

Rennasonic Inc. is a global leader in the testing and inspection of hydroelectric turbines and pump turbines for utilities and manufacturers around the world.

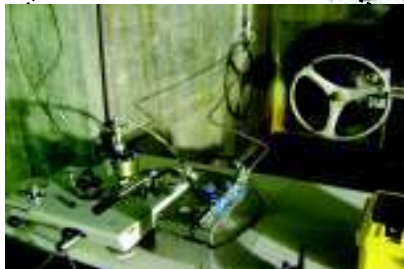
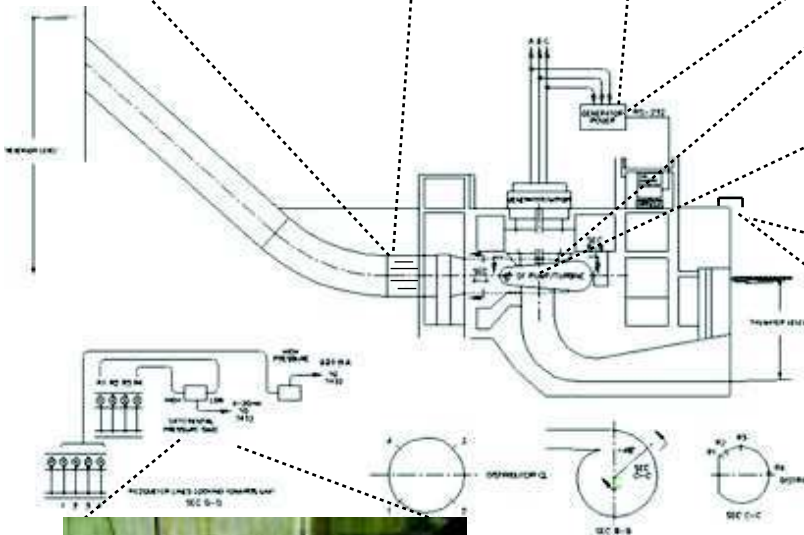
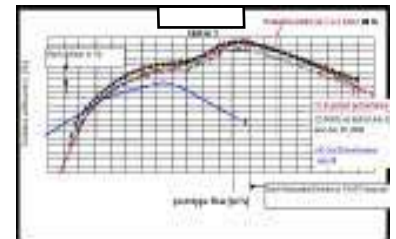
Our strength is in helping clients reduce their test time to place their prototype units into commercial operation as soon as possible. For more than 26 years, we have tested and certified turbines using electronic data acquisition techniques. In fact, we were pioneers in bringing automated data acquisition equipment for data collection. Today most test engineers utilize data acquisition systems that improve data quality and lower random uncertainties.

Our services include:

- Turbine performance testing
- Pump performance testing
- Pump turbine performance testing
- Index and witness testing
- Pressure pulsation and vibration testing

We also have performed vibration, and pressure pulsation testing identifying resonances and rough avoidance zones of operation for prototype turbines. Our global network of testing experts and state-of-the-art testing equipment will provide you with the guidance and services that are needed. We focus on solutions that demonstrate our expertise, our client-centered philosophy, and our commitment to being a fast and efficient testing partner

If you require more information contact:
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Excerpt From Typical Report:

Deliverables:

Test Plan - a complete test plan, once the plant configuration is known.

Rental of pressure/ level sensors, calibration equipment, and other items such as power meter and other sensors.

Report - a complete report summarizing all findings that includes all calibrations and tests that were performed.

All testing is performed in accordance with either ASME PTC-18 or IEC 60041 when appropriate including an uncertainty analysis.

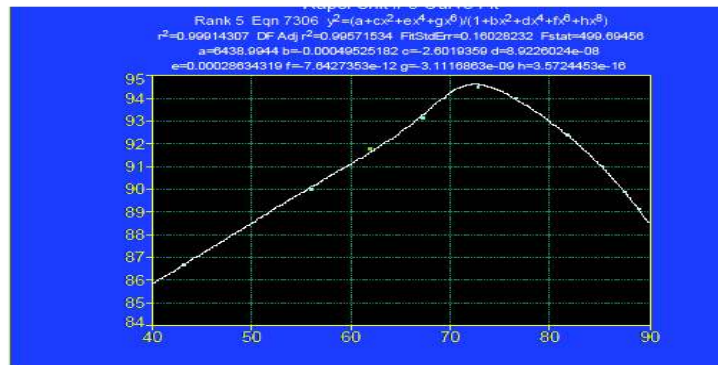
Our Data acquisition system interfaces to all major multi-path flowmeters using Modbus Protocol.

SUMMARY

The weighted turbine efficiency of xx.xx% was calculated using overall test uncertainty of +/- 1.2% as dictated by the contract. The performance of the turbine was measured in the field using the methodology outlined below. The performance data was reduced to reference conditions using the affinity laws as outlined in the test code. A curve fitting program was used to fit several hundred curves to the data and quotient of 7th order polynomials was chosen to fit the data and evaluate the performance. This function was chosen since the correlation coefficient is the lowest and the function does not depart from the data unrealistically over the entire region data. Table one lists performance guarantees, weights and results.

Guarantee					Field Results	
Power %	Power MW	Flow CMS	Efficiency %	Weighted Efficiency %	Actual Efficiency %	Weighted Efficiency %
95	70.0	100.7	94.00	9.40		
90	66.3	95.4	94.00	28.20	xx.x	xx.x
80	58.9	86.4	92.20	23.05	xx.x	xx.x
65	47.9	87.3	88.60	17.72	xx.x	xx.x
50	36.8	59.6	83.60	12.54	xx.x	xx.x
Total				90.91		xx.x

Table 1 Performance Guarantee Comparison



A zoomed in figure of the derivative indicates a zero crossing at 72.5 MW which indicating the peak efficiency of 94.59 %. The graph of the function and the performance data is presented below in figure 4

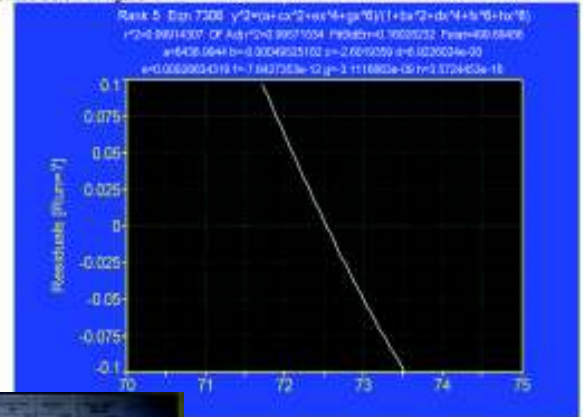
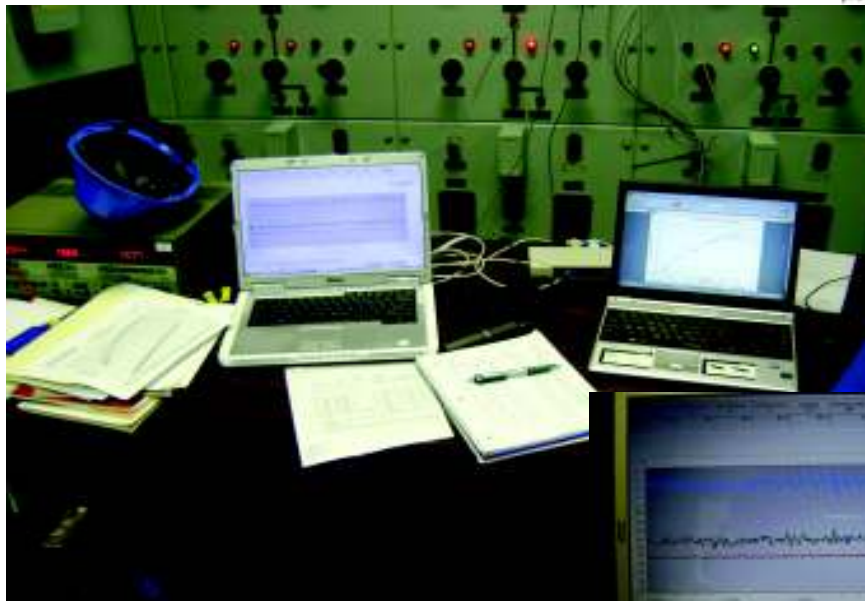


Figure 3 Zoomed derivative of function

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