Benefits of using V-MAP® G3

• Remote monitoring of all valve operations
• Reduces site exposure for personnel
• Automatic alerts and warnings of deterioration
• Measures compliance with acceptable criteria
• Focuses maintenance activity
• Therefore, maximises plant safety and availability and reduces costs

The third generation of V-MAP® G3 has all the benefits of the previous system but also benefits from being easier to install (in both Brownfield and Greenfield Sites), reduced weight and space requirements and reduced installation costs.

The Score Group has a 30+ year track record of delivering market leading solutions for Intelligent Valve Management™ and 20+ years of experience in delivering valve condition monitoring services / failure mode effects and diagnostic analysis consultancy. This has been coupled with our vision and of course the excellent guidance given to us by our existing customers, to show us the way forward for creating the market’s best available technology and systems for ensuring the required in-service performance and integrity of critical valves.

Available V-MAP® Case Studies Include :-

• Shell - Ormen Lange
• BP - Valhall
• Lundin Petroleum - Edvard Grieg

Critical Valve Monitoring Comparison
Summary of benefits :-

<table>
<thead>
<tr>
<th>Diagnostic Data from Operational Valve Movements</th>
<th>Planned Stroke Testing (Existing with Local Diagnostic Coverage)</th>
<th>Operational and Planned Stroke Monitoring with V-MAP® G3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
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| Unnecessary Valve Testing Operations             | Possibly                                                      | No                                                     |
| Planned Stroke Minimisation                     | No                                                            | Yes                                                   |
| Valuable Diagnostic Data Bases                   | Likely                                                        | Never                                                  |
| Failure Mode Confirmation or Stimulation         | Potential                                                     | No                                                     |
| Asset Life Cycle Effect                          | Reduction                                                      | Extension                                              |
| Confidence in Valve Operation                    | Improved                                                      | Maximized                                              |
| Failure Mode Development Detection               | Limited                                                       | Maximized                                              |
| Risk of Failure on Demand due to Missed Data     | Increased                                                     | Mirranded                                              |
Score's enhanced V-MAP® G3 system gives process plant owners, integrity and safety assurance engineers, and maintenance personnel enhanced visibility of critical valve condition and performance indicators. This makes developing failure modes in valves and their actuators quickly and easily identifiable. V-MAP® G3 further extends the Score range of diagnostic equipment available for monitoring valves in service performance over time.

The affordable, easier to install, complete diagnostic coverage valve condition monitoring equipment and system you have been asking for is now available from Score Diagnostics Limited, part of the Score Group of companies.

It is no coincidence that this has happened at time when there is an increasing pressure on our customers to comply with operational safety and integrity standards such as IEC 61508/61511, ANSI/ISA-84.00.01, ISO 55,000 and of course to respond to industry concerns over ageing assets - as evidenced by the UK Health & Safety Executive's recent KP4 programme for life extension and inspection.

V-MAP® G3 - A Customer Driven Solution

Whilst our existing customers are aware that our flag-ship valve monitoring system V-MAP® has been available in the marketplace for almost a decade already in both its first and second generation formats, they are also aware of our continuous improvement culture. In light of this, they requested an enhanced condition monitoring solution for safety and process critical valves with the following features and benefits –

- Fully independent of Valve and Accessories Manufacturers
- Widest Possible Diagnostic Coverage
- Passive and Non-Invasive Monitoring
- Easier to Install (in both Brownfield and Greenfield Sites)
- Reduced Weight and Space Requirements
- Reduced Installation Costs
- Enhanced Asset Life Cycle Management
- Setting of Performance Standards for all Safety Critical Elements
- Maximized Risk Mitigation with Minimal Probability of Failure on Demand
- Unique and Bespoke System Components, designed and manufactured "from the ground up" to exactly meet asset monitoring needs
- Easy to Interfaced Inputs and Alarms
- Evidence to Drive Proactive and Predictive Maintenance Models
- Wireless and Remote Installation Options

V-MAP® G3 is a passive, non-intrusive on-line system that continuously monitors the condition of Emergency Shutdown Valves (ESDVs) and other critical valves, providing the following features:

- ESDV condition and the process duty under which it is operating. Data is acquired remotely, without the need for personnel to be in attendance to monitor specific ESDV tests. V-MAP® G3 will also acquire data for every valve operation, including unplanned ESDV operation events, so building up a history of performance.

- V-MAP® G3 is an on-line system that continuously monitors ESDV condition and the process duty under which it is operating. Data is acquired remotely, without the need for personnel to be in attendance to monitor specific ESDV tests.

- The V-MAP® G3 sensors are continuously logged by bespoke sensors located on the valve, the actuator and on the adjacent piping. The sensor types typically selected are:
  - Position transmitter to measure the valve stroke
  - Pressure transmitters to monitor the actuator fluid power requirements
  - Actuator limit switch and solenoid status and timestamps
  - Strain gauges to measure the torque or force required by the stroke devices are.
  - Monitors the actuator supply pressure and strain between valve operations to ensure the readings are within their static operational limits and to detect any sensor malfunction.
  - Seamlessly integrates with customers’ Site Automation Systems (SAS).
  - Manipulation to obtain derived data
  - Provides trending, benchmark comparison, reports, and audit records.
  - Provides analysis that will identify maintenance requirements and provide reliability data for confirmation of Safety Integrity Levels (SILs) with the data also contributing to Reliability Centred Maintenance (RCM) studies that will maximise the plant availability.
  - All ESDV operations are recorded, whether partial or full planned or unplanned, PSD or ESD. V-MAP® G3 would not be disabled during an ESD in the way some partial stroke devices are.
  - Pressure transmitters to monitor the actuator fluid power requirements
  - Valve engineering analysis, data interpretation and valve engineering expertise.
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- The Development

V-MAP® G3 has been developed, based on Score’s long term experience in valve and actuator design, diagnostics, data acquisition, and system design and construction. The basic monitoring techniques and principles have been well developed in the past. It is the hardware and software developments of recent years that have enabled those techniques and principles to be implemented in a cost effective modular system design: One that can be tailored to the specific monitoring requirements, communications and protocols of the installation’s automation system.

- The Need

The monitoring of the condition of Emergency Shutdown Valves (ESDVs), on both onshore and offshore Oil & Gas installations, is an essential part of ensuring the safety of personnel, protection of the environment and capital assets. The failure of an ESDV to operate on demand, or fail to provide a shut off, will have a major impact.

- To demonstrate that an ESDV’s performance meets the installation’s safety criteria, it is normally subjected to routines involving inspection, partial closure, full closure, and leakage tests. These routines often require special test equipment and trained personnel, and will involve a planned shutdown, thereby interrupting production.

- The Solution

This need to continuously demonstrate valve condition and performance is met by Score’s V-MAP® system developments. V-MAP® G3 is an on-line system that continuously monitors ESDV condition and the process duty under which it is operating. Data is acquired remotely, without the need for personnel to be in attendance to monitor specific ESDV tests. V-MAP® G3 will also acquire data for every valve operation, including unplanned ESDV operation events, so building up a history of performance.

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- The System

V-MAP® G3 dedicated sensors are located on the valve, actuator and on the adjacent piping. The sensor types typically selected are:

  - Acoustic Emission leak detection sensors
  - Strain gauges to measure the torque or force required by the actuator
  - Pressure transmitters to monitor the actuator fluid power requirement
  - Position transmitter to measure the valve stroke

- The V-MAP® G3 sensors are continuously logged by bespoke sensors located on the valve, the actuator and on the adjacent piping. The sensor types typically selected are:

  - Position transmitter to measure the valve stroke
  - Pressure transmitters to monitor the actuator fluid power requirements
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  - All ESDV operations are recorded, whether partial or full planned or unplanned, PSD or ESD. V-MAP® G3 would not be disabled during an ESD in the way some partial stroke devices are.

- The monitoring of the condition of Emergency Shutdown Valves (ESDVs) and other critical valves, providing the following features:

  - Evidence to Drive Proactive and Predictive Maintenance
  - Easy to Interpret Outputs and Alarms

- V-MAP® G3 is an on-line system that continuously monitors ESDV condition and the process duty under which it is operating. Data is acquired remotely, without the need for personnel to be in attendance to monitor specific ESDV tests.

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