

# Real-Time Monitoring and Control For Oil & Gas Applications

**S**outhwest Research Institute® (SwRI®) has more than 20 years of experience in the research, design and development of real-time monitoring systems for a variety of industries, including space, aerospace and oil and gas.

## Real-Time Asset Monitoring

SwRI has developed real-time monitoring solutions that enable better informed decisions to be made regarding the safety and operational status of critical assets in remote locations. These systems include features such as:

- Large network of distributed analog and digital sensors
- Real-time condition monitoring
- System and component health status
- Real-time analysis, data interpretation and display
  - Well log data
  - Upstream and downstream corrosion data
  - Production equipment and performance data
- Simplified asset diagnostics and status display to facilitate decision-making process
- Smart, remotely configurable data selection and sensor configuration
- Optimization of data transfer in limited bandwidth communication channels
- Internet Protocol (IP)
- Ethernet – 10/100/1000 copper and fiber
- Low latency
- Quality of service
- Sub-microsecond network time synchronization (IEEE 1588) precision time protocol (PTP)
- SCADA

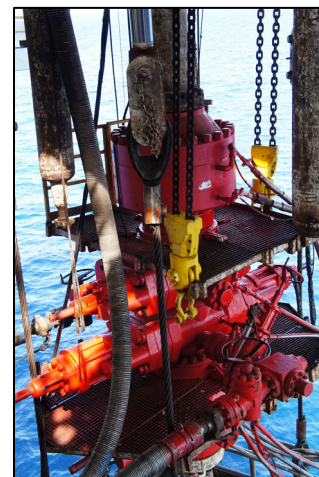


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*Real-time monitoring solutions that enable informed decisions to be made regarding the safety and operational status of critical assets in remote locations.*



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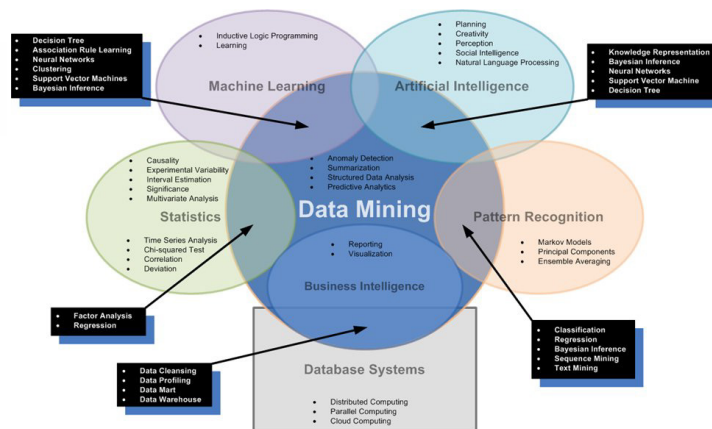


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## Predictive Monitoring – Discovering Unique Knowledge that Enhances Decision-Making

SwRI has extensive experience in integrating data analytics into real-time monitoring systems. By integrating predictive techniques into real-time monitoring systems, operators are able to gain insight into asset integrity issues before they impact operations, significantly reducing non-productive time and possibly preventing accidents. SwRI's data analytics capabilities include:

- Statistics
- Pattern recognition
- Machine learning
- Data visualization
- Artificial intelligence
- Business intelligence



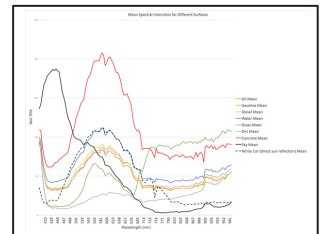
*SwRI has extensive experience using data mining techniques to predict integrity issues before they impact operations.*



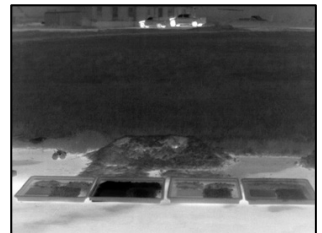
## Pipeline Integrity Monitoring – Leak Detection

Prevailing leak detection systems used today (e.g., computational pipeline monitoring) are simply unable to detect small leaks (<1% of the line throughput) in hazardous liquid pipelines. False alarms of any leak detection system are a major industry concern, as they lead to alarms being ignored, resulting in leak detection systems that are ultimately ineffective. SwRI has developed solutions to detect small leaks in pipelines while also characterizing and rejecting non-leak events, in order to significantly reduce false positive rates. Features include:

- Optical sensor fusion (hyperspectral, visible, SWIR – short-wave infrared and LWIR – long-wave infrared)
- Machine learning-based technology
- Multi-platform
  - Manned and unmanned aircraft
  - Ground vehicles
  - Stationary platforms (e.g. monitoring of pipeline pump stations, refineries, etc.)
- Ability to detect liquid and gas leaks
- Detection of liquids including crude oil and refined products typically found in pipelines (e.g. diesel, kerosene, etc.)



SwRI has developed remote sensing solutions that use combinations of hyperspectral, SWIR, LWIR and visible sensors to detect pipeline leaks (liquid and gas). The technology is suitable for airborne applications (manned and unmanned aircraft), ground applications as well as stationary applications, such as monitoring of pipeline pump stations.



## Open Systems Architecture

SwRI has led standardization efforts for a variety of instrumentation systems in the aerospace and military industries to promote interoperability between vendor components. Features include:

- Improved interoperability between equipment from multiple vendors
- Faster system development
- Lower system development cost

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