Valve Condition & Performance Monitoring: Driving Down Costs & Maximising Reliability & Profits

David M Anderson
Score Diagnostics Limited

Why Should We?

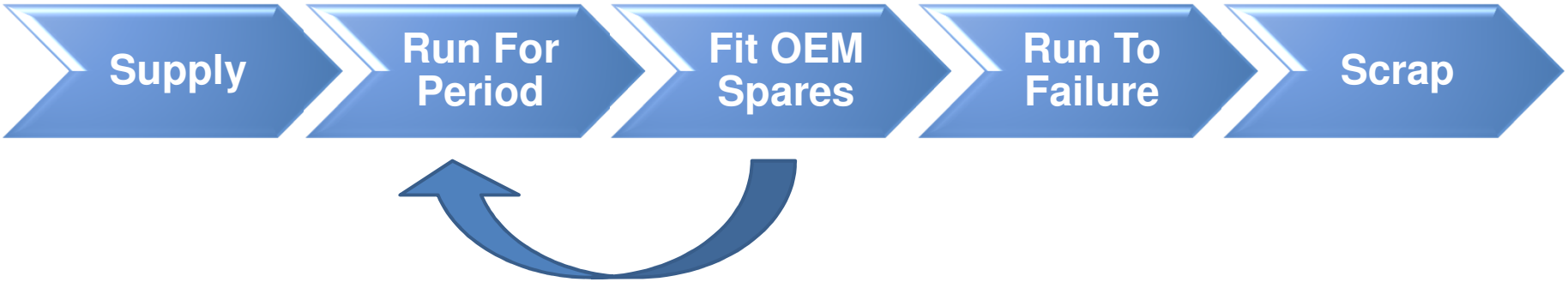
We MUST fulfil our Duty of Care and :-

- ***Ensure Zero Safety Accidents / Incidents***
- ***Protect our People and Process Plant***
- ***Protect our Environment***
- ***Minimise our Operating Costs / Losses***
- ***Maximise our Reliability and Profits***

Typical Valve Management Strategies

- Without Condition & Performance Monitoring (C&PM)

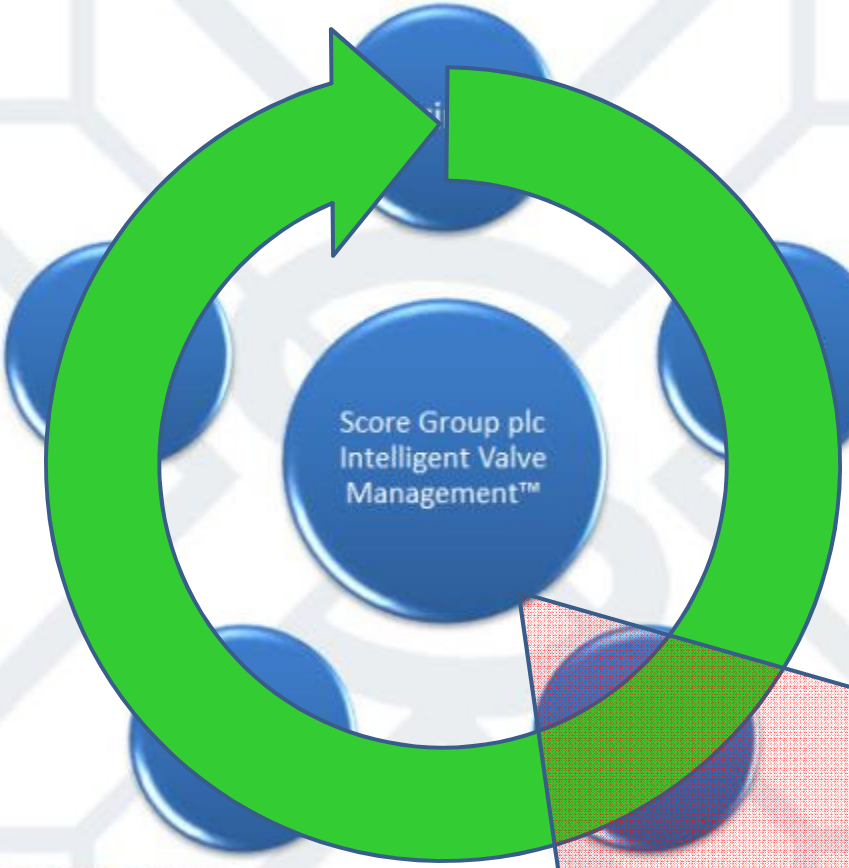
A Mostly "Linear" Approach…



Closing the loop with *Intelligent Valve Management™*

Score **Group plc**

The Virtuous Circle of Continuous Improvement



Experienced and Specialised Teams Providing Front End Engineering Design (FEED), Research, Specification, Strategies, Performance, Reliability

Experienced and Specialised Teams Enhancing Performance Reliability and Strategies, through Failure Mode Effects & Diagnostic Analysis (FMEDA)

Supply Chain Relationships
Global Contracts (Pre-Qual)
Strategic Stock Holding of Complete Valves, Spares & Associated Equipment

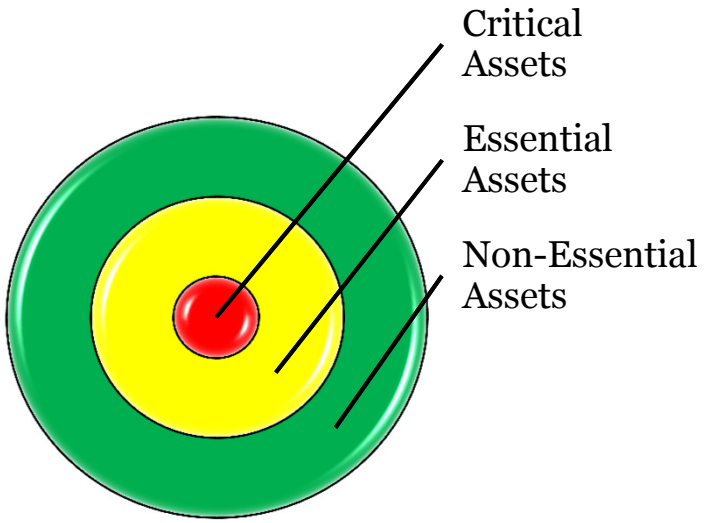
Qualified and Experienced Service Technicians
Local Repair & Testing Facilities
On-Site Workshop Facilities
Score On-Site Services "SOS" Team (24/7)
Specialist Site Working Equipment

Asset Integrity Management
Condition and Performance Monitoring
Permanent Installed and Portable Equipment
Monitoring "Surveys as a Service"
Lease & Rental Options

Global Market Drivers :-

- **Operating Cost Reductions**
- **Asset Integrity Management**
- **Ageing and Life Extension**

Global and Local Compliance Requirements are Changing



PAS55 / ISO 55,000 : *Asset Integrity Management*

ISO 9001:2015 : *Risk Based thinking*

ISO 15848 : *Fugitive Emissions*

ISO / IEC 61508 / 61511 : Safety Integrated Systems

ANSI/ISA-TR96.05.01-2008 Partial Stroke Testing of Automated Block Valves

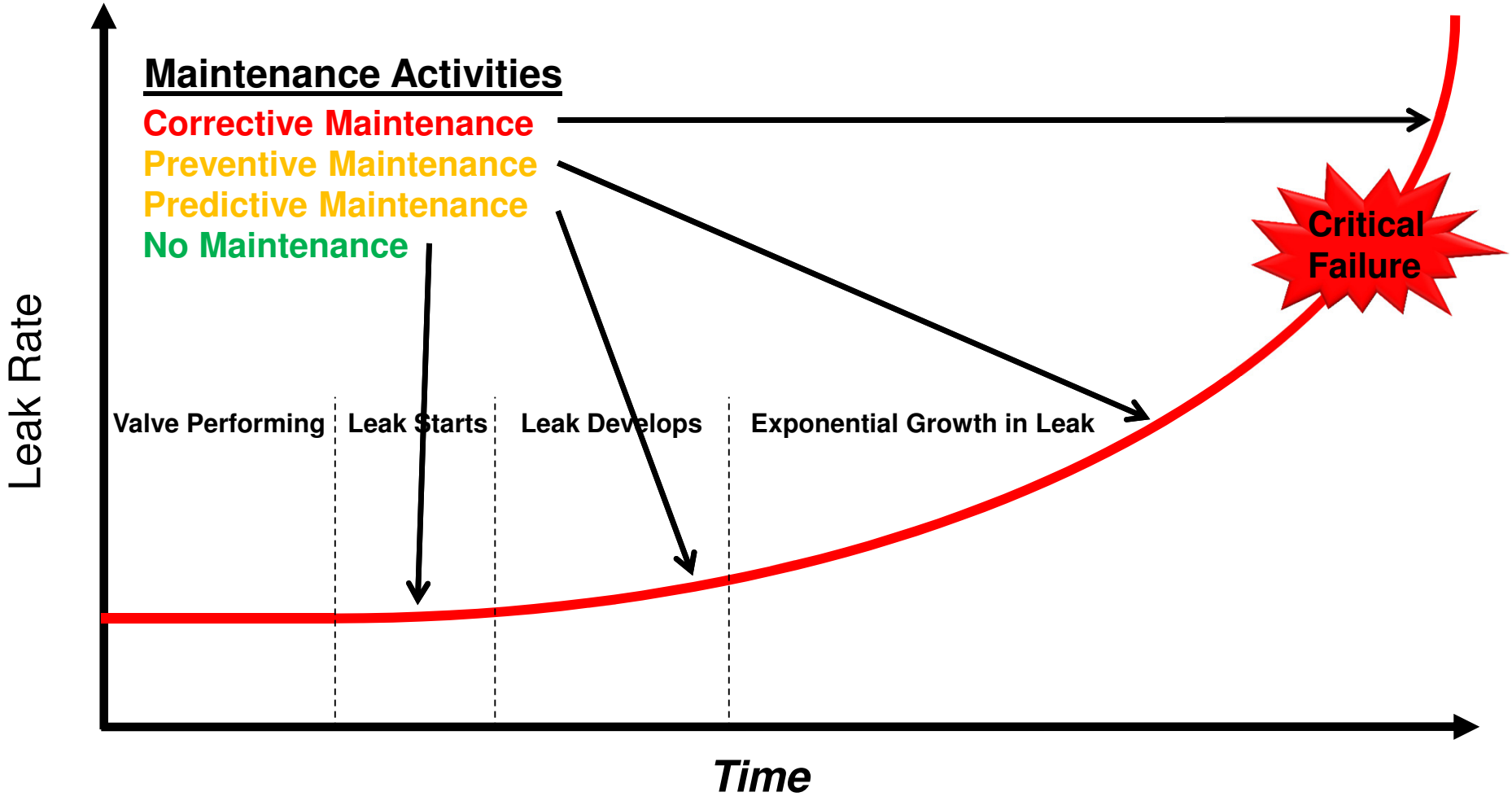
Kyoto Protocols : *CO2 Emissions Reductions*

Integrated Pollution Prevention Regulations (IPPR) : *Local Obligations*

Hydrocarbon Release Reduction (HCRR) : *Local Targets*

UK HSE's "KP4" Audits : *Ageing & Life Extension of Assets*

Valve Life Cycle (Reliability Curve)
Sealing Performance / Capability



What's it about?

- Not Just about duty of care
- Not just about best practice
- Not just about compliance
- Not just about efficiency
- Not just about risk management
- Not just about cost reduction

…IT'S ALL OF THE ABOVE

Investment : What Does Integrity Cost?

Clear metrics are quantifiable and should be easily understood.

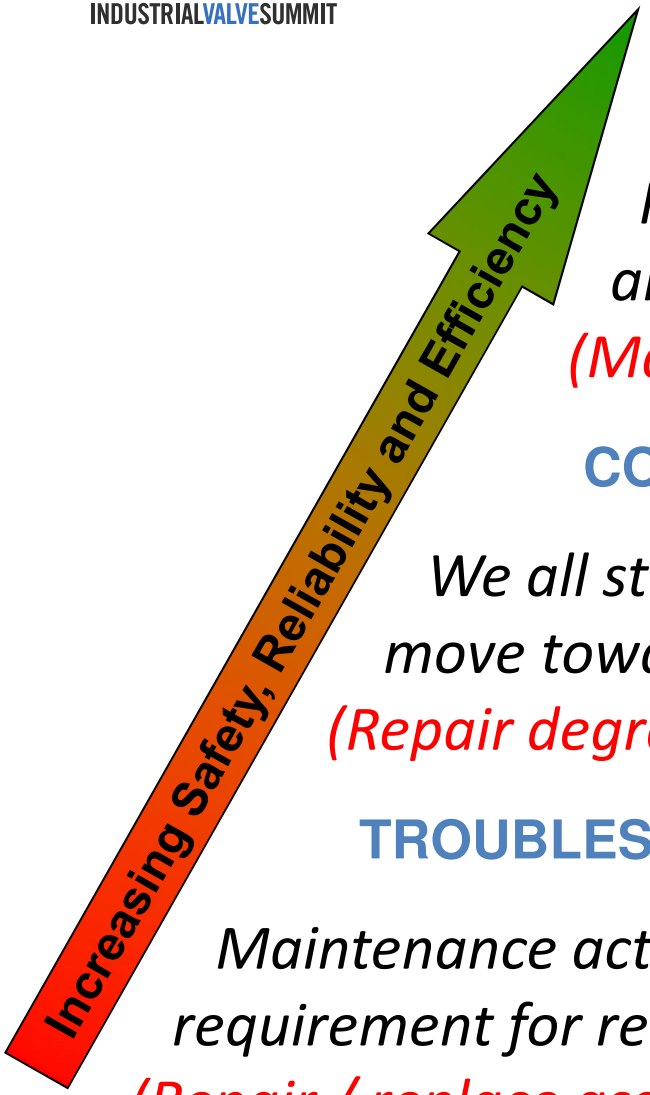
Metrics must always be considered within the context of Safety, Environmental, Operational and Non Operational risk exposure.

For example, from a operational (economic) perspective, you may ask yourself questions like :-

- How much does an accident cost?
- How much does one hour / day of downtime cost?
- How much does each preventative maintenance (PM) routine cost me each time it is done?
- How much does monitoring cost me each time it is done?
- How often does the monitoring / PM task need to be done?
- What is the cost and consequence of not doing the task?

NOTE : High “Process Availability” metrics (which most organisations measure) do not necessarily mean good asset reliability.

C&PM : Smarter Maintenance Strategies



PREDICTIVE MAINTENANCE

Ideally, we would like to get ahead of the game and move to predictive maintenance activities

(Manage assets in service proactively)

CONDITION (VALUE) BASED MAINTENANCE

We all strive to move away from that approach and move towards condition based maintenance

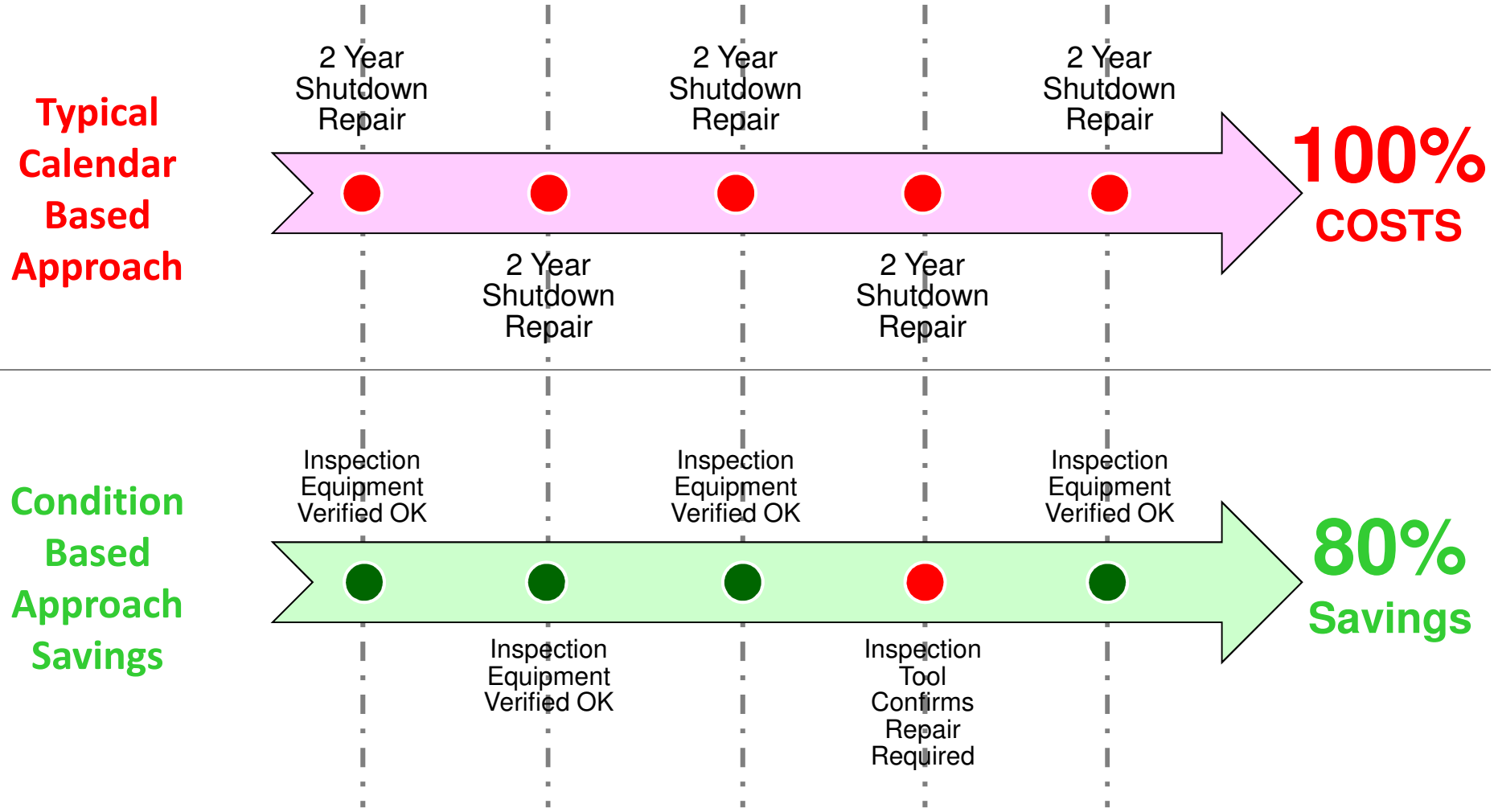
(Repair degrading assets, prior to critical failure in service)

TROUBLESHOOTING

Maintenance activities in most plants are driven by the requirement for reactive response.

(Repair / replace assets that have already failed – perhaps critically)

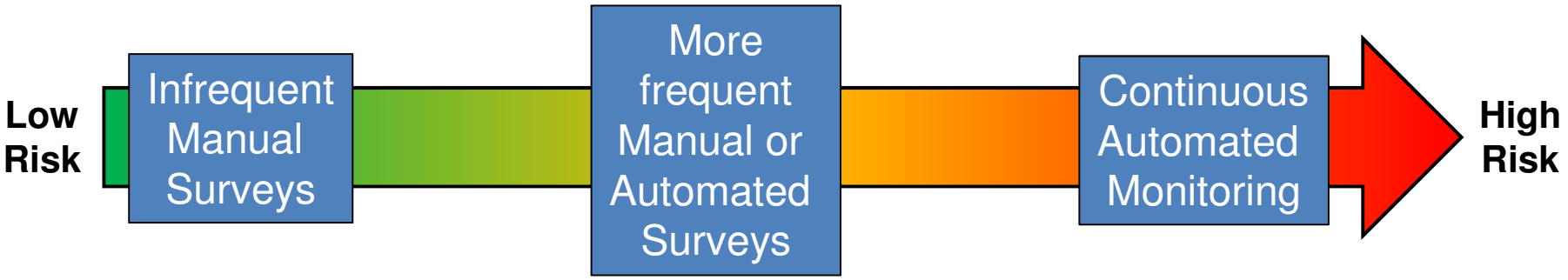
Timeline Of Valve Maintenance



Which Valves should you monitor…
…and When?

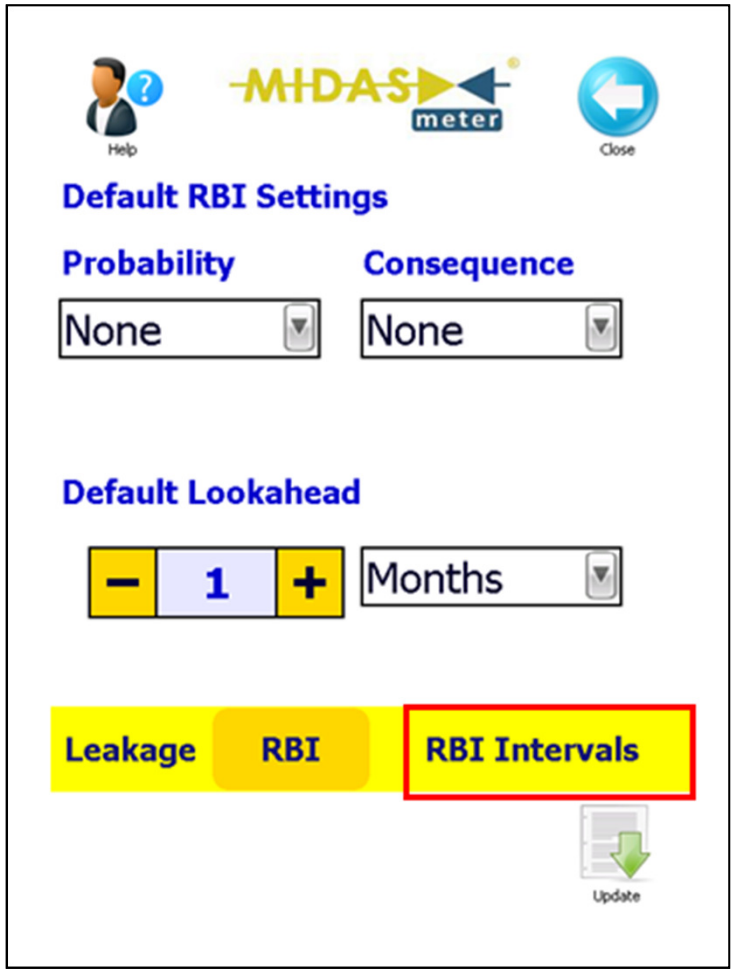
Risk Based Approach :-

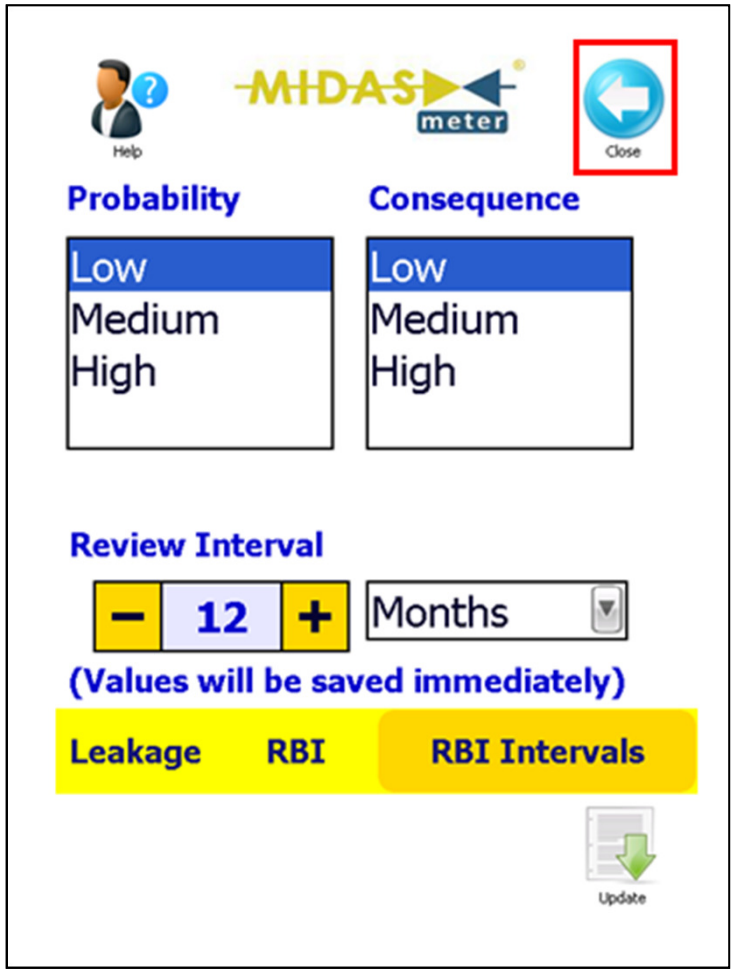
- **Increasing risk due to "Probability of Failure"**
- **Increasing risk due to "Consequences of Failure "**



MIDAS Valve Diagnostics
MIDAS meter
MIDAS sensor
MIDAS Wireless sensor
VMAP Portable Test Unit
VMAP G3 Valve Monitoring

Risk Based Inspection (RBI)





Risk Based Inspection (RBI)

Risk	Consequence	Frequency	Units
Low	Low	12	Months
Low	Medium	9	Months
Low	High	3	Months
Medium	Low	9	Months
Medium	Medium	6	Months
Medium	High	4	Months
High	Low	6	Months
High	Medium	4	Months
High	High	1	Month
None	None	0	Months

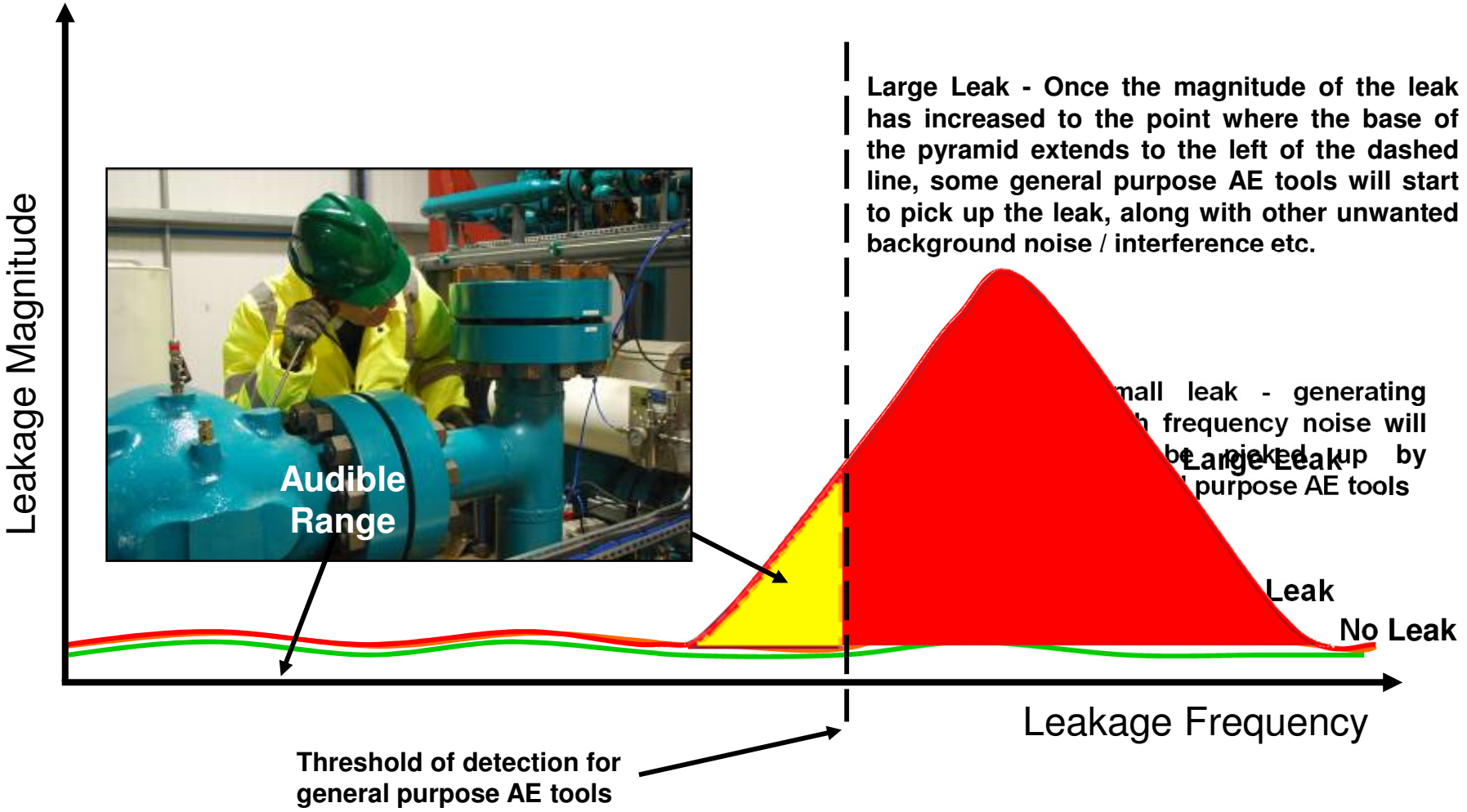
C&PM Inspection Tools Techniques and Sensitivity...

Camera

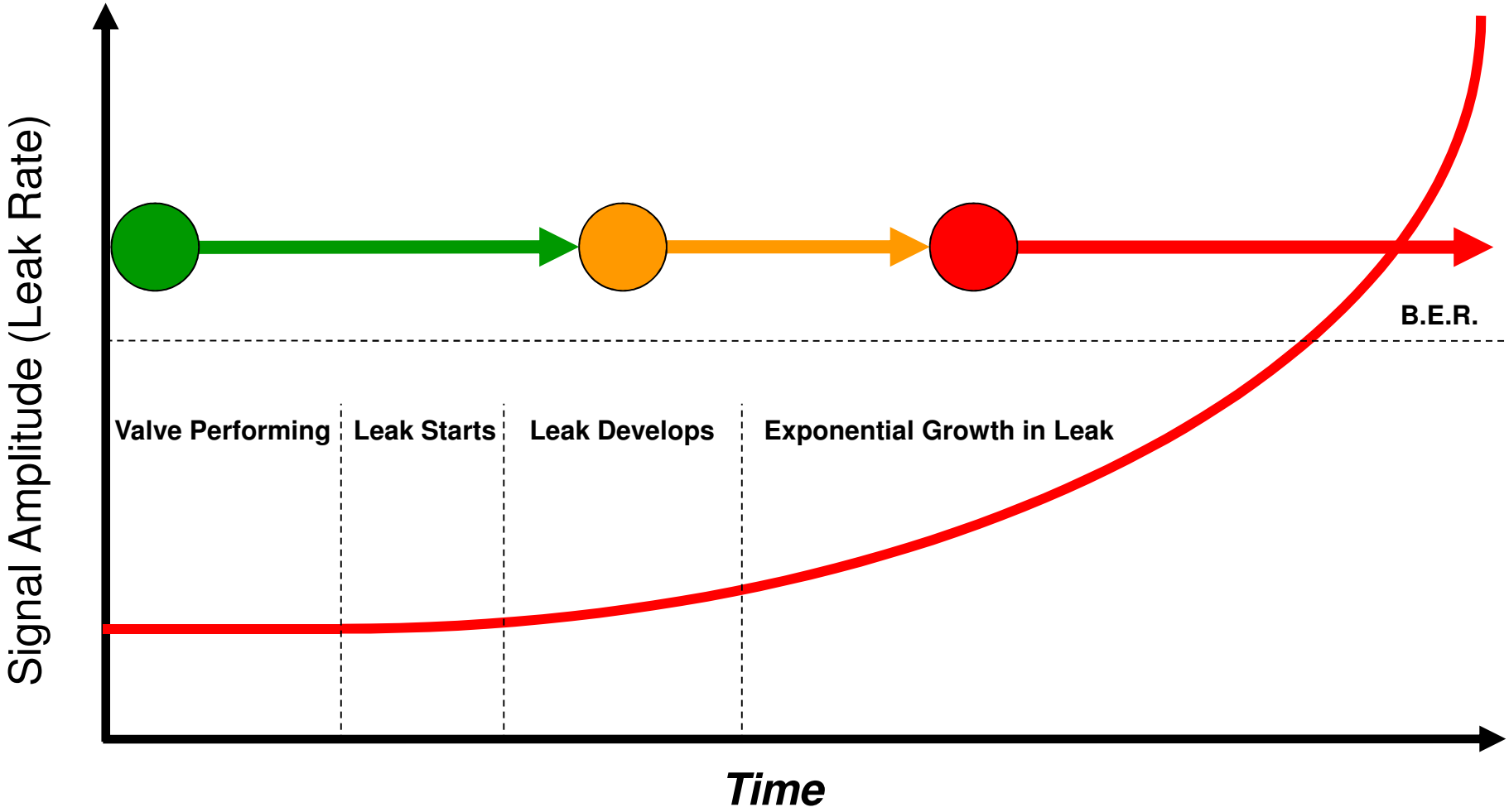
Acoustic Sensor

Gas Analyser

Early Leak Detection by C&PM Tools = Strategic Advantage



Exponential Deterioration in Valve Performance



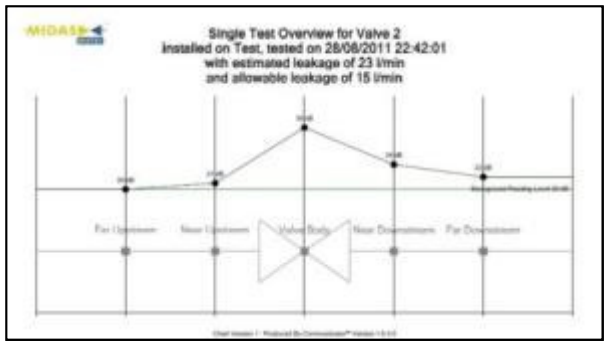
C&PM Inspection Tools...

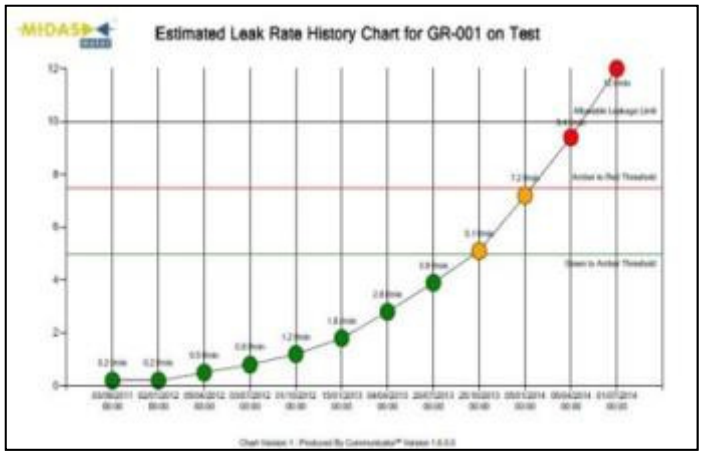
Collect Data + **Analyse Data** + **Report & Trend Data**

Troubleshooting

Condition (Value) Based Maintenance

Predictive Maintenance





ACTIONABLE EVIDENCE

DATA

Environmental : Case Study

Blow Down Valve Survey

Cost Saving and Loss Reduction

Condition Monitoring Benefits

4 Day Survey : £100,000+ GBP Savings

Targeted Maintenance : Case Study

Pre-Shutdown Surveying

Conclusive Valve Leak Verification

1 Hour Survey : $20m+ USD Savings

Cost Reduction : Case Study

Pre-Shutdown Planning

Condition Monitoring Survey

5 Day Survey : £340,000 GBP Savings

Process Reliability : Case Study

Pressure Boundary Testing

Reducing Downtime

3 Hour Survey : up to $2m USD Savings

Environmental : Case Study

Instant Savings from Flare Stack

Isolation Valves Condition Survey

Reduced & Targeted Maintenance

30 Second Survey : 000's QR Savings

Safety System Valves : Case Study

Emergency Shutdown Valve Monitoring

Compliance, Reliability & Efficiency

No Unexpected Shutdowns
in a decade of operation

Remote Valves Monitoring : Case Study

Retrofit to Existing Offshore Platform

Emergency Shutdown Valve Monitoring

Compliance, Reliability & Efficiency

All Maintenance Planning and Interventions now driven by C&PM Evidence

INDUSTRIALVALVESUMMIT

Valve Condition and Performance Monitoring Equipment is proven to deliver benefits such as :-

- Quick and Easy Valve Condition Assessment
- Portable and permanently installed equipment and systems
- Non-Invasive and passive in-situ condition monitoring of performance
- Reliable data acquisition and storage
- Consistent analysis and reporting
- No “expert” support required to assess valve condition
- No more “Just-in-case” maintenance
- Fewer maintenance interventions / Reduction of in-service failures
- Focused maintenance activities, driving enhanced efficiency
- Effective / efficient shutdown planning
- Shorter, more efficient planned turnarounds
- Less unplanned / unexpected shutdowns
- Less production losses /downtime (Improved plant availability)
- Cost avoidance through non-removal /repair of “performing” valves
- Reduction in spare parts consumed
- No additional off-line testing required
- Site valve repair costs dramatically reduced
- Labour costs dramatically reduced

Critical Valve Monitoring Comparison Summary of benefits :-

Measurable Comparison Criteria	Planned Stroke Testing Schedules with Limited Diagnostic Coverage	Operational and Planned Stroke Monitoring with V-MAP® G3
Diagnostic Data from Operational Valve Movements	No	Yes
Unnecessary Valve Testing Operations	Possibly	No
Planned Stroke Minimisation	No	Yes
Valuable Diagnostic Data Missed	Likely	Never
Failure Mode Creation or Stimulation	Potential	No
Asset Life Cycle Effect	Reduction	Extension
Confidence in Valve Operation	Improved	Maximised
Failure Mode Development Detection	Limited	Maximised
Risk of Failure on Demand due to Missed Data	Increased	Minimised

WIIFM?

Summary of Valve Monitoring Benefits by Engineering Discipline

	Finding Poorly Performing Valves	Quantifying Leak Rates in Valves	Trending Leak Rate Growth Over Time
Maintenance Engineers	Leak Detection	Prioritise Budget Spend	No Unplanned Shutdowns
Reliability Engineers	Identify Problems Early	Shutdown Planning	Minimise Downtime
Asset Integrity Management Engineers	Risk Based Inspections	Proactive Maintenance	Predictive Modelling
Control Room Team	Troubleshooting	Loss Reduction	Profit Maximisation
HSEQ Team	Risk Management	Leak Reduction	Optimised Performance

Why Should We?

In conclusion, C&PM valves delivers:-

- ***Enhanced Safety Performance***
- ***Protection for People and Process Plant***
- ***Protection of the Environment***
- ***Minimised Operating Costs / Losses***
- ***Maximised Efficiency and Reliability***

Valve Monitoring Solution Selection…

What Diagnostics for What Valve?

	Assessed Criticality of Valve		
	Low Criticality	Medium Criticality	High Criticality
MIDAS Meter®	✓	✓	✓
MIDAS® Sensor		✓	✓
MIDAS® Sensor (Wireless)		✓	✓
V-MAP® Portable		✓	✓
V-MAP® G3			✓
V-SCAN™	✓	✓	✓

Any Questions?

midas.enquiries@score-group.com

www.midasvalvediagnostics.com

www.score-group.com

Tel : +44 1779 482350