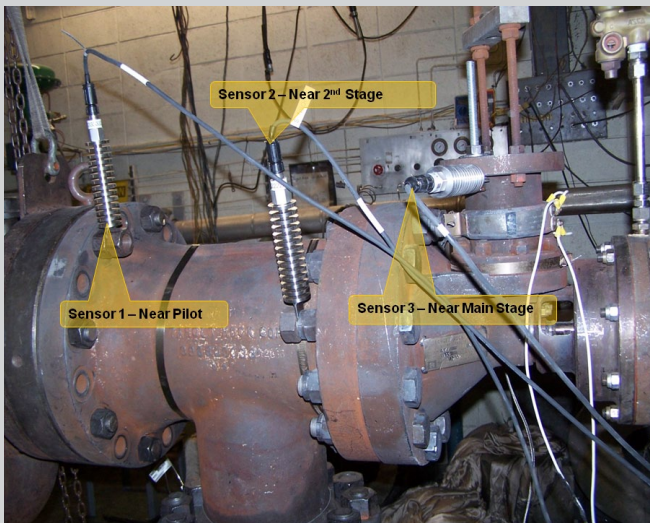


**StressWave monitoring technology** showed promise as a means to successfully detect leakage, measure the amount of leakage and determine the source of the leak within steam pressure relief valves. In testing conducted at a noted testing facility with the cooperation of Target Rock and a major nuclear station operator, the technology was proven to be effective in the detection of leakage, as well as indicating that the amount and source of the leak can be determined.

A portable test unit was supplied to collect continuous StressWave Energy (SWE) readings on a set of customer-selected valves – in this case nine (9) reconditioned valves. Three (3) sensors were mounted using heat dissipating mounts on each tested valve. No valve modifications were required. As seen in the illustration, one sensor was mounted near the pilot, one near the 2nd stage and one near the 3rd stage.



The StressWave system uses a proprietary and patented sensor that is designed for easy mounting and installation. Thus, unlike traditional sensors which require specific mounting locations the StressWave sensors only require a suitable sound path through solid connection to the structure. In this particular case, the sensor locations were chosen to optimize accessibility.

### Valve Leakage Detection System

The StressWave Systems group of Scientech first deployed a successful valve leakage detection system at a major European natural gas storage and distribution facility in 2008.

### Analysis Performed and Results

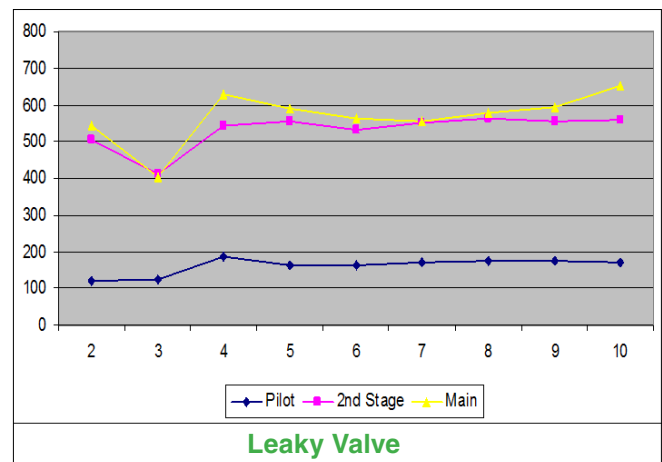
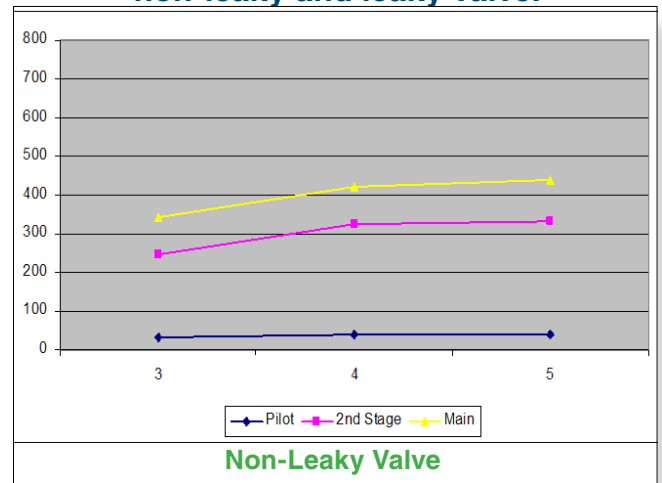
Once the StressWave system collected the data, a detailed analysis was performed using SWE trends and histograms to make a basic conditional analysis for each test.

The basic information collected during the testing allows Scientech software to provide the following types of analysis:

- Identification of a valve leak
- Source of valve leak
- Quantification of the leak

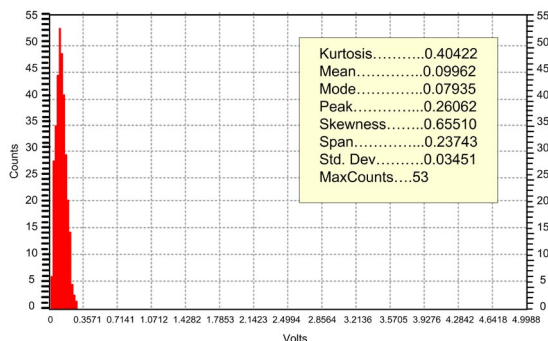
The basic property being recorded by the StressWave sensor is the StressWave Energy (SWE) levels generated by the leakage in the valves. StressWave readings can be used to provide an operator with the overall level of leakage in a valve.

### StressWave trends for a non-leaky and leaky valve.

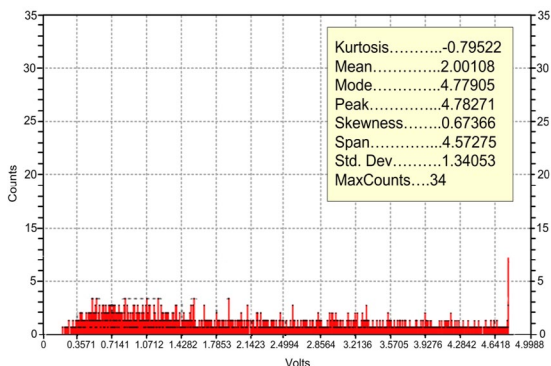


## Histograms for non-leaking and leaking valves

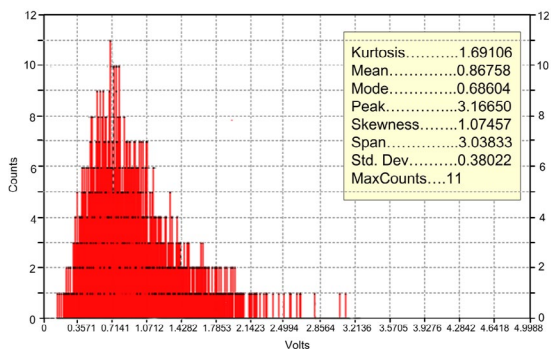
Histograms that are tall, thin and located near the Y-axis indicate uniform, low-level random stress wave energy indicative of a non-leaking valve. Histograms that are skewed and or flattened indicate non-uniform, high level random energy indicative of a leaking valve.



Non-Leaky Valve



Leaky Valve



Leaky Valve

Non-leaking valves typically have SWE readings which are less than the following upper control limits:

Valve Stage	Upper Control Limit
Pilot	75 SWE
2nd Stage	350 SWE
Main	500 SWE

## Testing Conclusions

The successful testing proved that StressWave analysis technology can detect valve leakage effectively. Sensors are extremely sensitive to even small amounts of leakage. It also indicates that amount and source of the leakage may be detectable.

- StressWave Energy (SWE) and histograms can indicate valve leakage.
- SWE levels and histograms can serve as an indicator of leakage quantity. Small leaks generate high SWE and skewed histograms. As the leak increases, SWE increases and the histogram becomes more skewed. When the leak becomes larger, the combination of dropping pressure and increased valve opening reduces SWE and flattens the histogram.
- SWE trends provide insight into the inner workings of the valve. Each of the three sensors generate differing shapes and amplitudes which can permit conclusions regarding the inner workings of the valve and the source of the leak to be identified.

## The StressWave Approach Optimizes Your Performance

Scientech's StressWave analysis technology effectively detects even small amounts of leakage.

For additional information contact Scientech at 208-524-9200 or visit <http://famos.scientech.us>.



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