

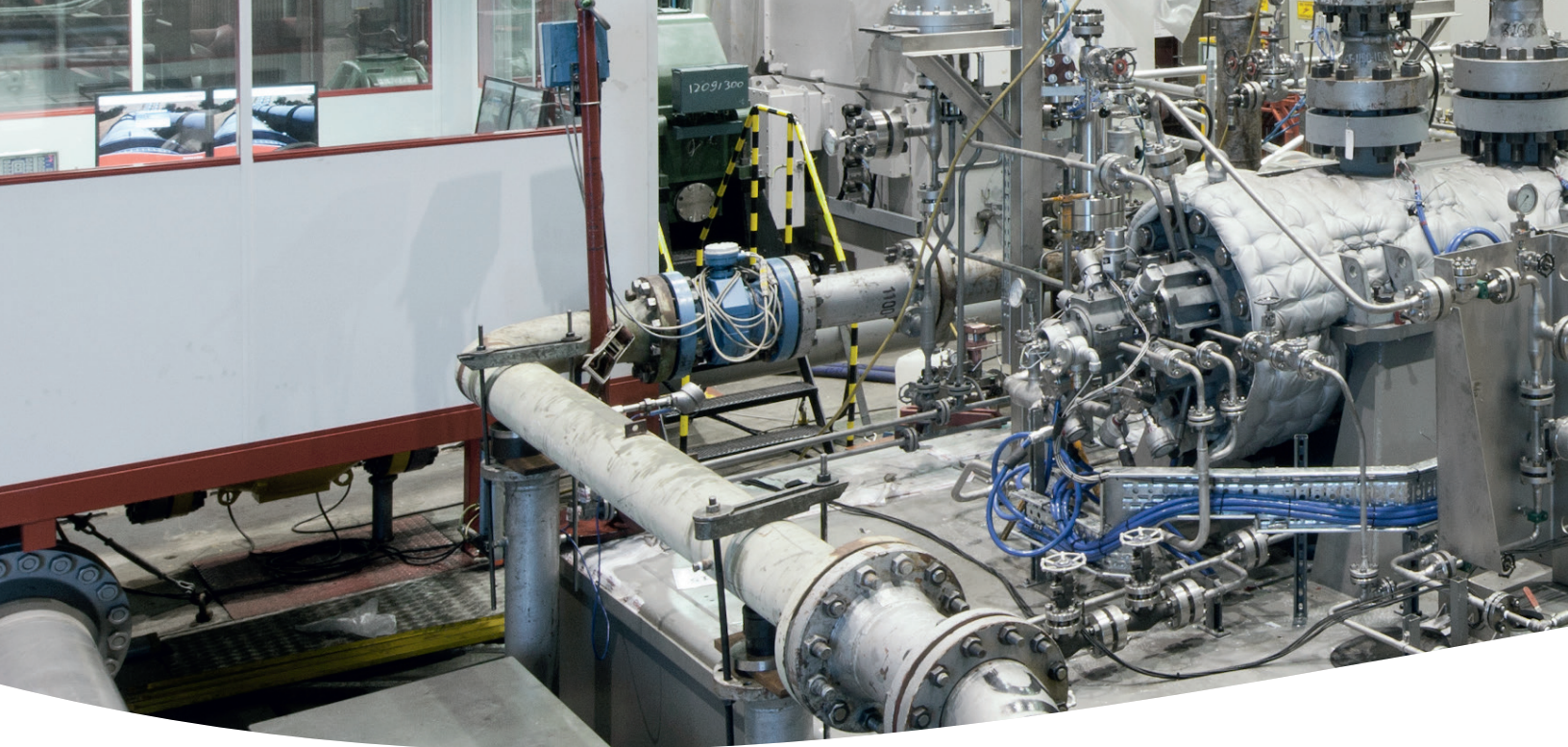


Flowserve Etten-Leur Test Center

Advanced Testing and Engineering Expertise
Serving Europe, Middle East and Africa



Experience In Motion



Providing unparalleled testing capabilities to the EMA market

Highly engineered pumps and seals are designed to meet specific requirements, but over time, their performance can decline. And as equipment performance slips, it can negatively impact your operation, causing increased downtime, higher maintenance and energy costs, lost revenue and more risk.

The Flowserve Etten-Leur campus is a one-stop shop for all sorts of aftermarket services. Engineers at the facility can respond rapidly to identify and correct issues related to pump and seal performance and reliability, regardless of the OEM.

Fully equipped with machinery and expertise

The Etten-Leur Test Center is part of the Etten-Leur campus. The campus is fully equipped, including high-end, five-axis CNC machines and a state-of-the-art warehousing system. It is staffed with about 100 engineers with CFD, FEA and CAD expertise to test, modify and repair pumps, seals and other equipment.

Some campus numbers

- 22,500 m² of floor area
- 100 dedicated engineers
- 450 operational employees
- 20 nationalities
- 35 high-end, five-axis CNC machines
- 20,000 different parts in stock

Testing capabilities

The Etten-Leur facility is designed to quickly meet the needs of customers in Europe, Middle East and Africa. With access to advanced testing capabilities, engineers can evaluate the performance of pumps and seals under real-world conditions. In addition, other equipment can be tested, such as gearboxes, valves and electric motors.

Pump testing capabilities

- 11 different loops
- Capacities to 30,000 m³/h
- Pressures to 400 bar (5,802 psi)
- Speeds to 9,000 rpm (VFD)
- Horizontal, vertical and submersible pump hydraulic testing
- String testing, field test simulation
- Measurements according to API 610/ISO and Hydraulic Institute standards (head/pressure/flow rate, power and efficiency, NPSH, vibration, noise)





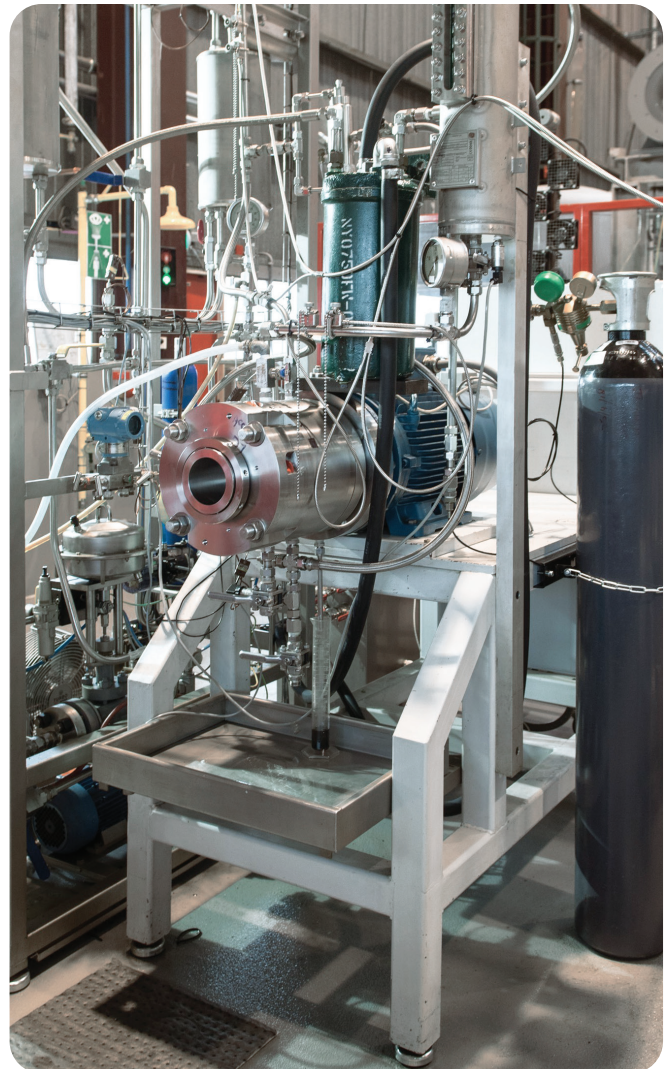
Seal testing capabilities

- Four test units
- Speeds to 7,000 rpm
- Pressures to 200 bar (2,901 psi)
- Temperatures to 150°C (302°F)
- Water, oil and caustic fluid condition testing
- Clean-room facilities for seal inspections and maintenance
- Face profile measuring
- Microscope
- Measurements according to API 682 (leakage, temperatures, lifetime)

High-energy testing

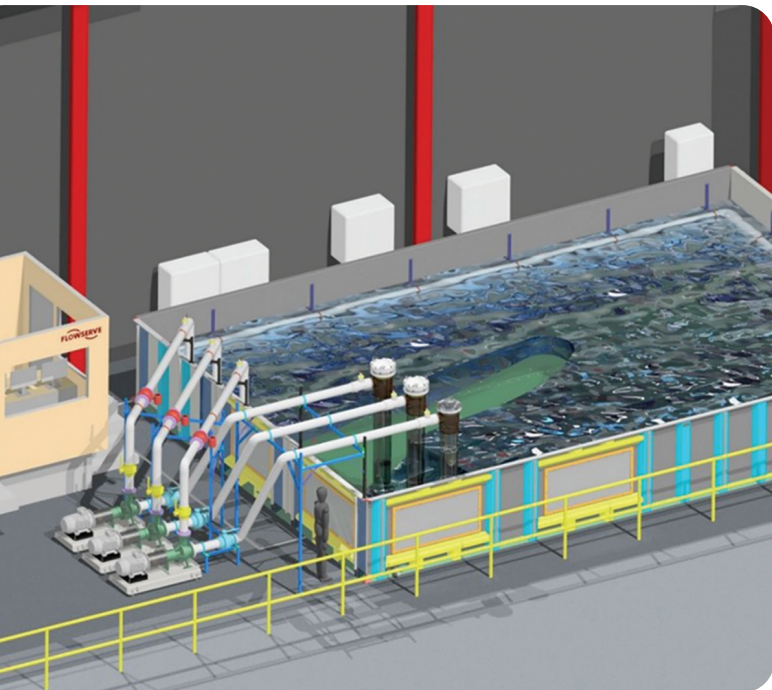
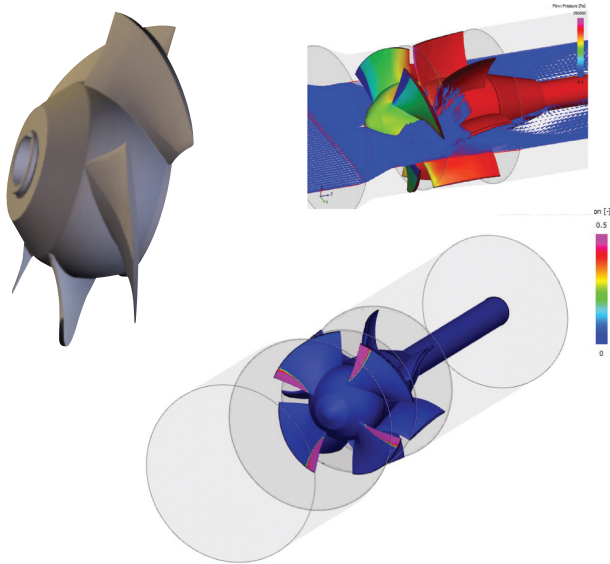
Testing highly engineered equipment under real-world conditions requires a huge amount of power as well as the ability to cool rapidly. To meet these needs, the Etten-Leur facility features the following:

- 28 MW (38,000 hp) of electrical power (largest electrical driver: 18 MW)
- 30 MW (42,000 hp) of cooling capacity
- Direct power supply of 150 kV; transformed to 3, 6, 6.6 or 10 kV
- 6 MW variable frequency drive electric motors to 13.8 kV
- Cutting-edge data collection
- Lifting capacity to 120 metric tons at 13 m (42.7 ft) height



Scaled model testing

For large, high specific speed pumps and critical NPSH applications, the Etten-Leur facility provides cavitation visualization and scaled model testing. Scaled model testing includes a dedicated loop for product and experimental tests as well as fully stainless steel piping and a vacuum tank to ensure the highest cleanliness level and visibility.



Pump intake testing

The facility provides Froude scaled pump intake testing for cooling water intake channels and sumps, surface water pumping stations and drainage stations. Free surface intakes are prone to issues related to submergence, air entrainment and vortex formation, directly impacting operational reliability.

Hydraulic engineers can improve performance and reliability by analyzing and addressing adverse approach flow conditions, free surface and submerged vortices, overall hydraulic conditions and local areas of high turbulence.

Electric motor testing

Flowserve offers electric motor testing at its Etten-Leur Test Center in the Netherlands. This capability ensures that electric motors are performing as expected after service, a major component change or design modification.

Electric motor testing is essential to ensure a motor's in-service operating power is consistent with its rated power. It also helps Flowserve determine how a motor is operating in a loaded condition, with all associated risks, or if the motor is oversized for a particular application — which could uncover cost- and energy-saving opportunities.

Variable frequency drives (VFDs) or variable speed drives (VSDs) are tested in combination with a motor to guarantee operational functionality.

Electric motor testing capabilities

The Flowserve Test Center's electric motor testing capabilities include:

- No-load testing, according to API 541 and IEC 60034 to 18 MW, on different kinds of voltages and frequencies
- Partial-load testing to 6 MW, according to API 541 and IEC 60043
- Full-load testing to 6 MW, according to API 541, through the back-to-back principle and — if required — mounted to a gearbox
- Problem diagnostics in vibration, temperature and sound
- Winding resistance measurement
- Winding insulation
- Polarization Index (PI) calculation
- Dielectric Absorption Ratio (DAR) measurements





Facts and figures:

- 150 kV direct supply from the distribution grid
- 28 MW (38,000 hp) of electrical power
- 50 Hz test voltages at 0.4, 3, 6, 6.6 or 10 kV
- Reverse power at 0.4, 6, 6.6 or 10 kV
- 6 MW variable frequency drive up to 13.8 kV
- Measurement of motor efficiency, with a maximum deviation of 1%

- Lifting capacity to 120 metric tons at 13 m (42.7 ft) height
- Seven test areas, the largest of which has a size of 270 m² (886 ft²)

All our instruments are calibrated according to API and IEC. Customers are welcome to witness Type and Factory Acceptance Tests (FATs). These tests are carried out in the presence of the end user or the subcontracted approval authorities.

Conveniently located

The Etten-Leur campus is easily accessible. It's centrally located near Europe's main seaports (Rotterdam, Antwerp and Hamburg) and airports (Amsterdam, Brussels, Paris, London and Frankfurt).



Testing Center

① Etten-Leur

Seaports

② Rotterdam

③ Antwerp

④ Hamburg

Airports

⑤ Amsterdam

⑥ London

⑦ Paris

⑧ Frankfurt

⑨ Brussels



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