



Identification of the installation/facility:

Country: Germany
Location (city): Goettingen
Name of the facility: Next Generation Turbine Test Facility (NG-Turb)
Date of construction or of acquisition or of main refurbishment: 2008 - 2014
Owner: DLR Institute of Propulsion Technology
Contact point: Turbine Department, Frank Kocian (Frank.Kocian@dlr.de)
Internet site: <http://www.dlr.de/at>

Technical characteristics:

1 - Type of infrastructure

Wind tunnel	<input type="checkbox"/>
Propulsion bench	<input checked="" type="checkbox"/>
Structures facility	<input type="checkbox"/>
Material facility	<input type="checkbox"/>
Simulator (ex. Flight simulator, tower, ...)	<input type="checkbox"/>
Flight test bed (aircraft, embedded facilities, ...)	<input type="checkbox"/>
Supercomputers	<input type="checkbox"/>
Other	<input type="checkbox"/>

2 - Main technical characteristics

Continuous running turbine facility (closed circuit)
Transonic flow (flow medium air)
Reynolds number $\leq 1,000,000$
Total inlet pressure $\approx 10 \div 200$ kPa
Total inlet temperature $\approx 300 \div 520$ K
Maximum turbine pressure ratio $\approx 10 \div 12$
Maximum turbine casing radius 450 mm

First stage of extension (one shaft configuration):

Number of turbine stages $\leq 2\frac{1}{2}$
Turbine shaft power ≤ 1 MW
Turbine speed $\leq \pm 13,000$ rpm

Future expansion (two shaft configuration):

Number of turbine stages (HPT shaft) ≤ 2
Number of turbine stages (IPT/LPT shaft) $1\frac{1}{2}$
Turbine shaft power (HPT shaft) ≤ 3 MW
Turbine shaft power (IPT/LPT shaft) ≤ 1 MW
Turbine speed (HPT shaft) $\leq \pm 15,000$ rpm
Turbine speed (IPT/LPT shaft) $\leq \pm 13,000$ rpm

3 - Research domains which can be addressed (refer to ACARE taxonomy <http://www.acare4europe.com/sites/acare4europe.org/files/document/ASD-Annex-final-211004-out-asd.pdf>)

- Increased turbine efficiency



- More efficient cooling technologies
- Combustor-turbine interaction (application of a combustor simulator)
- HPT-IPT/LPT interaction with short intermediate duct
- Fast rotating LPT's (applied in geared turbofan engines)
- Contra-rotating turbines (applied in counter rotating turbofan engines)
- Validation of computational methods
- Aerodynamic optimization

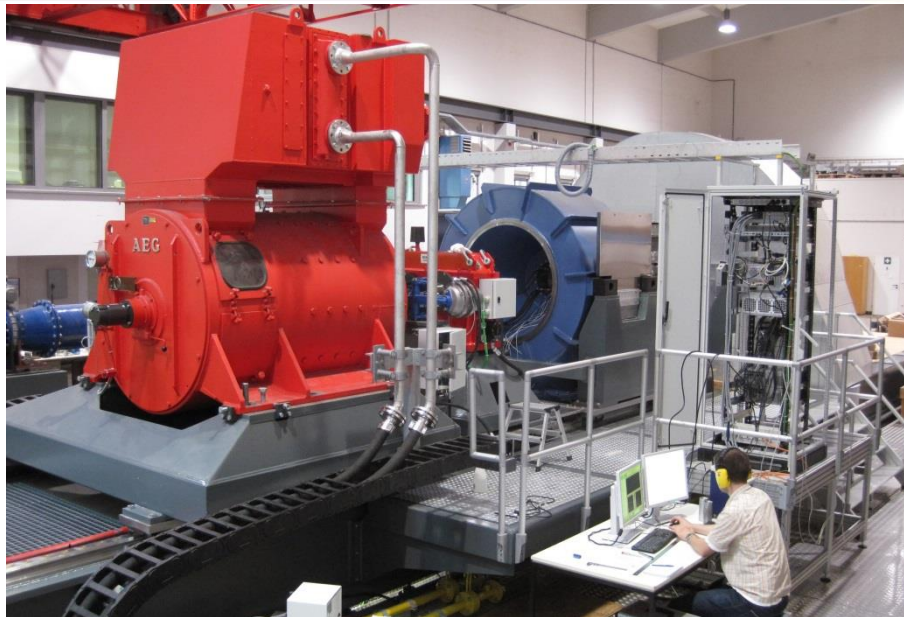
4 - *Main (or specific) associated measurement techniques*

- Standard techniques (pneumatic probes, steady and unsteady pressures, thermocouples, etc.)
- Laser measurement techniques (Laser-2-Focus Velocimetry, Particle Image Velocimetry, Doppler Global Velocimetry, Transient Grating Spectroscopy, Filtered Rayleigh Scattering, Light sheet techniques for detection of coolant concentration, etc.)
- Steady and unsteady surface pressures with Pressure Sensitive Paint (PSP)
- Heat transfer and cooling effectiveness with infrared image cameras or Temperature Sensitive Paint (TSP)
- Acoustic measurement techniques (microphone arrays)

5 - *Operational status*

- Fully operational with one shaft (first research turbine installed) in April 2015

6 - *Photo of the NG-Turb test rig (test-section)*



Financial elements:

Replacement cost (M€uros)

Less than 10

10 to 30

30 to 60

60 to 100

More than 100

Practices concerning:

Turbine research and development with industrial partners, preferably in a long-term collaboration (via contract).

Comments:

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Origin of information ('signature'): author and date

Hans-Jürgen Rehder, 26 August 2014