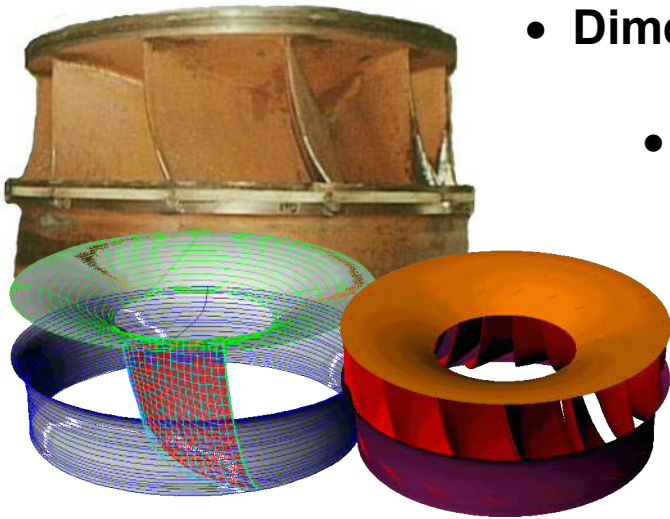


"Precision Measurement We'll do it for



- Dimensional measurement specialists
- Shape and surface measurement
- 3D coordinate measurement
- Reverse engineering
- Alignment
- QA
- GD & T
- Machine control
- Dynamic Measurement

Industrial Measurement specialists.
The leaders in dimensional measurement and analysis.

- Hydroelectric Brochure -



ADS



Advanced Dimensional Solutions Pty Ltd

www.a-solution.com.au



Capability Summary – Hydroelectric

ADS has a range of instrument systems suitable for various Alignment, Inspection and Dimensional Measurement tasks in the Hydroelectric Industry.

Our measurement systems are mobile and flexible and allow rapid deployment. We are able to provide accurate and timely dimensional measurement solutions with an array of technologies including Leica, Faro and API Laser Trackers; PCMM – Potable Articulated Arm, and Precision Industrial Total Stations. These, along with our main metrology software - Spatial Analyzer, provide state-of-the-art 3D measurement systems.

Note that the technology employed for most of these projects is fully 3 dimensional (3D). There are significant advantages to be gained over linear 1D & 2D approaches that use instruments such as stick micrometers, callipers, pi-tapes, plumb lines, positional geometric lasers etc. However, ADS can readily complement and integrate its modern 3D technology with traditional mechanical methods and work closely with other contractors where necessary.

Our capabilities include but are not limited to the following:

Shaft alignment Machine static Centres CL axis of Rotation	Verticality & Straightness, Parallel & Angular offset $\pm 0.005\text{mm/m}$ Dynamic Orbit measurement $\pm 0.010\text{mm}$
Machine and component Position, dimensioning, shape and alignment	Surface shape profiles deviations to drawings, Dimensions Diameters, $\pm 0.010\text{mm}$ Stator, Rotor, Runner
Concentricity, Circularity, Ovality Cylindricity, Parallelism	Stator, Rotor, Shafts, Runner, Seals, Journals, Bearings (rotational & geometric) $\pm 0.010\text{mm}$
Flatness, Level, Perpendicularity & Elevation	Turbine/Generator shaft coupling faces, Cheek Plate, Thrust pads/bearing, Sole plates $\pm 0.005\text{mm/m}$
Disassembly and reassembly checks	- Dimensional, Position, Alignment, Elevation $\pm 0.010\text{mm}$
Positioning, Pitch & Orientation	3D coordinate Position, xyz/r θ z deviations keybar re-Statoring, Guide vanes $\pm 0.005\text{mm/m}$
Reverse Engineering by digitisation for model testing and remodelling	Verification of existing hydraulic (wet) path of all surfaces and components of entire machine $\pm 0.010\text{mm/m}$
Static (epoch) Deflection monitoring	Turbine pit top cover, thrust; Stator sole plates $\pm 0.010\text{mm}$
Dynamic measurement In-situ machining control	Rotating component movement and deformation under operational conditions $\pm 0.010\text{mm}$
Measurement system Consulting and development for specific requirements.	



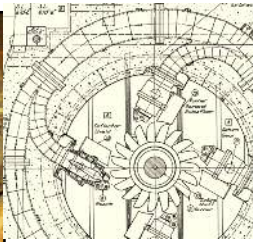
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Jet alignment



Core inspection;
static components



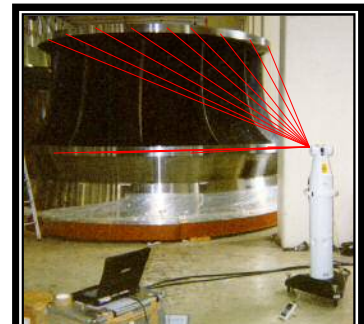
Bearing shape
inspection



Keybar positioning



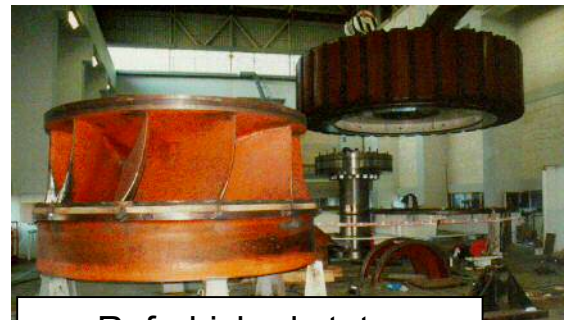
Pressure pipe
alignment



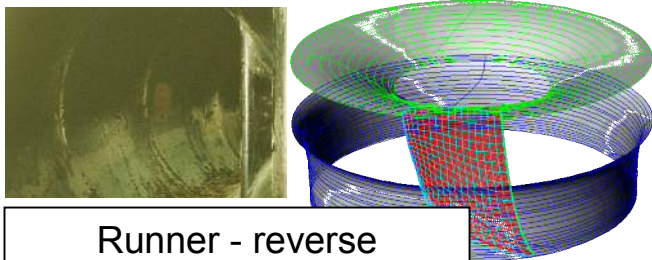
Runner Inspection



Rotor packet
dimensional inspection



Refurbished stator
installation



Runner - reverse
engineering & modelling



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Benefits

If you are involved in the mechanical/electrical overhaul, refurbishment, or maintenance of hydroelectric power turbines/generators, then you will have dimensional measurement and analysis requirements that you will want to guarantee to be within the specified tolerances. ADS uses the latest proven technology to obtain timely results you can rely on to easily meet specifications with significant benefits and cost savings. ADS has successfully applied its technology in all aspects of Hydroelectric work.

Once your project scope is known, use ADS to provide the most efficient integrated solutions including measurement sequence using our latest proven technology.

Get ADS involves before project commences to optimize benefits

Determine/guarantee outcomes

Where processes/sequences can be sped up/streamlined

How to integrate IEEE requirements and still ensure shortcuts/time savings

Reduce or avoid partial assembly/dis-assembly to check fits

Confidence, independent checks on traditional methods

Contractors' and Principal's independent QA

Avoid time waste and expense through well planned and thought through processes.

Accurate 3D information

- The greatest advantage of 3D Coordinate Measurement Systems over traditional mechanical methods and optical tooling techniques of traditional surveying is the flexibility gained by being able to measure and then analyse a complete machine and/or components in 3D.
- Geometric forms such as spheres, cylinders, circles, planes, cones and lines are applied to the data to determine sizes, shapes and alignment. Components measured dis-assembled can be **mathematically assembled**. This means that eccentricities, ovality, clearances, diameters, and runout can be determined and assessed from the data before assembly without trial partial assemblies.
- Correct remedial work and adjustments can be made in a timely manner.

No physical references

It is not necessary to physically reproduce any geometric form such as a surface or centre line with a piano wire or by placing an instrument on that feature. All measurements, adjustments and positioning can be easily made from any suitable location.

Significantly higher accuracy and reliability

Significantly higher accuracies are achievable with reliability and the ability to measure and obtain results faster. With the laser tracker 3D point accuracy of 0.005mm/m is achieved. Results are provided correct at the standard reference temperature of 20°C or at any other required value. Tighter tolerances are more readily achievable.

Fast and flexible measurement

Mobile instrumentation enables on site measurement of components. When appropriate, ADS can readily complement its modern 3D technology with traditional mechanical methods and work closely with other contractors where necessary.



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Cost Saving benefits:

- ✓ Get the whole machine right – good Condition Monitoring practice.
- ✓ Reliable assessment – better maintenance/overhaul decisions.
- ✓ Rapid deployment and Faster measurements - Less down time
- ✓ More accurate results - longer periods between maintenance
- ✓ Tighter Tolerances – production efficiency gains
- ✓ Tighter Tolerances – smooth and faster start-up generation

ADS - Hydroelectric Experience

Since 1994 our staff have been applying leading edge dimensional metrology systems in the **Hydroelectric** industry (and many other industries) throughout Australia, New Zealand and overseas. Our experience includes providing Alignment and Dimensional Measurement Services for the refurbishment and overhaul of both vertical and horizontal **turbine generator** machines (often multiple at the larger power stations) requiring mechanical overhaul, half life refurbishments, upgrades, repair and maintenance or monitoring.

ADS has been involved in numerous major and minor projects both for the Principals (current and former owners) and via their Contractors at various Power Stations over the last 19 years.

New Zealand power stations we have worked at are:

- Manapouri (P:Simon Ashton)
 - Runner, spiral case and draft tube digitising and surfacing for redesign – 1 machine.
 - Rotor Inspection 3 machines
 - Half life refurbishment 4 complete machines
- Aviemore, Benmore, Coleridge, Clyde, Ohau, Tekapo A&B, Waipori, Waitaki. (C: ABB, Alstom, Transfield etc)
- Roxburgh (P: Colin McDonald, C:TGE)
 - Stator optimisation sector rewedging 5 machines; /rebuild – cylindricity, positioning, dimensioning, and referencing the position of the axis of rotation – 9 machines.
 - Shaft alignments – 10 machines.
Major restatoring/recoring keybar installation; Rotor Inspections - 5 machines
- Arapuni, Aratiatia, Atiamuri, Karapiro, Whakamaru

Australian power stations we have worked at are:

- Bogong, Burrinjuck, Clover, Hume Weir, Eildon, Sugarloaf, McKay Creek, West Kiewa, Jindabyne, Tumut I&II, Murray I&II, Eildon, Gordon, Poatina, Palooona, Meadowbank, Tungatinah, Kangaroo Valley, Kareeya, Barron Gorge. (P:Stanwell, Snowy Hydro, Southern Hydro, Hydro Tasmania –Paul Henderson, AGL, TGE, GE, Alstom etc)

Contact ADS to discuss the best solutions for integrating mechanical and measurement sequences to achieve/exceed specified tolerances and specifications in the most efficient way.



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ADS Quality System is certified to ISO9001:2008