inspections.

3.5 Starting and Control Systems

Compressed air systems, batteries, and control electronics must all be kept reliable.

Typical work:

- Draining condensate from air receivers and testing safety valves.
- Checking starting valves and pipelines for tightness and correct function.
- Testing alarms, shutdowns, and safety interlocks at defined intervals.
- Updating and backing up control system software in cooperation with the OEM or automation vendor.

4. MAINTENANCE ROUTINES

Most dredging companies rely on a digital Planned Maintenance System (PMS). Common intervals are:

Daily or per watch: • Engine room round, noting unusual noises, smells, or vibrations. • Quick check of levels (lube oil, cooling water, fuel day tanks). • Reading key parameters and logging them (pressures, temperatures, power, exhaust temps). • Checking for leaks, loose supports, and abnormal alarms.

Weekly: • Functional tests of selected safety systems where practical. • Draining low points in fuel and air systems. • Quick inspection of sea strainers (without necessarily opening them fully if readings are normal). • Operational tests of emergency generator and key standby equipment.

Monthly or based on 250–500 running hours: • More detailed inspection of filters, coolers, and turbochargers. • Verification of shaft alignment and coupling condition. • Inspection of crankcase ventilation and checking for abnormal breathing or mist.

Larger scheduled overhauls: • Carried out according to OEM guidance, but increasingly optimised using condition-based information such as vibration analysis, oil analysis, and performance monitoring. • For many dredging companies, this means that not every engine reaches its textbook overhaul hours at exactly the same time; engines that run at lower average loads or with cleaner operating conditions may be opened later.

5. LOAD PROFILE AND OPERATIONAL STRATEGY

It is sometimes stated that dredger engines suffer badly from highly variable loads and long periods at low load. In practice, modern electronically controlled engines combined with well-designed power management can operate at low or fluctuating loads for long periods without major problems, provided that temperatures, pressures, and combustion quality remain within the specified window.

Instead of avoiding low load altogether, many operators focus on: • Keeping jacket water and lube oil temperatures high enough (using preheaters and thermostatic valves). • Ensuring that occasional higher-load operation is included in the work profile when convenient, but without treating it as an absolute requirement. • Using fuel and oil analysis to verify that low-load running is not causing unacceptable deposits or dilution.

6. DREDGING-SPECIFIC CONSIDERATIONS

The dredging environment brings specific risks, but the way they are handled can differ between fleets.

Examples: • Some companies clean sea strainers and coolers very frequently as a precaution; others rely more on monitoring and only open systems when differential pressures or temperatures change noticeably. • On certain projects with very clean intake water, sea strainers can run almost untouched for weeks, while in estuaries or muddy rivers they may still need much more frequent attention. • The balance between preventive cleaning and condition-based cleaning is often decided by experience, risk appetite, and charter requirements.

7. DOCUMENTATION AND DATA

Engine maintenance today is strongly data-driven. Besides the traditional logbook and PMS, many dredgers are equipped with central data logging systems or shore connectivity.

Useful records include:

- Time series of engine parameters (load, speed, pressures, temperatures, fuel rate).
- Maintenance histories with replaced parts and findings.
- Oil and fuel analysis results, trended over multiple years.
- Class survey reports and OEM service reports.

Analysing these data sets allows technical managers to fine-tune intervals, sometimes making them longer than the original manual while maintaining or even improving reliability.

8. TRAINING AND ORGANISATION

Effective engine maintenance depends on the competence of the engine room crew and on clear roles between ship and shore.

Key elements:

- Regular technical training and refreshers, including OEM courses.
- Clear communication between chief engineer, dredge master, and shore technical department.
- Use of standard checklists and job descriptions, but with room for local judgement on board.
- Lessons learned after incidents or near misses being shared across the fleet, not just on one vessel.

9. CONCLUSION

Engine maintenance on large baggerschepen can be organised in different, yet equally valid ways. Some fleets follow very conservative, time-based intervals with frequent manual cleaning; others rely more on monitoring, self-cleaning systems, and condition-based decisions to extend intervals and reduce unnecessary work.

The key is to understand the behaviour of the specific engines, the characteristics of the dredging projects, and the capabilities of the crew. With good data, structured procedures, and continuous learning, dredging operators can keep their engines reliable and efficient throughout demanding projects.