On-board datalogger for dynamic pressure and strain for hydroturbines

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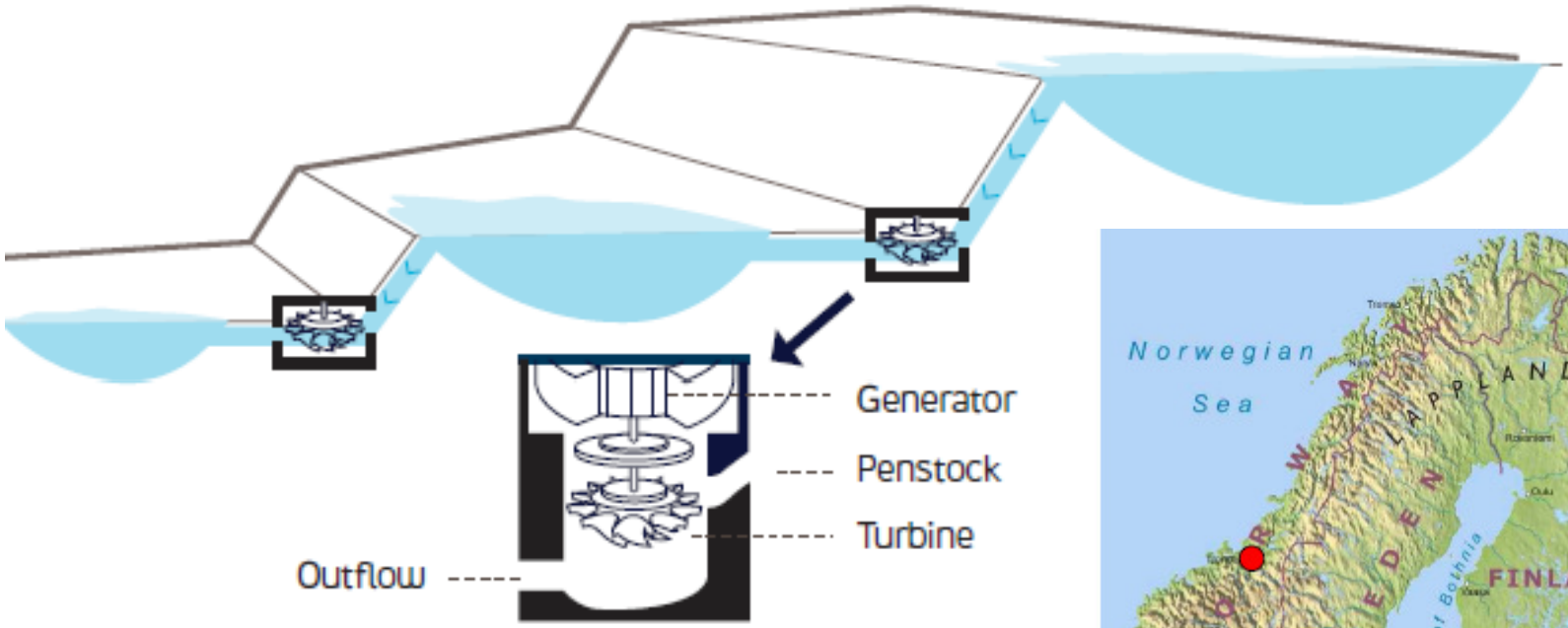
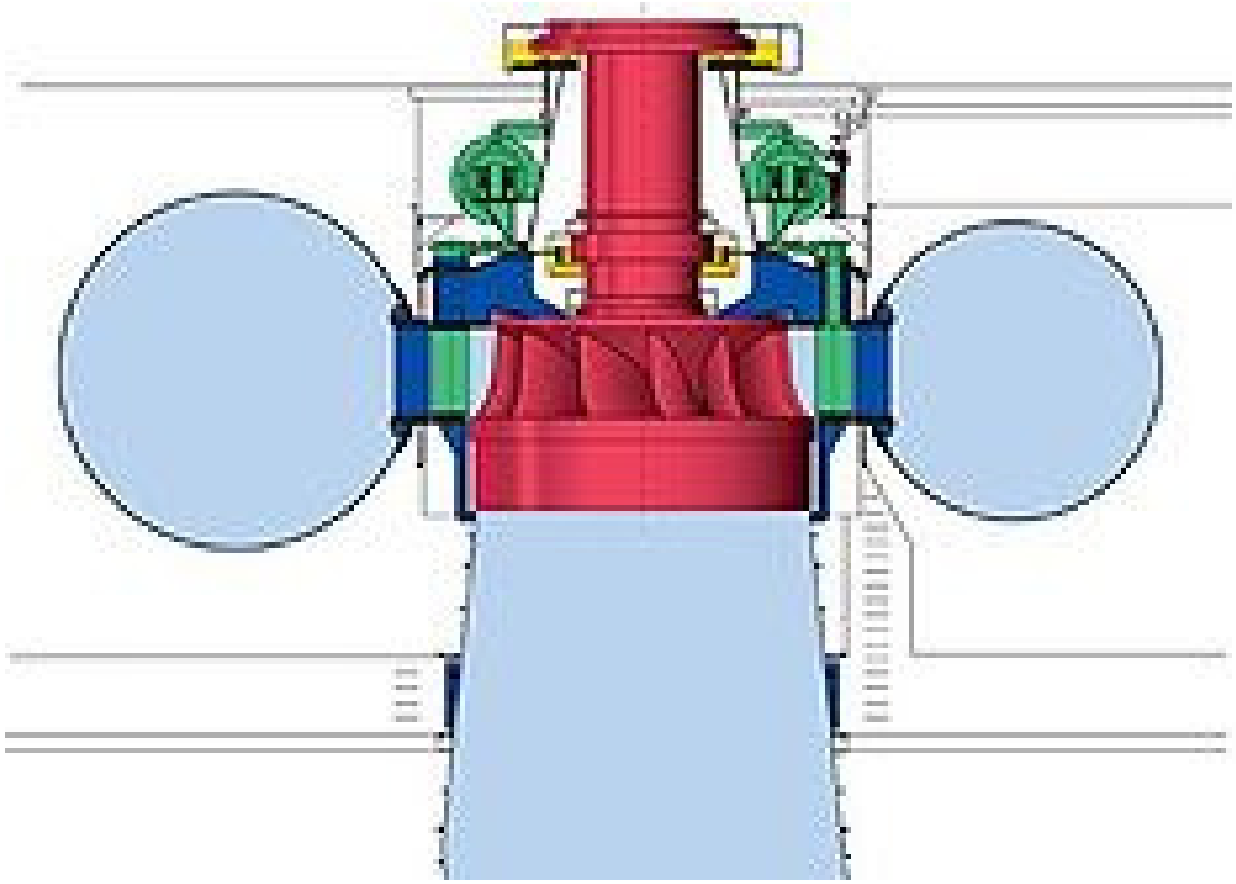
NATIONAL INSTRUMENTS

Hydro Power is an economic form of renewable energy

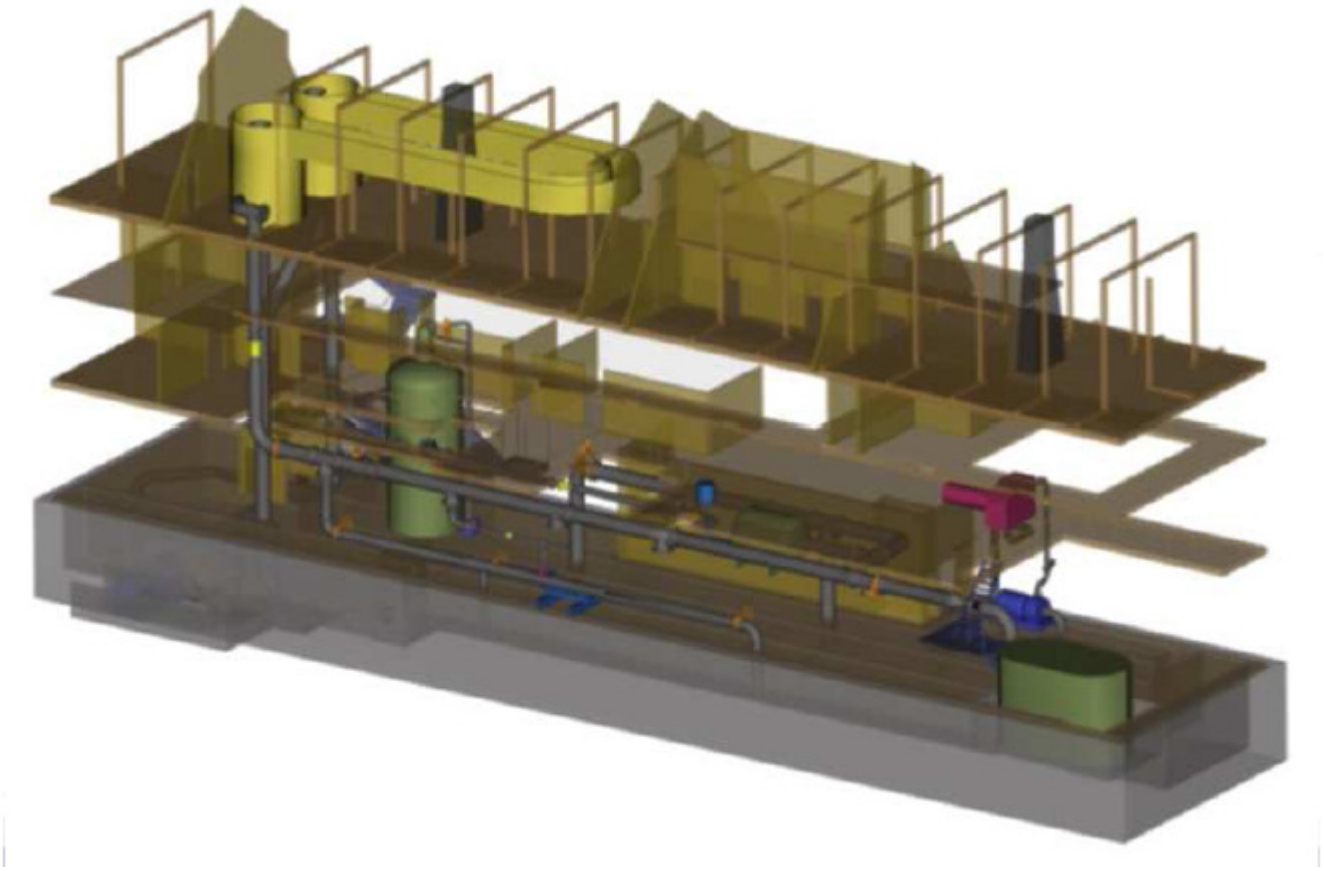


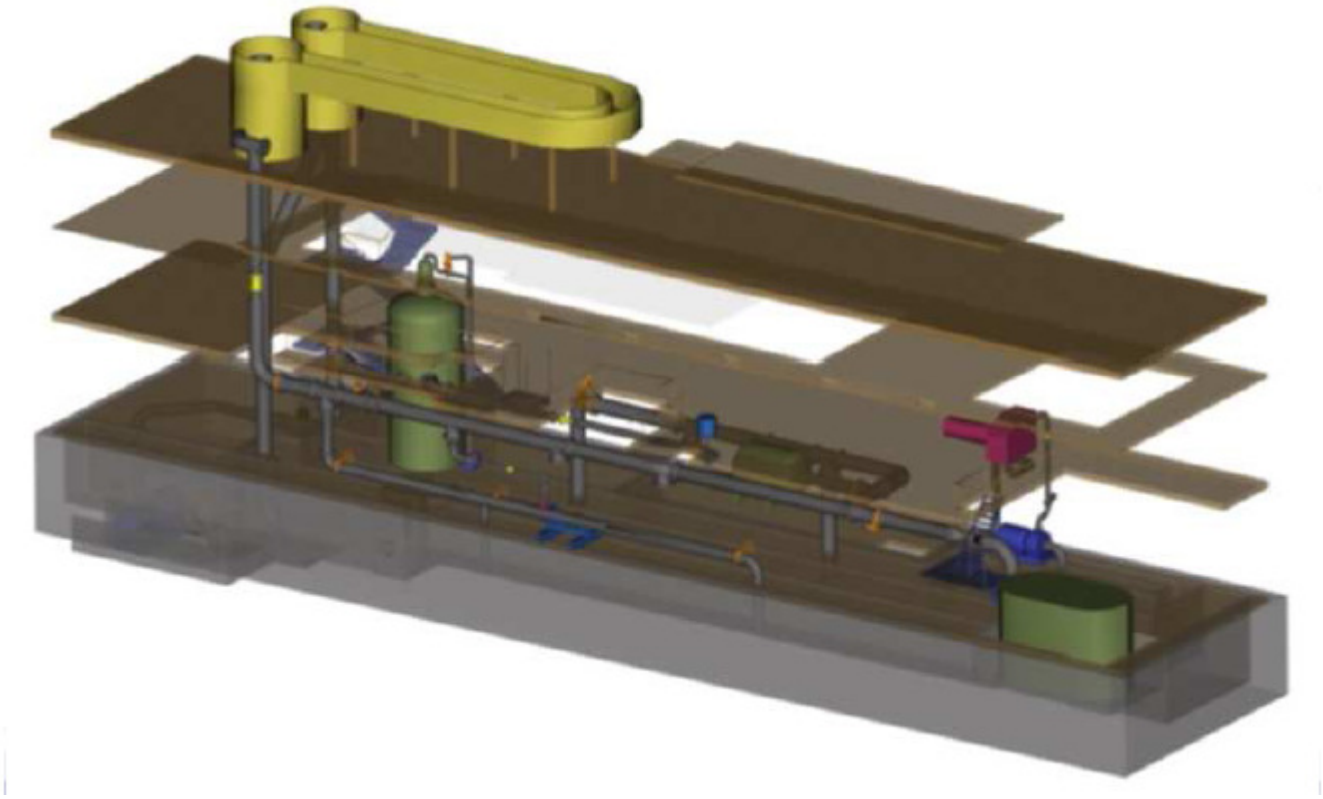
Runner Failure Cracking of turbines is a major problem

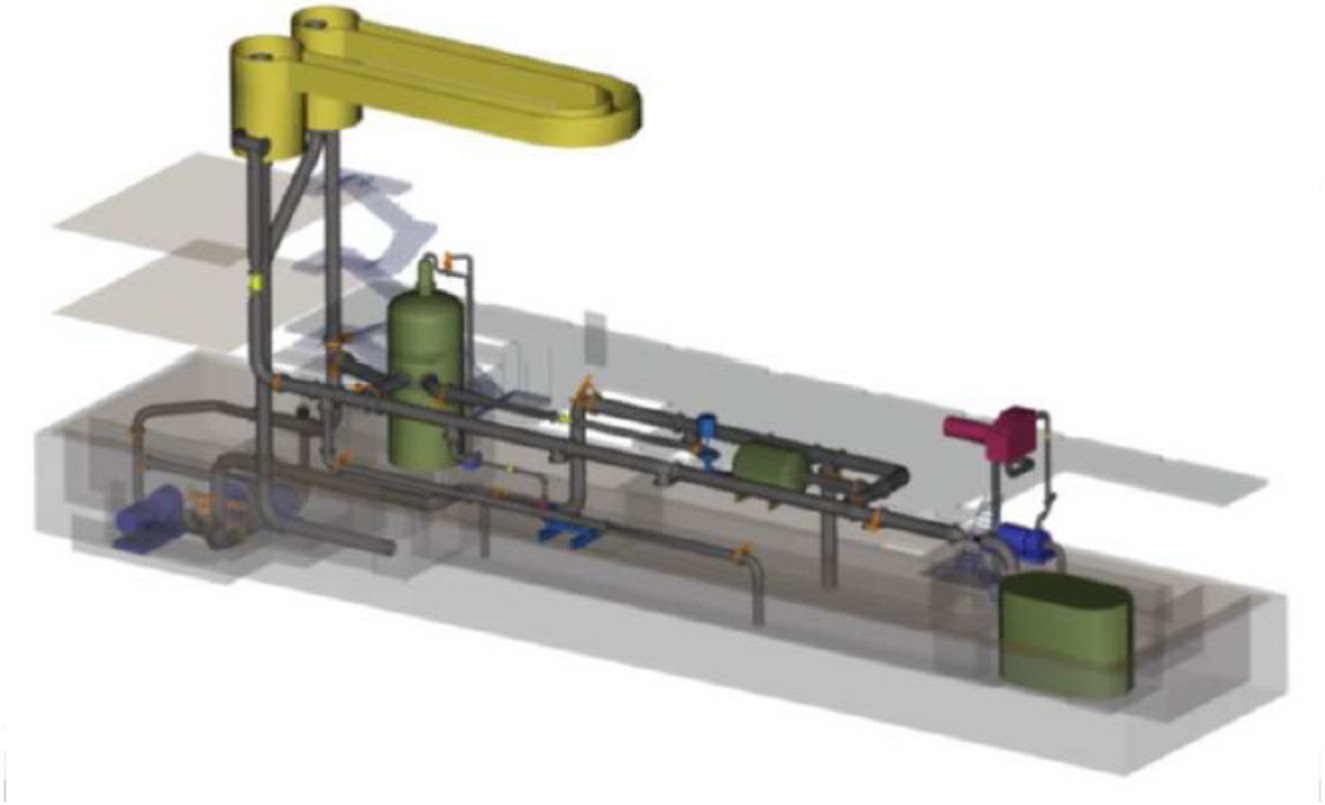
Francis turbines are the most common water turbine in use today

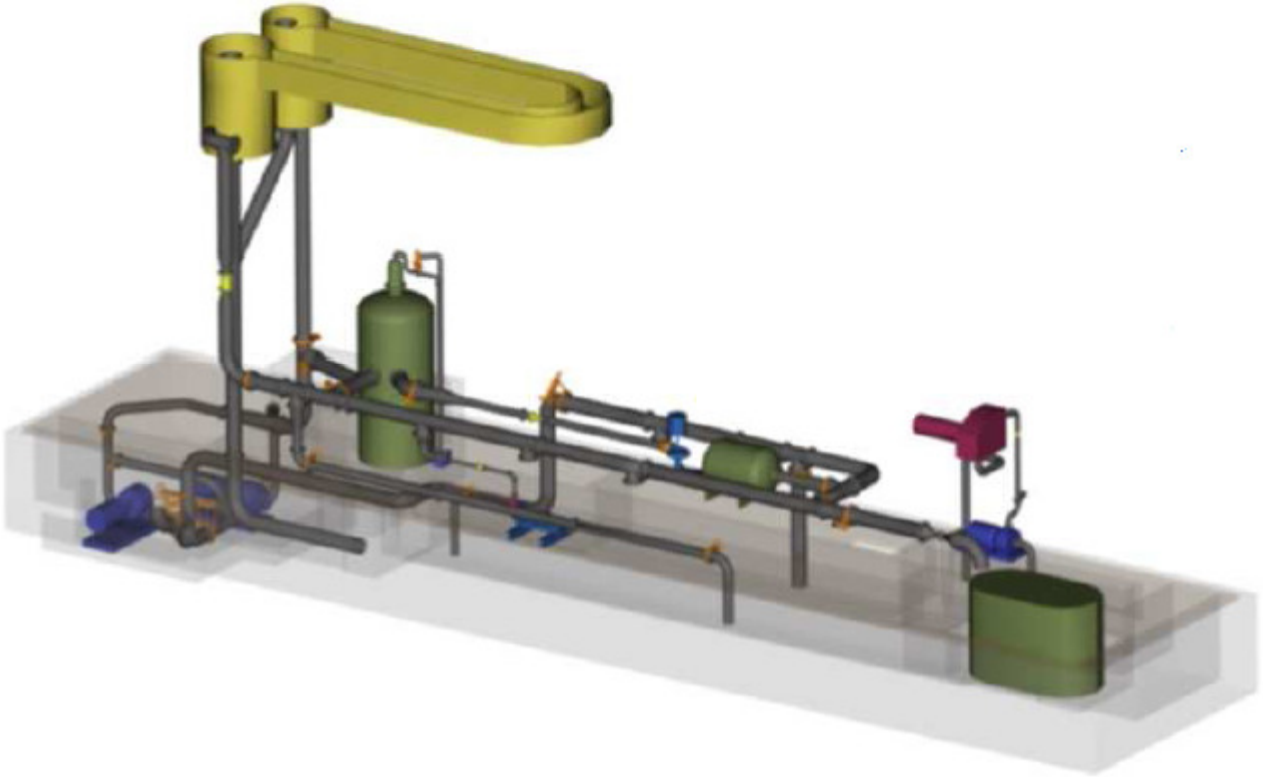


Waterpower Laboratory design



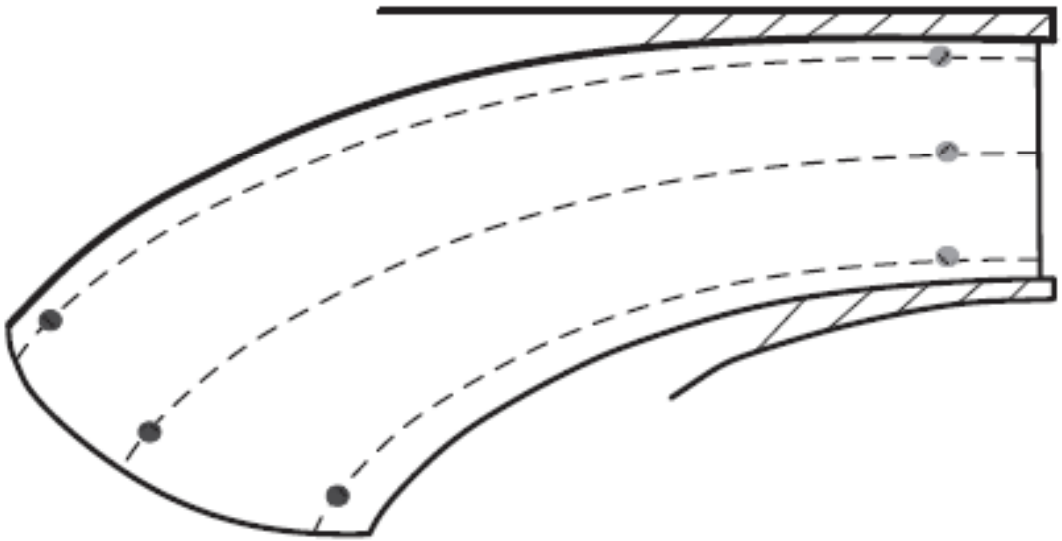




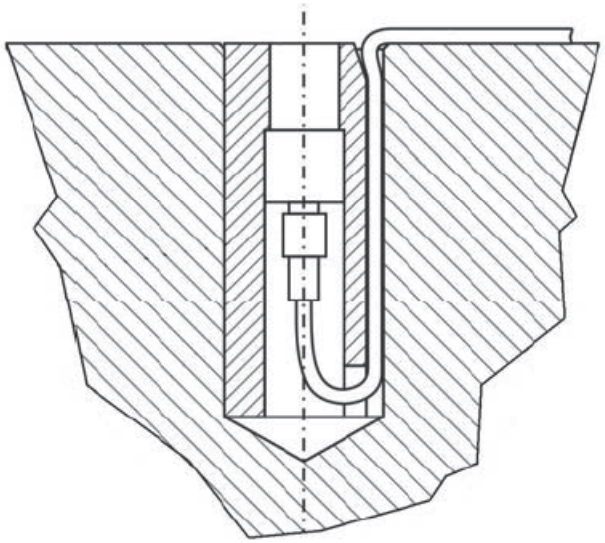


Strain gauges and pressure transducers installed on runner blades

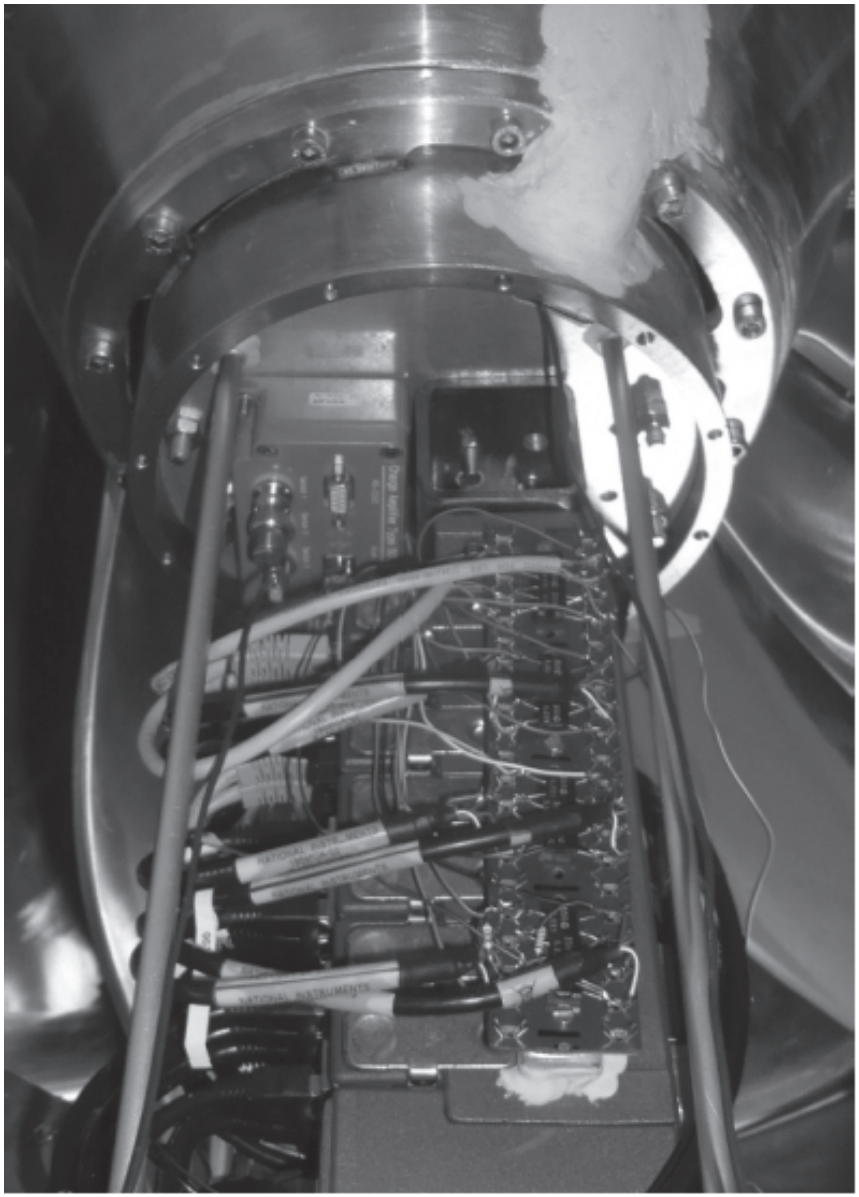
Placement of pressure transducers in prototype runner blade



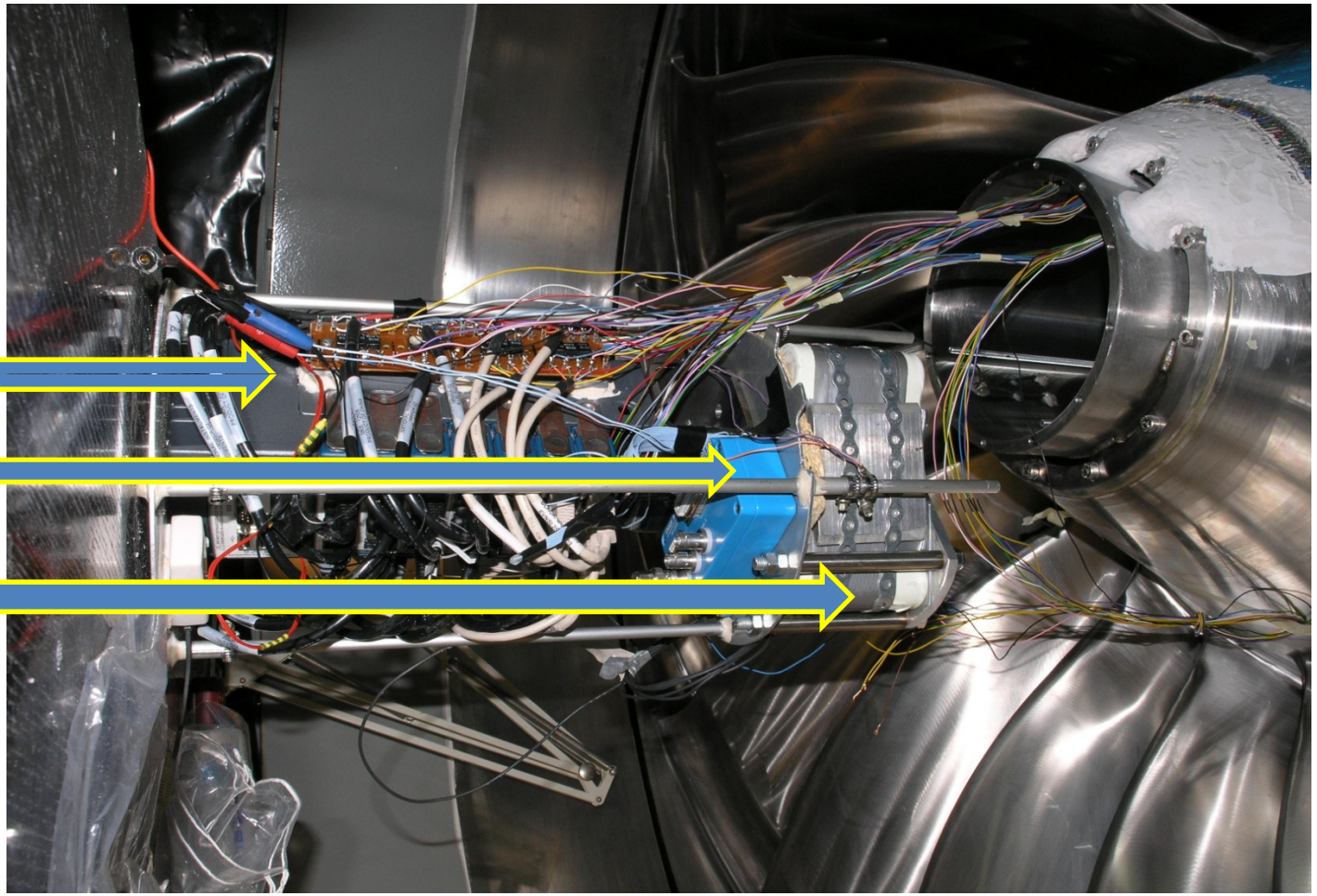
Inlet pressure fixed in plexiglass housing



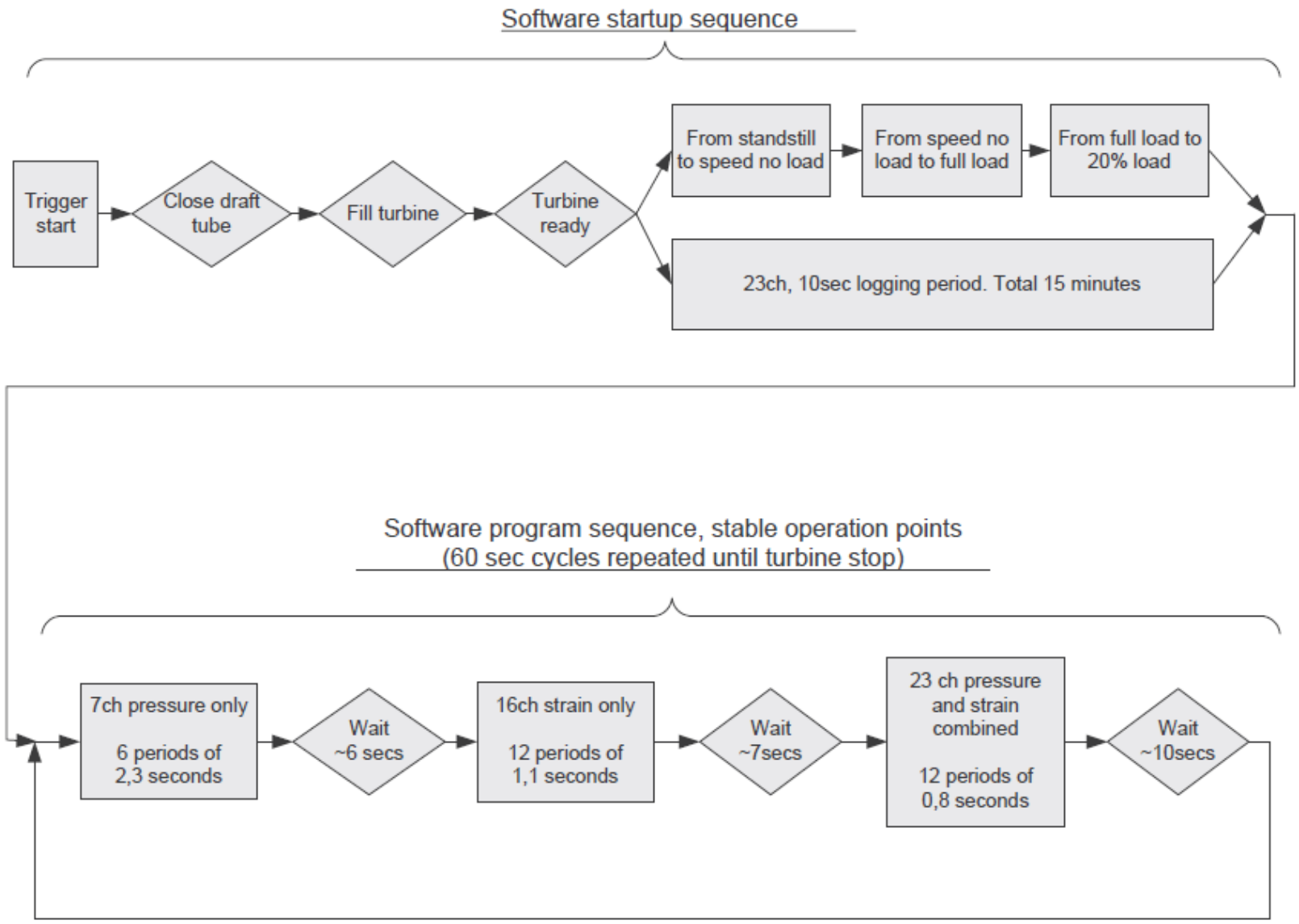
Onboard Data Logging Unit was inserted in turbine



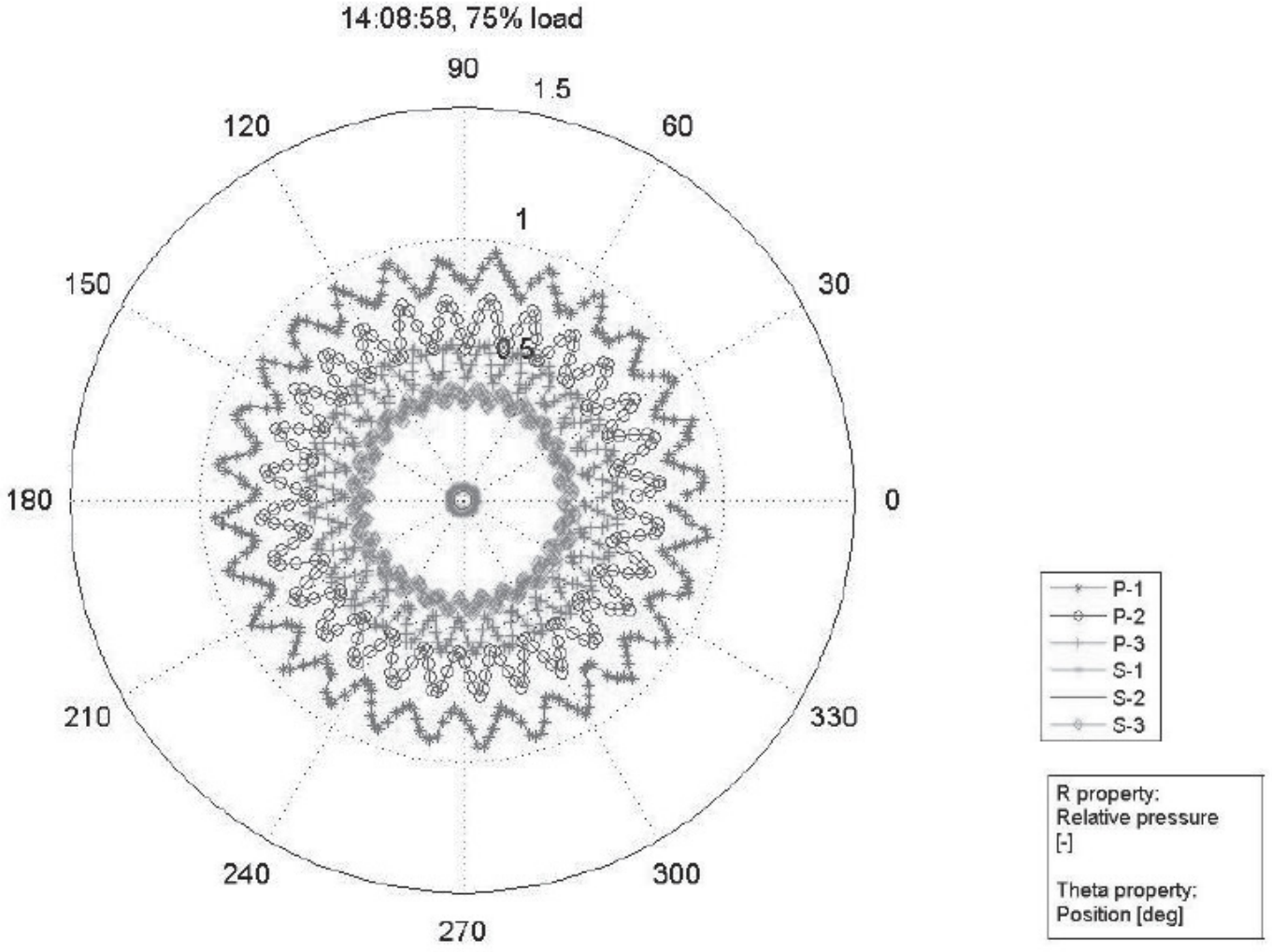
Data logger ready for insertion in watertight compartment



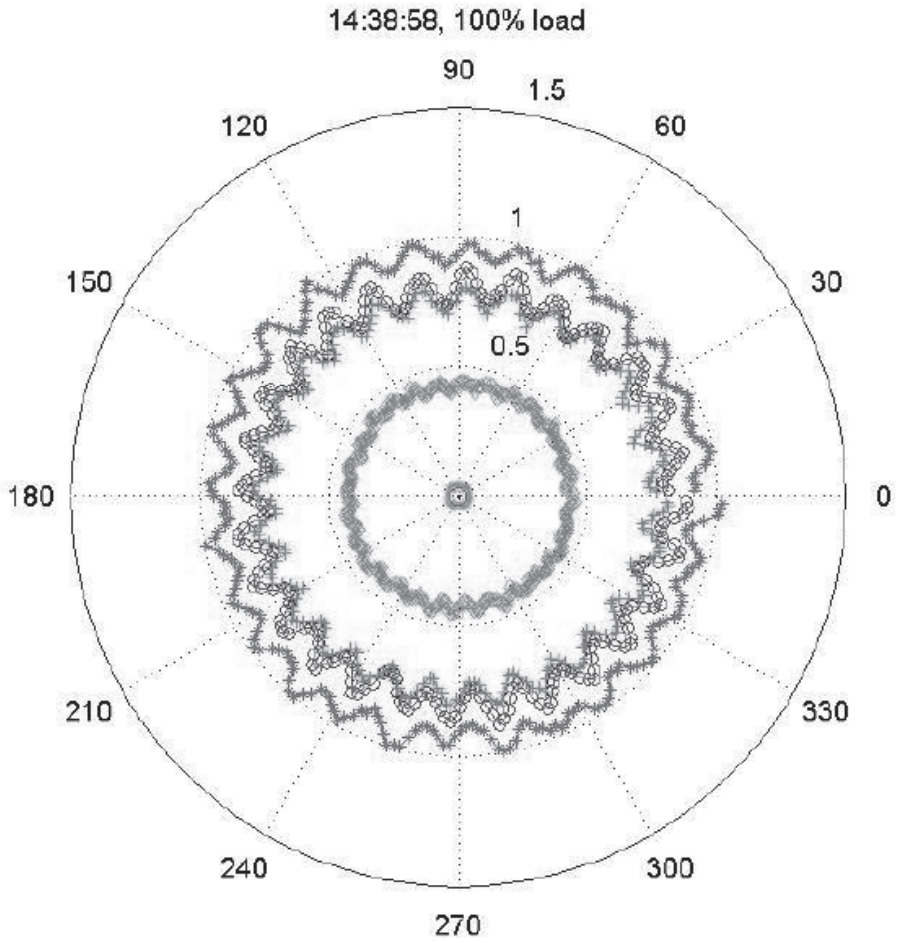
Completed System minutes before filling the unit with water


Software startup sequence
Trigger start
Close draft tube
Fill turbine
Turbine ready
From standstill to speed no load
From speed no load to full load
From full load to 20% load
23ch, 10sec logging period. Total 15 minutes
Software program sequence, stable operation points
(60 sec cycles repeated until turbine stop)
7ch pressure only
6 periods of 2,3 seconds
Wait ~6 secs
16ch strain only
12 periods of 1,1 seconds
Wait ~7secs
23 ch pressure and strain combined
12 periods of 0,8 seconds
Wait ~10secs

Blade Passing visible as a sine curve



Data obtained provided solid foundation pressure oscillation studies



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