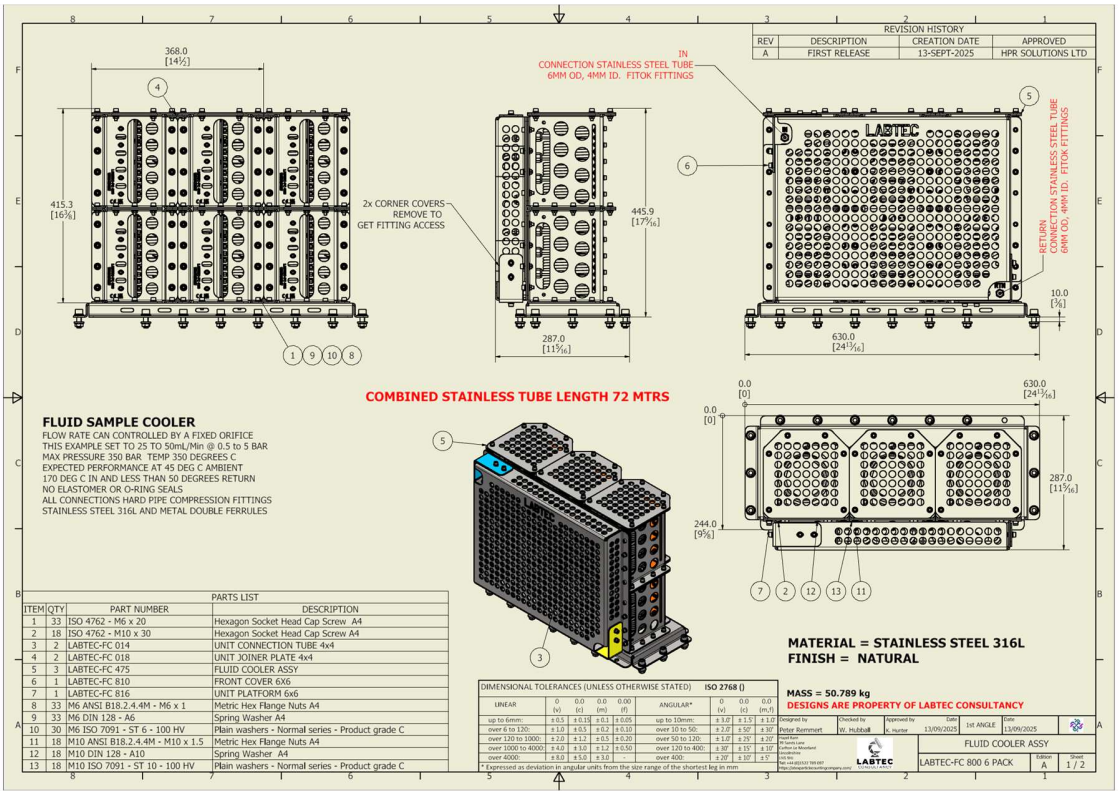
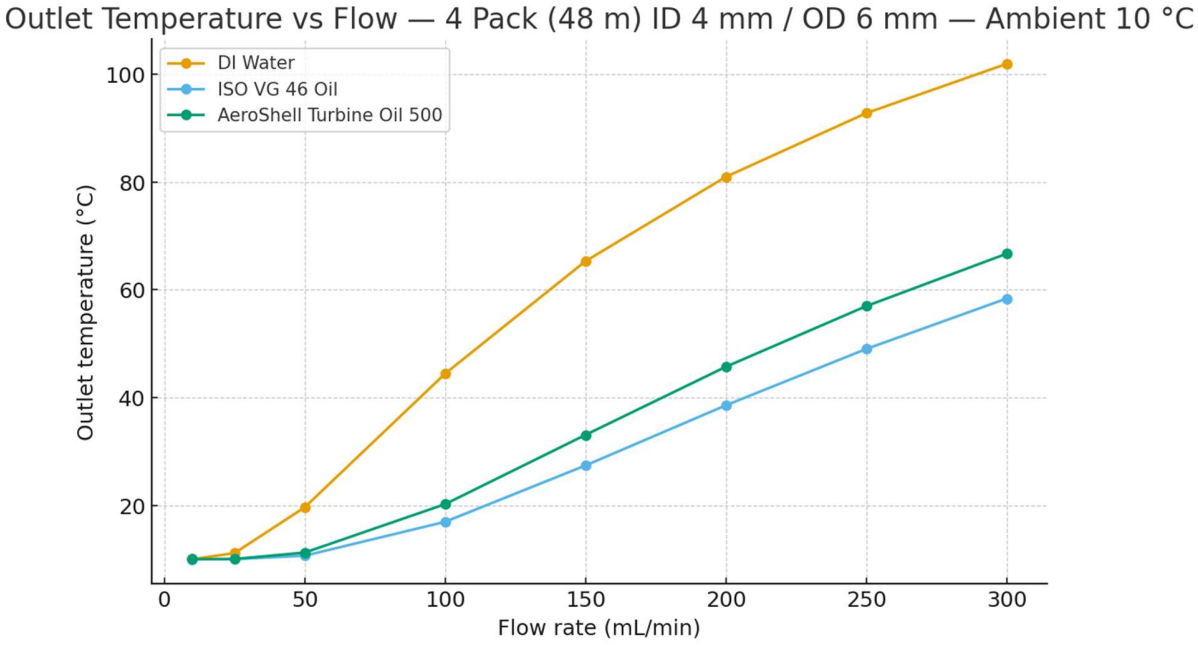
Thermal Cooling Model Report

This report compares outlet temperature and pressure drop for three fluids (DI Water, ISO VG 46 Oil, and AeroShell Turbine Oil 500) flowing through SS316L stainless steel tubes. Two configurations are considered: a '4 Pack' (48 m tube) and a '6 Pack' (72 m tube).

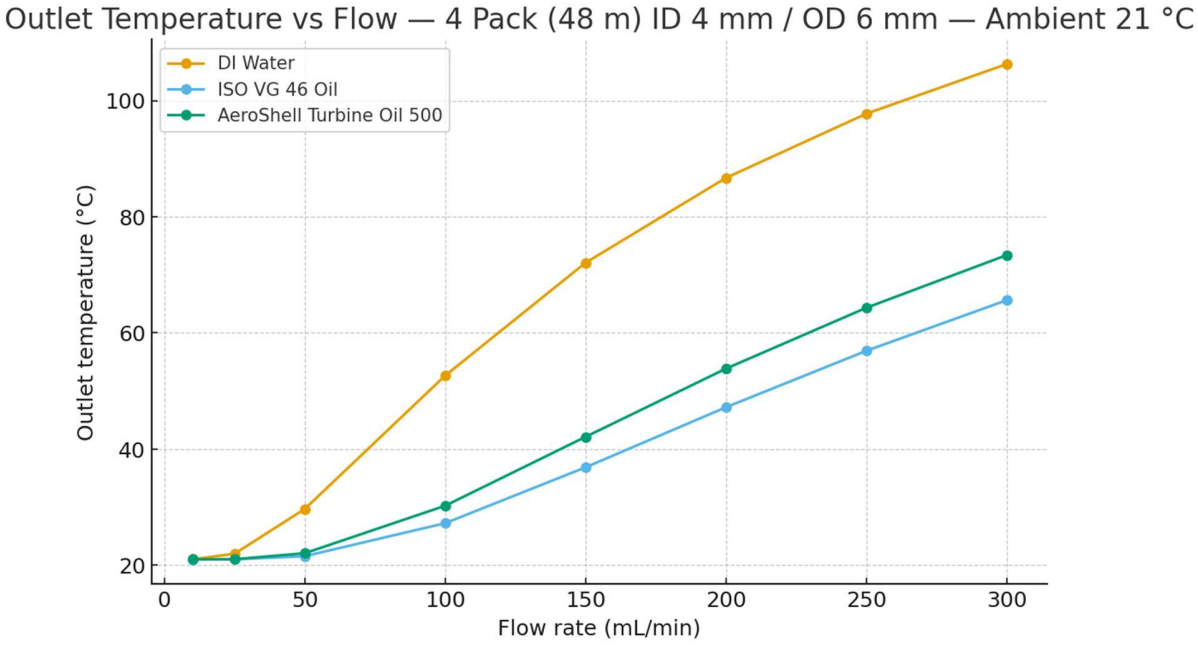
Assumptions

- Tube material: SS316L
- Tube OD = 6 mm, ID = 4 mm
- Ambient temperature: 45 °C
- Inlet fluid temperature: 170 °C
- Heat transfer inside: Sieder–Tate correlation with μ/μw correction
- Heat transfer outside: Churchill–Chu natural convection + radiation (ε = 0.6)
- Oil viscosity μ(T): ASTM D341 Walther equation fit
- Segmentwise 1D energy balance with temperature-dependent viscosity

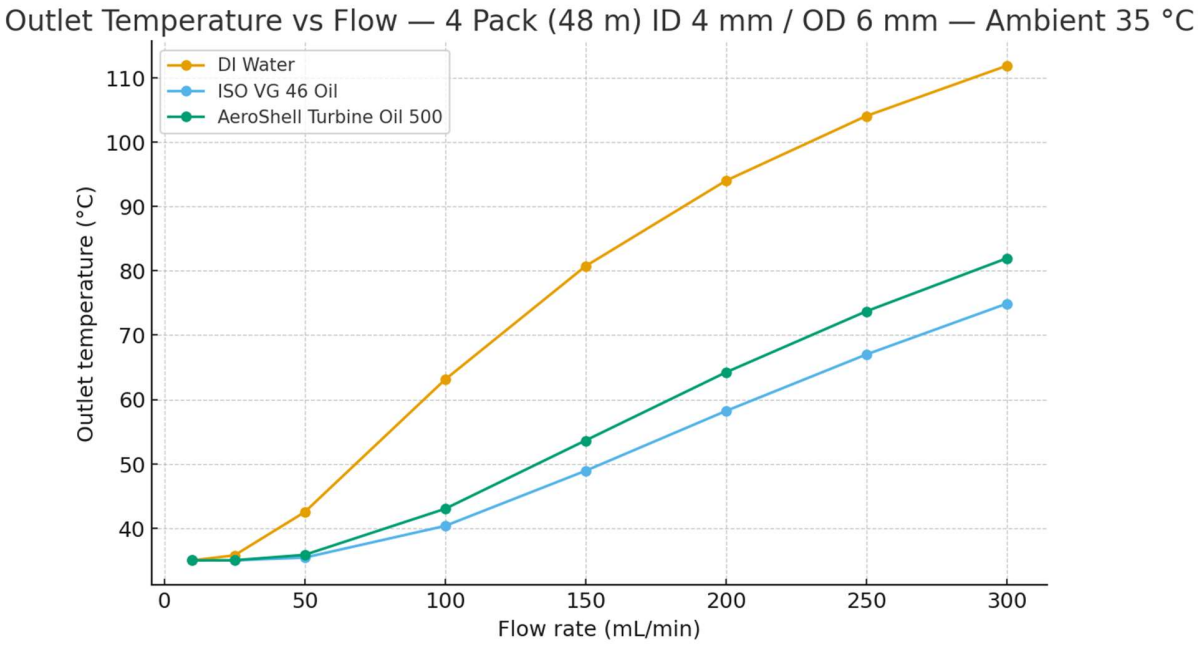




Tout_vs_Flow_4pack_Amb21.png



Tout_vs_Flow_4pack_Amb35.png



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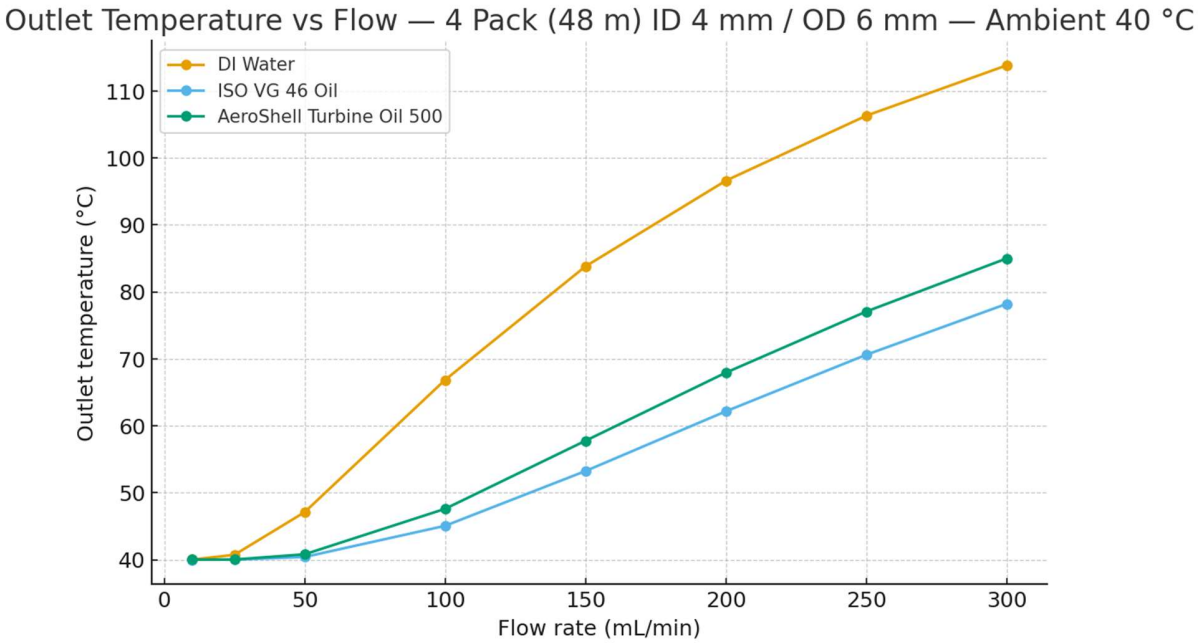

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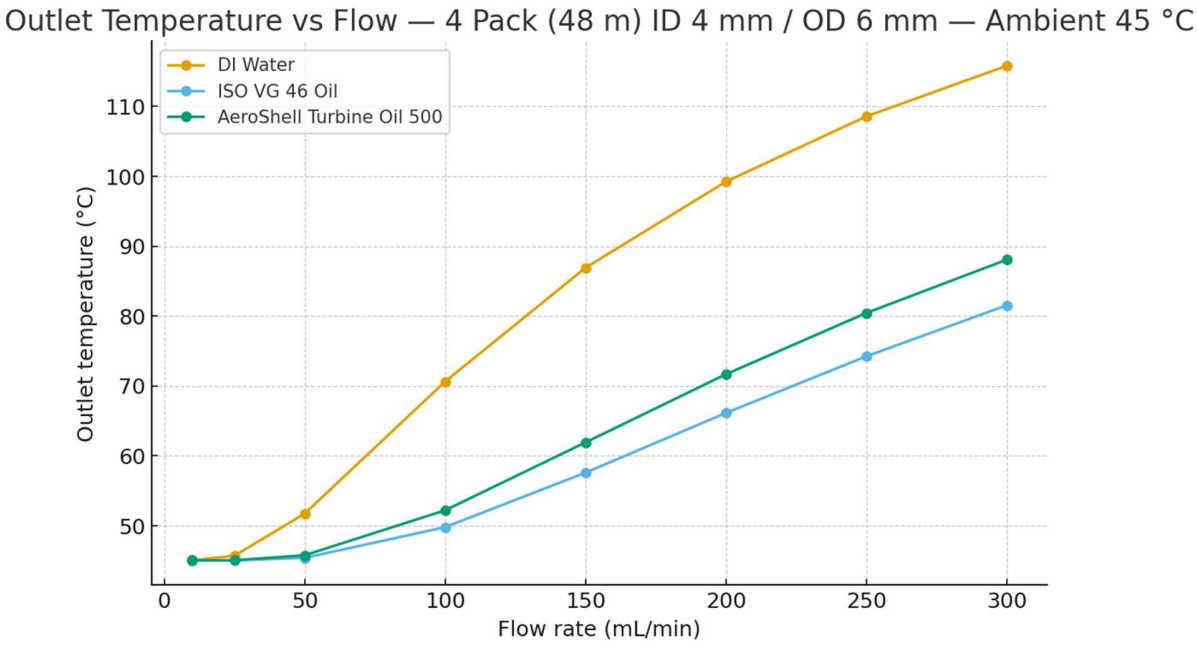
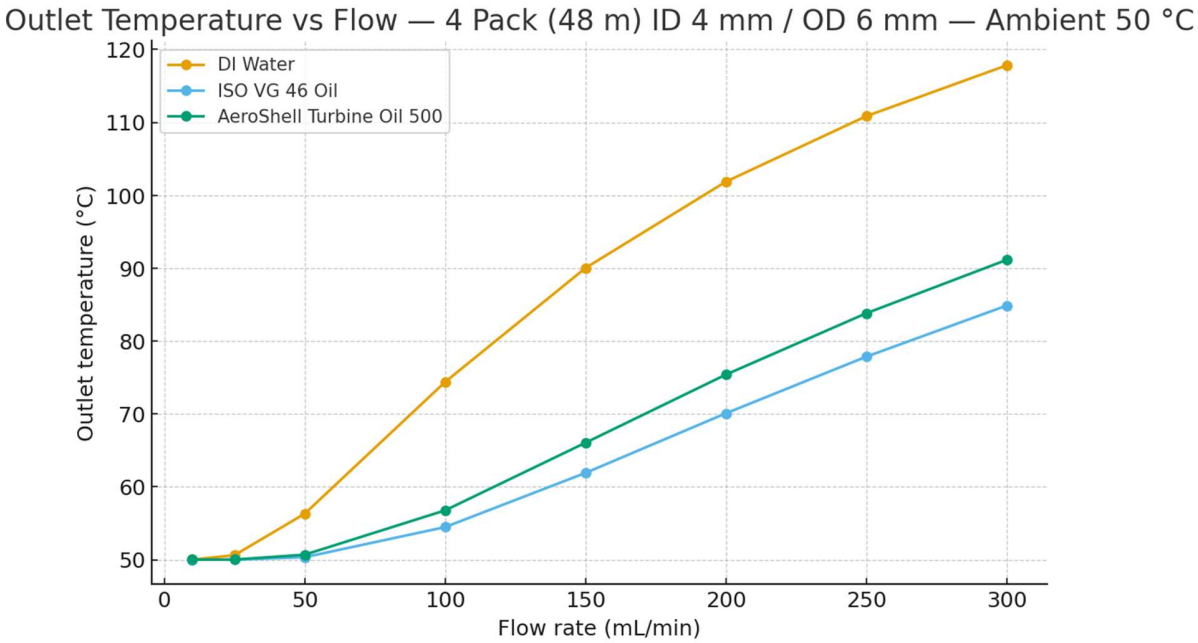


Tout_vs_Flow_4pack_Amb50.png



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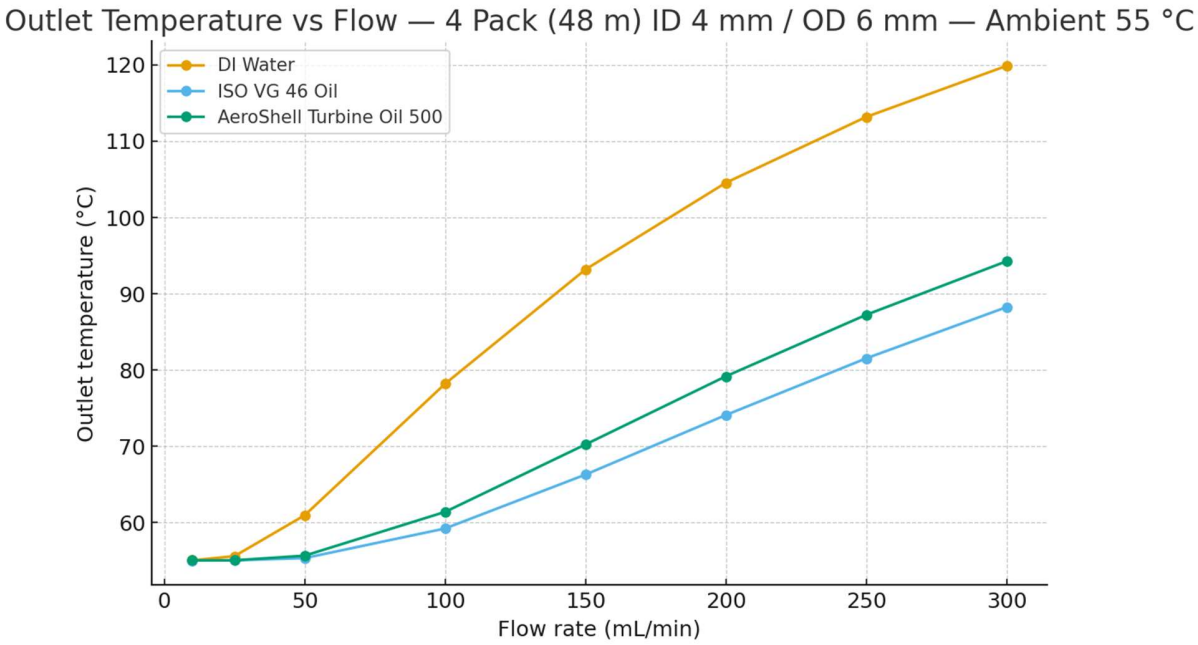

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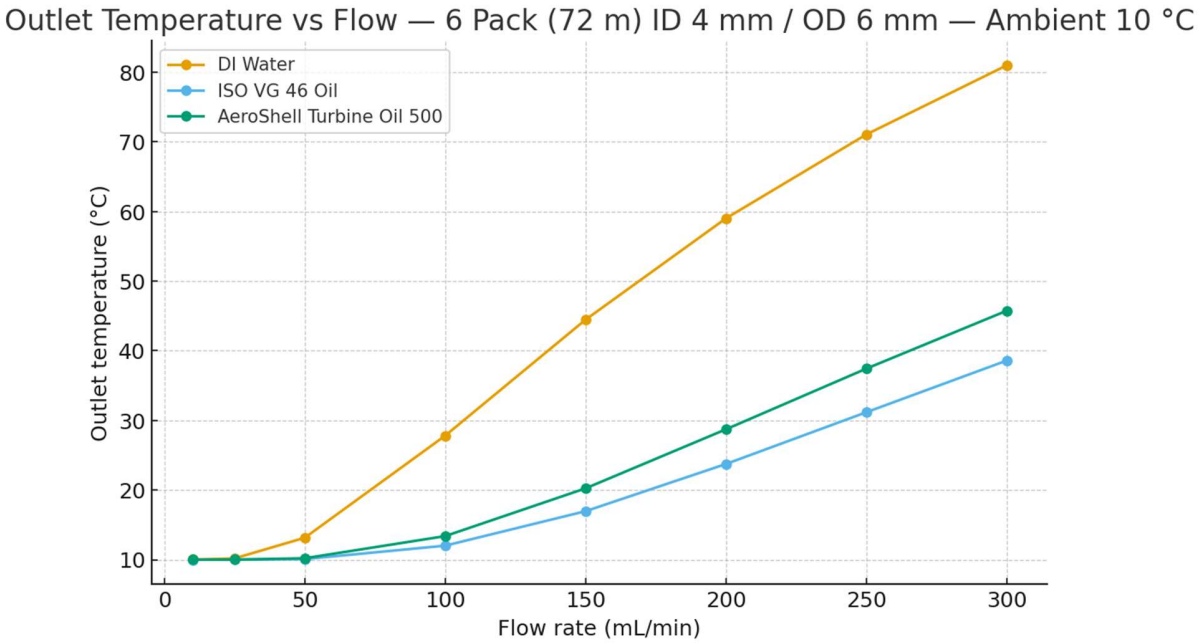

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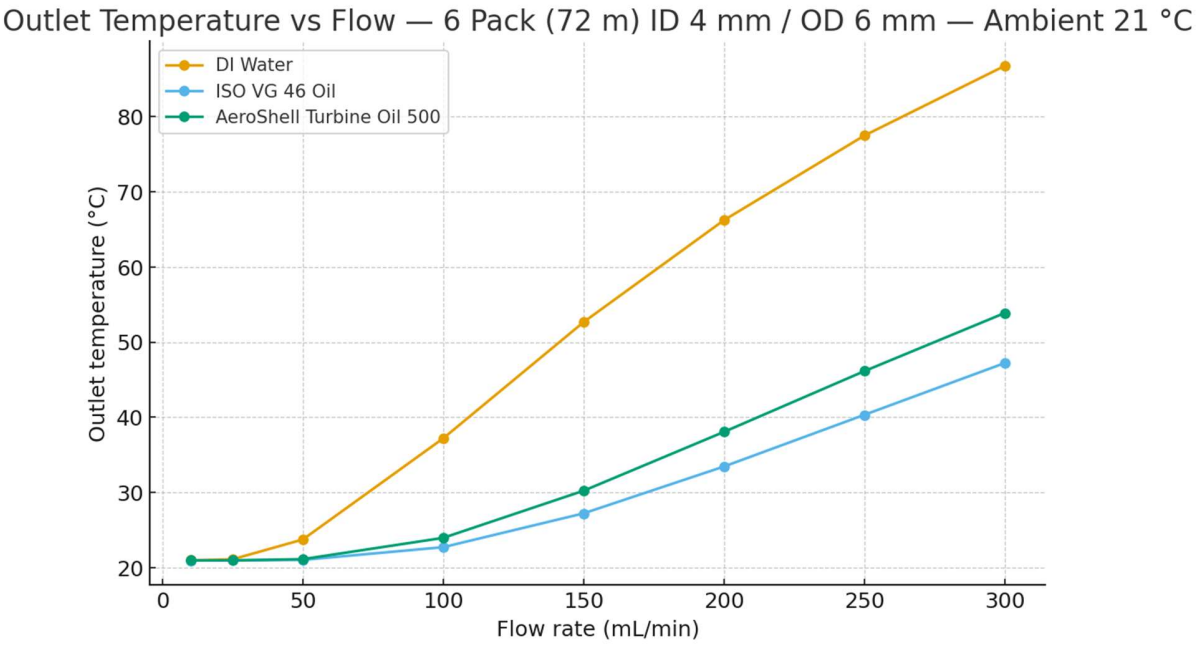

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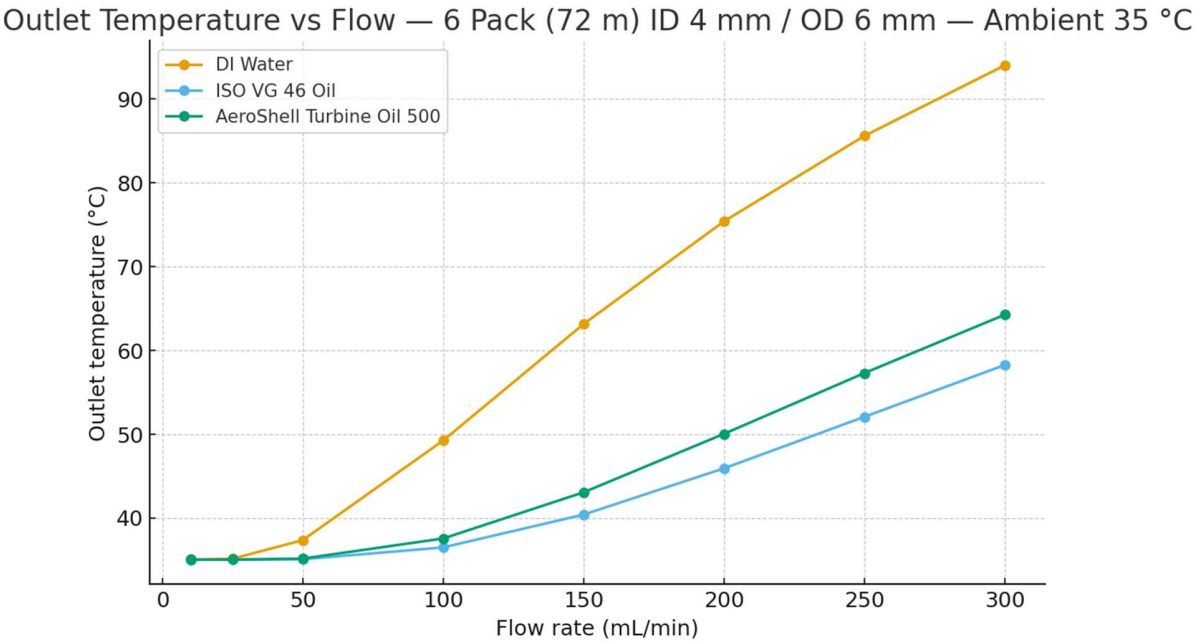

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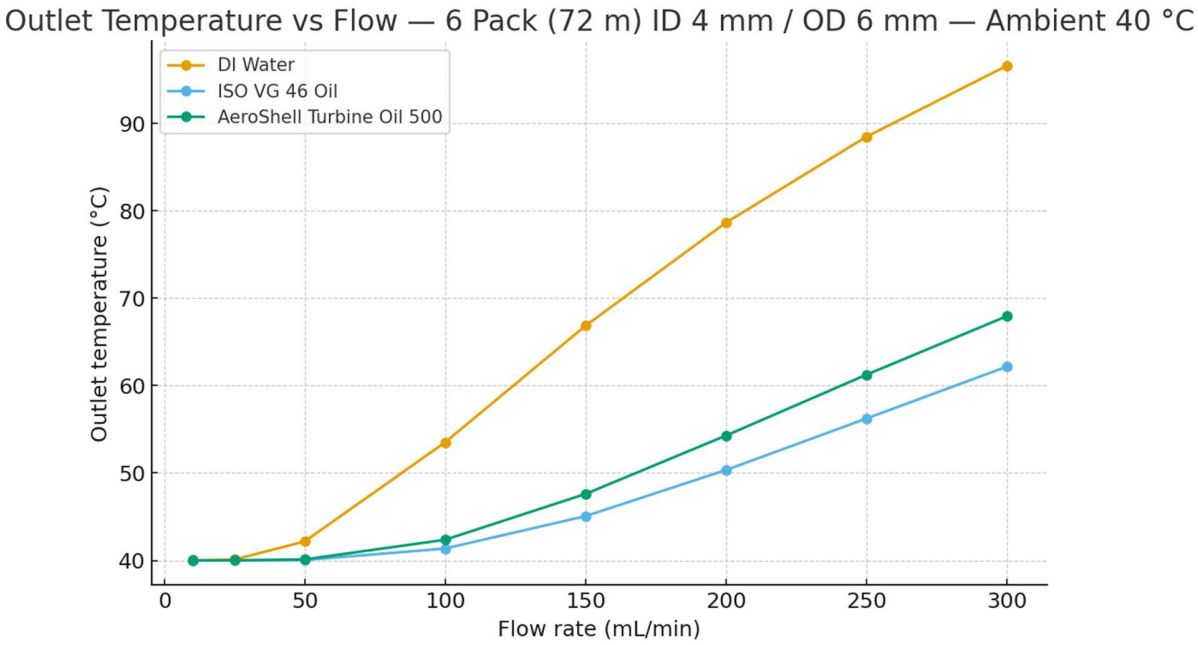

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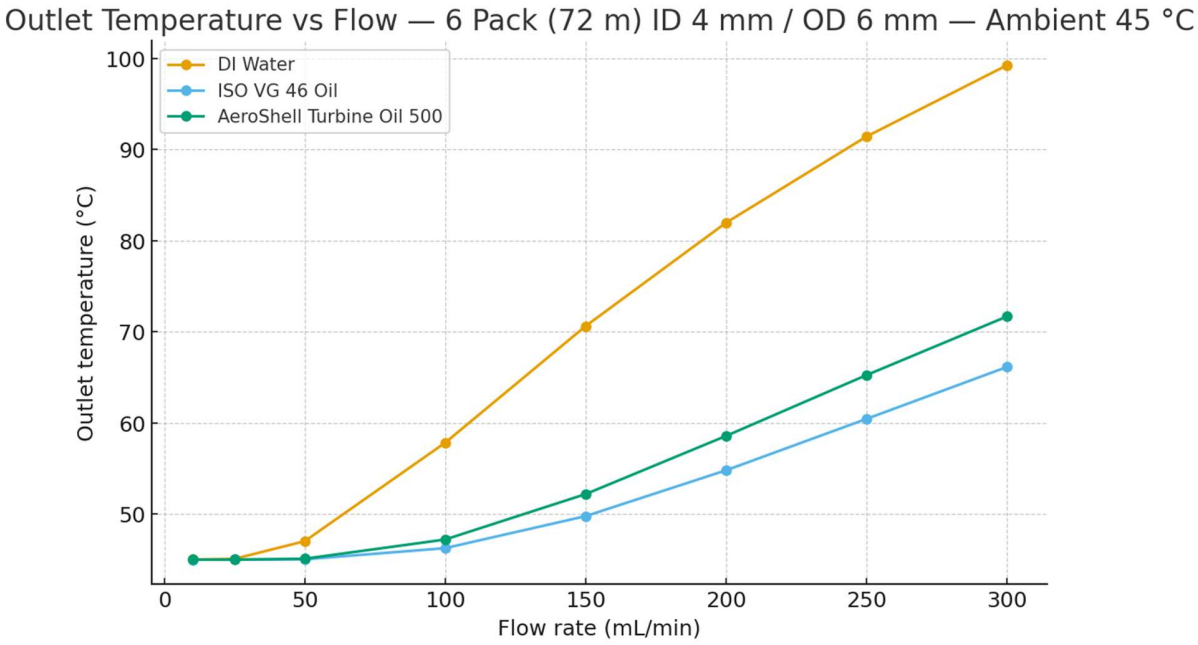
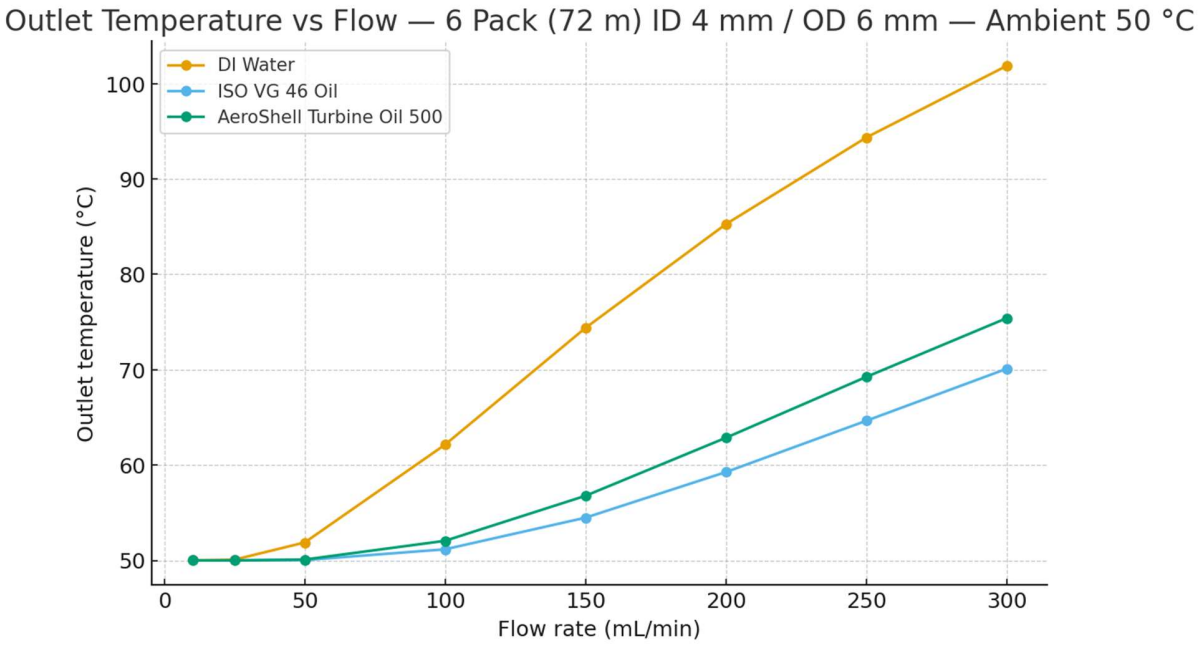


Tout_vs_Flow_6pack_Amb50.png



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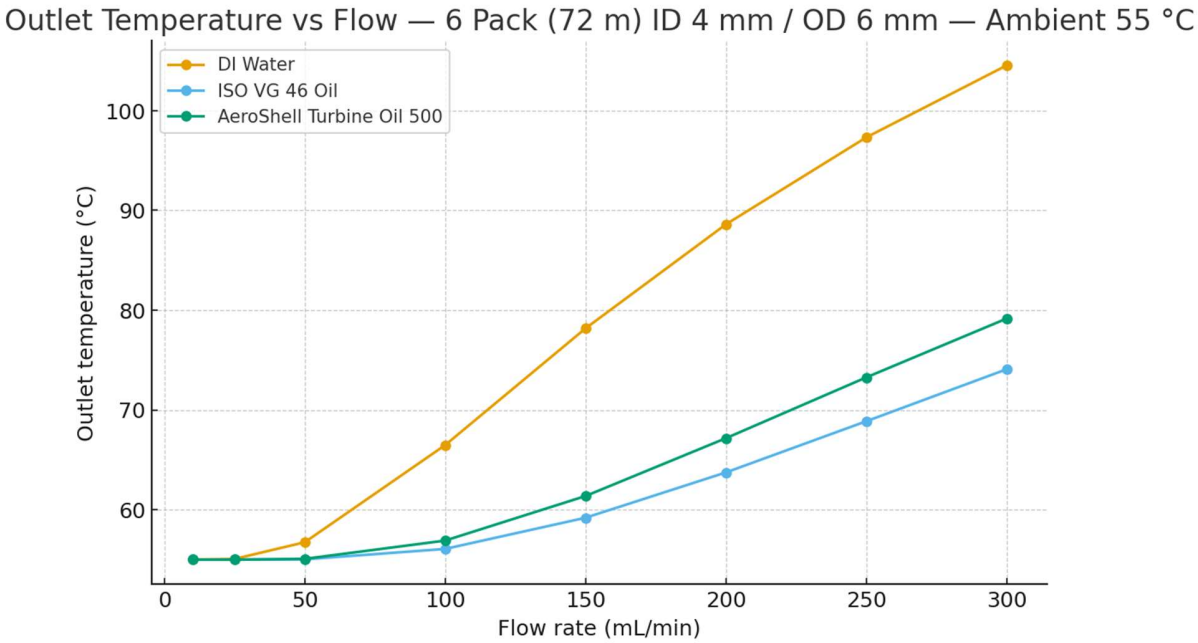
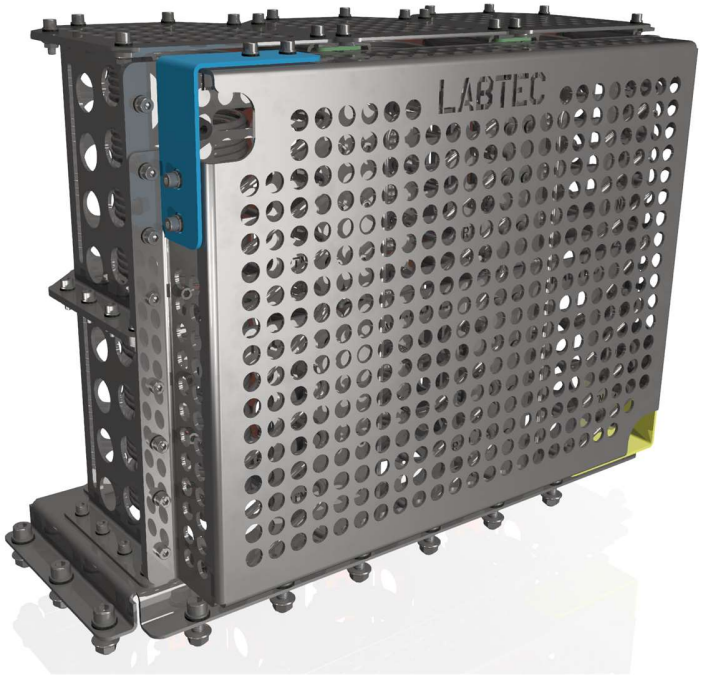


Data used from the Technical data sheet of the Aeroshell Turbine Oil 500 to calculate the oil profile performance.



Rendered images of 6 pack version.