

BESPOKE SOLUTIONS FROM OUTSIDE THE BOX

Steam Turbine Axial Exhaust Movement Monitoring System.



CHALLENGE

A continuous movement monitoring system consisting of 14 individual LVDT sensors, monitoring the Exhaust asset at one end of the facility by the control room at the opposite end.

SMART UNIQUE SOLUTION

- High efficient robust solution for early indication of potential movement issues
- Utilising WirelessHart, Fibre optics interfacing the LVDT sensors with the Yokogawa DCS
- Repurposing the Rosemount 848T to monitor and update the LVDT measurements

PARTNERSHIP OUTCOME

- Bespoke position monitoring solution for plant operation and safety
- Team approach; Design, Installation and Commissioning
- Fully optimised future proof solution

TECHNOLOGY AND BRANDS

- Rosemount WirelessHart 848T
- Rosemount WirelessHart 1410 Gateway & 751 Fieldlink Module
- Fibre Optics and Transceivers
- RDP Electronics DCC050A LVDT
- Yokogawa DCS



EFFICIENCY ENGINEERED



VALUE ENGINEERED



SAFETY ENGINEERED



PARTNERSHIP ENGINEERED



CONSISTENCY ENGINEERED

THE CUSTOMER AND BACKGROUND

Suez recycling and recovery UK, nestled close to St Austell Cornwall, is an Energy from Waste (EfW) facility with a 24-megawatt electrical capacity, which is exported to the National Grid. The EfW plant was commissioned June 2018 and has been converting Cornwall's household waste to energy ever since.

THE CONTEXT AND CHALLENGE

The Steam Turbine situated at the far end of the facility in the Turbine Hall, has a large Axial Exhaust which diverts the spent steam into the air-cooled condenser.

The Axial exhaust is around 8m long and 3m diameter and is mounted on a steel beam and concrete foundation. Constructed out of 3 sections with a bellows type arrangement between each section, the Exhaust assembly is subject to large swings in temperature and kinetic forces from steam entering it from the turbine.

From a safety perspective it is necessary to measure any small changes in movement of the exhaust in relation to its foundation mounts.

In total there are 14 areas of possible movement that are required to be monitored (horizontal, vertical and depth) at strategic points around the exhaust. The movement measurements are required to be constantly monitored and alarmed within the control room situated at the other end of the facility.

OUR SOLUTION

Suez EfW teamed up with MJ Wilson and together designed, installed and commissioned a unique system, to meet the monitoring system requirements. Utilising LVDT movement sensors, Rosemount WirelessHart self-organising mesh network devices, existing site fibre optic infrastructure and the Yokogawa DCS with dedicated graphics and alarming, the solution took shape.

The position sensors chosen for the movement measurement being loop powered LVDTs (Linear Variable Differential Transformer) with a movement of 50mm scaled over the 4-20mA range.

LVDTs mounted on very sturdy, large thermal mass supports, in a Christmas tree type arrangement.

Example of two mounts with the LVDTs left & below. Each mount is customised for the specific area of the exhaust to be monitored. The LVDTs set to mid-range (25mm 12mA) at exhaust working temperature, to detect/measure positive and negative.



LVDT MOUNTS



MOVEMENT DISPLACEMENT MONITORING

The LVDTs were independently powered and the 4-20mA loop monitored through the Rosemount 848T Temperature multiplexer set to loop monitoring. 8 seconds for each of the 848T channel measurements (4 channels per device). 4 off Rosemount 848T required for the 14 measurements in various locations around the exhaust.

Example of the Rosemount 848T with the LVDT Junction boxes (below) - the mounting panels are acrylic to allow radio waves to pass through and protect the Rosemount 848T antennas



DATA ACQUISITION (4-20mA, WIRELESSHART, ETHERNET & FIBRE OPTICS)

The Rosemount 848T WirelessHart transmitters formed a mesh network, along with the Rosemount 1410D WirelessHart Gateway, where the LVDT readings are constantly updated within the Modbus registers in the gateway.

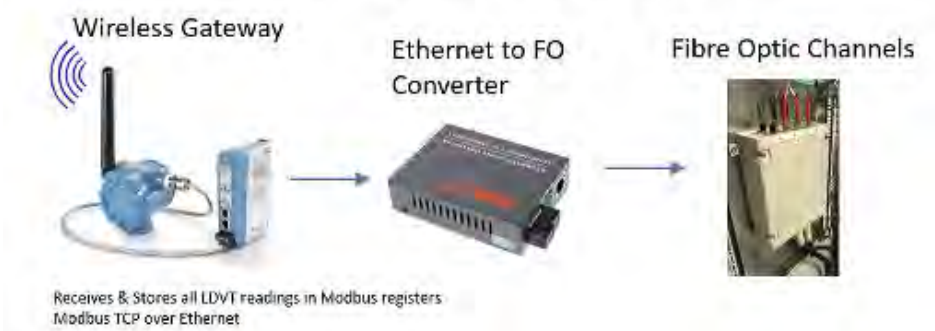
The Gateway is mounted in a marshalling cabinet within the turbine hall and the Rosemount Fieldlink module (Intelligent Gateway Antenna) mounted on top nearby.

The gateway is powered locally in the cabinet and connected via Ethernet to the Fibre Optic converter.



TURBINE HALL MARSHALLING CABINET

Turbine Hall Marshalling Cabinet

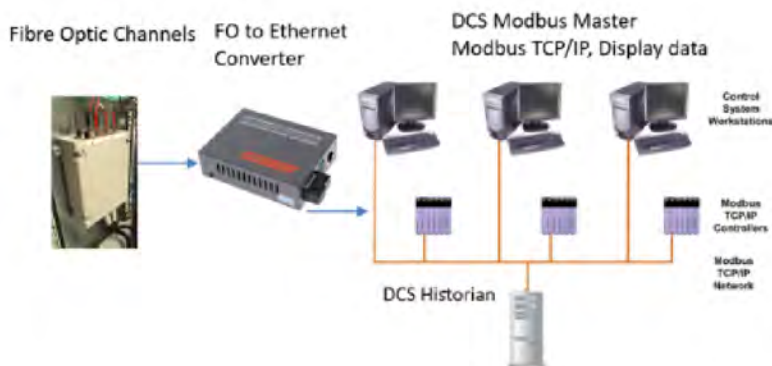


The FO cables run the length of the plant and terminate in the marshalling room for the DCS

CONTROL ROOM



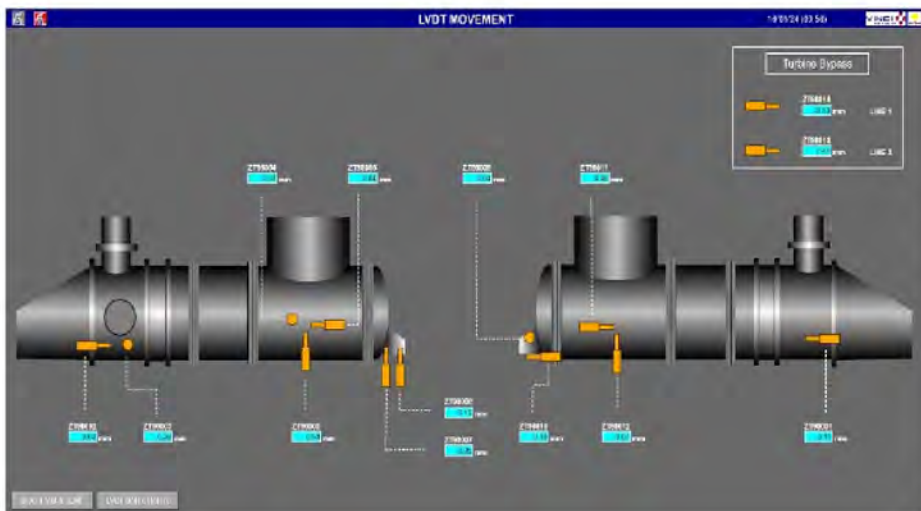
Control Room



GRAPHICS AND ALARMING

The DCS now monitors all 14 displacement sensors and will alarm the operators if any movement falls outside the allowable tolerance.

They can then quickly call up the graphic and instantaneously understand which part, or parts, of the steam turbine exhaust have moved, by how much, and make a judgement of what to do next.



SUMMARY

" Utilising WirelessHart and Fibre Optic technology, a cost-effective, real-time movement detection system using non wireless sensors, ensures early indication of potential problems. Enabling increased availability of the steam turbine, which in turn maximises power generation revenue. We, also now have a functioning WirelessHart Mesh network in place, which we can easily utilise, cost effectively add additional instrumentation as and when required."

Daryl Parsons
Maintenance Planner at Suez

MJ WILSON TRUSTED ADVISOR

Our help, support and teamwork for the project offered peace of mind throughout the whole process. Bespoke projects constantly throw up unexpected challenges, however working together with a "never say die" attitude, these were easily overcome. Today we remain as dedicated as ever, to delivering added value in support to Suez facilities in the UK.

Value Engineered. Efficiency Engineered. Partnership Engineered.



VALUE ENGINEERED

85% SMART COST-EFFECTIVE SOLUTION



EFFICIENCY ENGINEERED

90% FUTURE-PROOF DESIGN, ZERO LIFECYCLE COSTS



PARTNERSHIP ENGINEERED

100% TEAMWORK, FROM DESIGN & INSTALLATION TO COMMISSIONING