Development of Geothermal Turbine

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1. Who we are

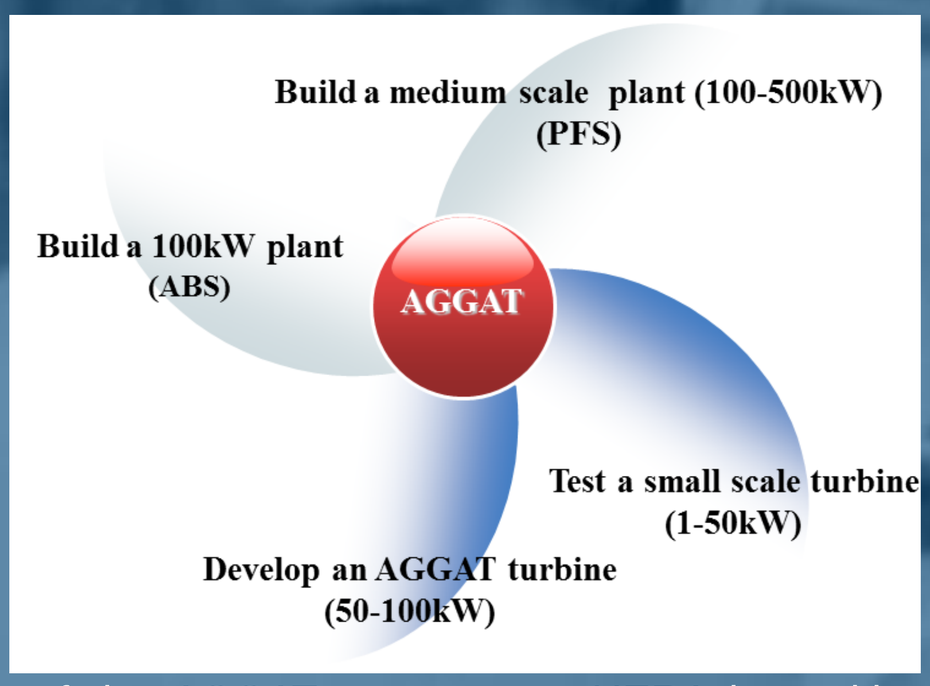
The **New Zealand Heavy Engineering Research Association (HERA)** is an industry owned, non-profit research organisation dedicated to serving the needs of metal-based industries in New Zealand.

To meet the needs of a 100% efficient energy economy in the future, the **HERA-lead Above Ground Geothermal & Allied Technologies (AGGAT),** which is a co-operative research platform and brings together researchers, industry and international partners, is set to support the development of Organic Rankine Cycle power plant manufactured for the low enthalpy, geothermal and waste heat market.

***HERA** is also interested in seeking the **international collaboration opportunities** for the development of* Organic Rankine Cycle power plant.

2. What we do

The AGGAT programme consists of four objectives: small scale turbine test, AGGAT turbine development, 100kW power plant construction and medium scale power plant construction.

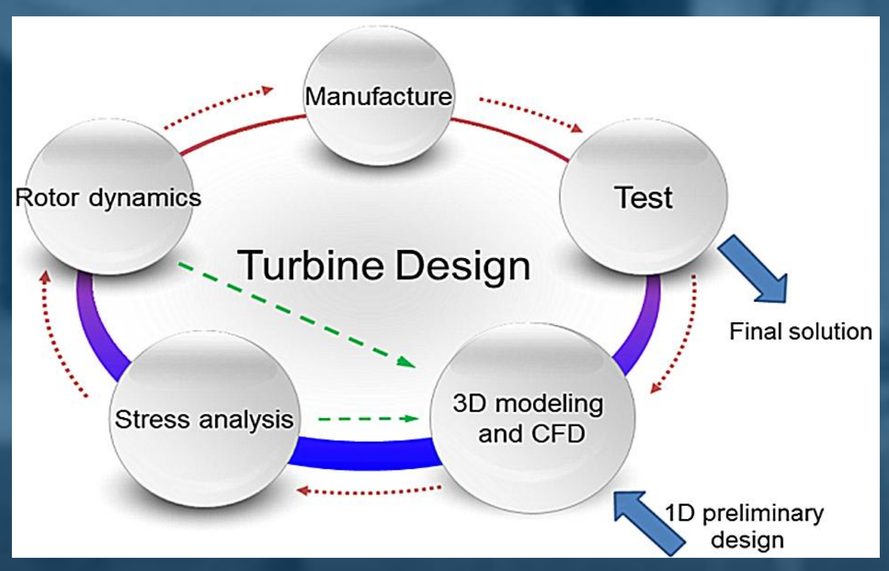


As part of the AGGAT programme, HERA is working on the development of medium scale **AGGAT Turbine** for power generation based on Organic Rankine Cycle Technology. The requirements of the design are:

- Power: 50-100kW
- Efficiency: ≥ 0.85
- Working fluid: R245fa
- Long lifespan
- High stability

3. How we do it

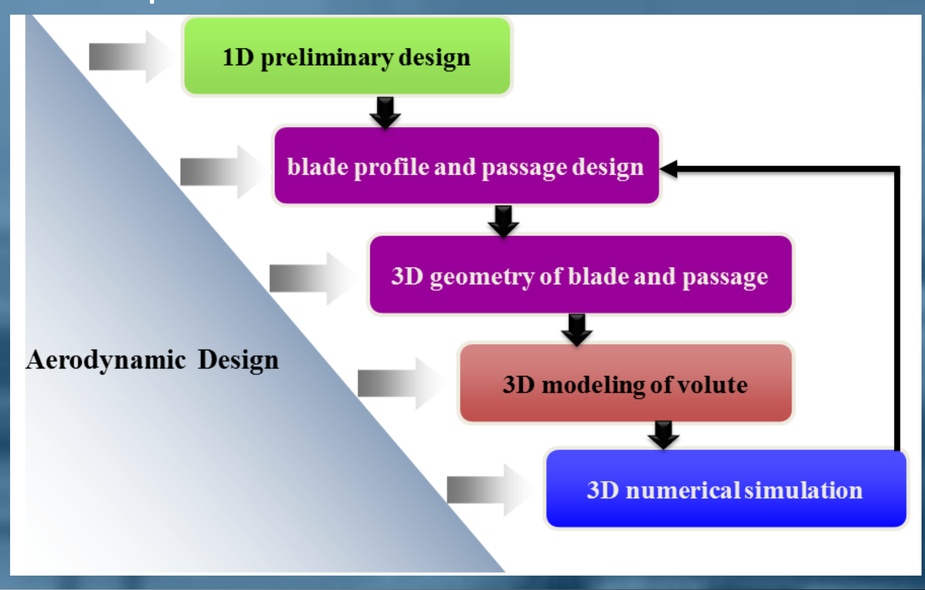
The design process of the geothermal turbine consists of five steps: aerodynamic design (1D and 3D modeling), stress analysis, rotor dynamics analysis, manufacture and test.



- Aerodynamic design: turbine 3D geometry
- Stress analysis: good structural design
- Rotor dynamics analysis: excellent dynamics and stability characteristics
- Manufacture: construction of turbine
- Test: validation of turbine performance

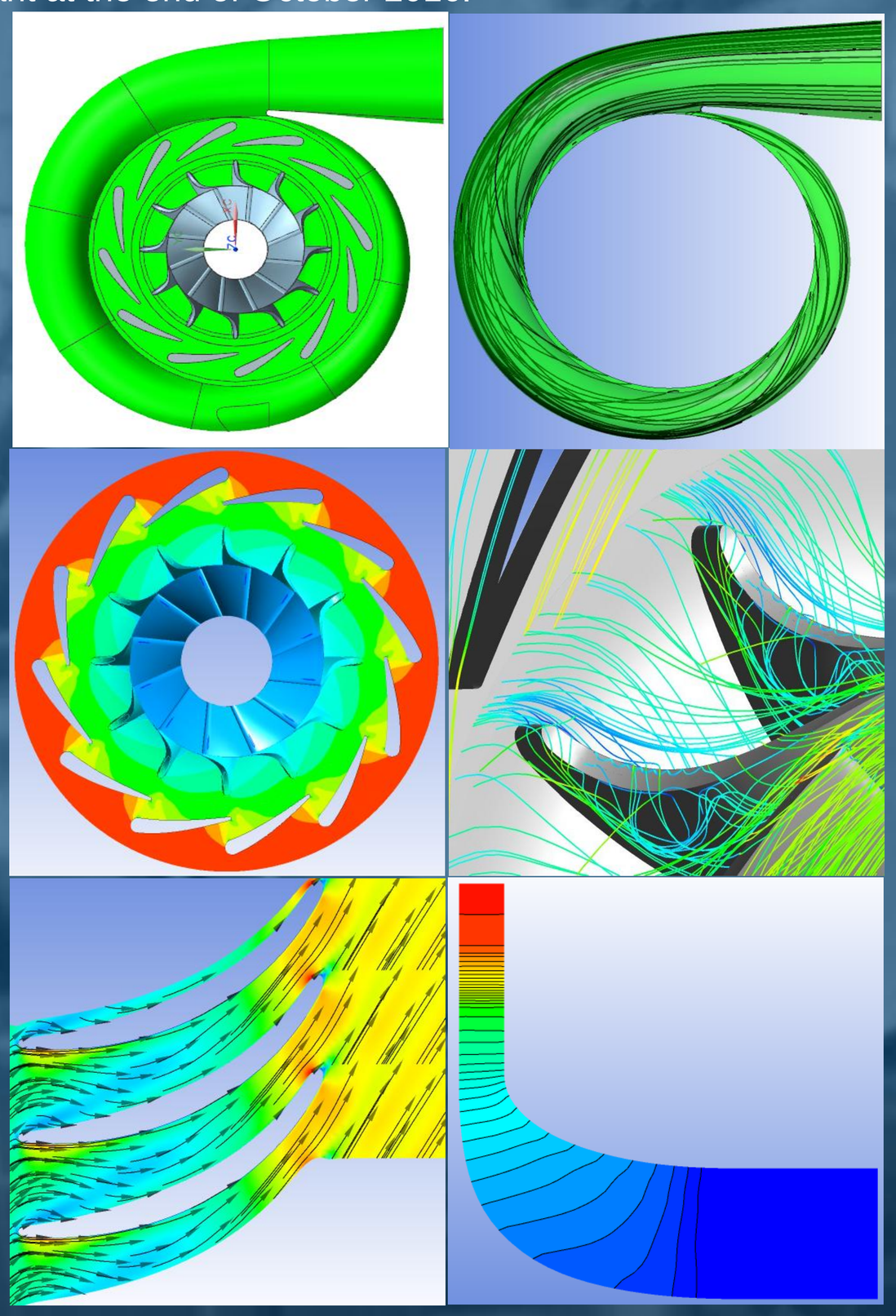
For the aerodynamic design, it has

- 1D preliminary design: well-matched flow conditions and basic dimensions of blade and passage
- 3D modeling of blade and passage: 2D design and 3D modeling of turbine blade and flow path
- 3D modeling of volute: 3D design of volute geometry
- 3D numerical simulation: numerically evaluate the turbine performance



4. Our current work

HERA is working on the aerodynamic design of AGGAT turbine with **power 100kW** and **efficiency 0.89** from the current design, followed by stress analysis and rotor dynamics analysis. We will complete the construction of geothermal turbine in March 2016 and finish the test in the pilot power plant at the end of October 2016.



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