

Marine Engine Cooling Water — SW / FW Loop Design

cBallast · IACS UR M53 · System design reference

Why central cooling

Central-cooling architecture: SW (seawater) high-temp loop from sea chest through plate HX overboard. FW (freshwater) low-temp loop circulates through every heat source, rejects heat to SW via plate HX. Isolates every downstream HX from SW corrosion, marine growth, salt scaling. Only the plate HX sees seawater.

Material selection

Component	SW-wetted	FW-wetted
Sea chest	Steel + anti-fouling + Zn anodes	—
Main SW piping	90/10 CuNi or GRP	—
Plate HX plates	Titanium Gr 1 or 316L	Same plate
Gaskets	NBR-HT	EPDM or NBR
SW pump	Ni-Al bronze impeller, duplex casing	—
FW pump	—	CI casing, bronze impeller
FW piping	—	Carbon steel painted or galvanised
Expansion tank	—	Carbon steel with air-vent, breather

FW water treatment

Parameter	Range	Corrective
pH	8.3 - 10.0	NaOH dose up; blowdown down
Chloride	< 50 ppm	Blowdown; check for SW ingress
Sulphate	< 100 ppm	Blowdown
Total hardness	< 100 ppm CaCO ₃	Fill only with demineralised
Nitrite	500 - 2400 ppm as N	Sodium-nitrite inhibitor
Glycol (freeze)	0 - 35%	MPG; verify with refractometer

Expansion tank sizing

Absorbs thermal expansion, provides positive suction head to FW pumps, chemical dosing point. Volume 6-10% of loop volume, mounted at highest point, vented through breather with float overflow. Low-level alarm + magnetic bar filter at outlet.

Pump redundancy (IACS UR M53)

Every critical cooling function needs standby pump equal capacity with auto-start on discharge-P loss. Merchant vessel: 2 SW pumps, 2 HT

FW (main), 2 LT FW (aux + reefer).
Independent power supply for
standby so switchgear fault does not
kill both.

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