



# LDAR 2.0:

LDAR for Environmental Compliance and  
LDAR for Operational Excellence

Powered By:



# Agenda

- ▶ LDAR Overview-How did we Get Here
- ▶ Traditional LDAR Monitoring vs. Acoustic Monitoring LDAR
  - ▶ Component Count Difference
  - ▶ Relative Leak Rates Traditional LDAR vs. Valve Seat Leakage to Flare
  - ▶ Comparing rate reductions
  - ▶ Economic Return
- ▶ How does Each LDAR type work
- ▶ Evolution of LDAR
- ▶ Case Studies
- ▶ Conclusion

# LDAR Overview

## How did we get here?

- ▶ What is LDAR?
  - ▶ LDAR is the process of identifying a leak in the production process and repairing it (*Leak Detection And Repair*)
- ▶ Why do we do LDAR?
  - ▶ Community Standpoint:
    - ▶ The largest benefit of LDAR is the environmental benefits of reducing emissions from Leaking valves
  - ▶ Company standpoint:
    - ▶ LDAR = Operational Excellence
      - ▶ By quantifying leaks and fixing the leaks via maintenance or redesign, a company has greater mechanical availability
        - ▶ More Mechanical Availability = More production per input
- ▶ How does Acoustic Monitoring fit into the overall picture?
  - ▶ It eliminates the largest source of process leakage to the flare reducing the overall emissions tonnage and provides a significant financial return



- ▶ Steve Probst
- ▶ Chairman
- ▶ Sage EHS International

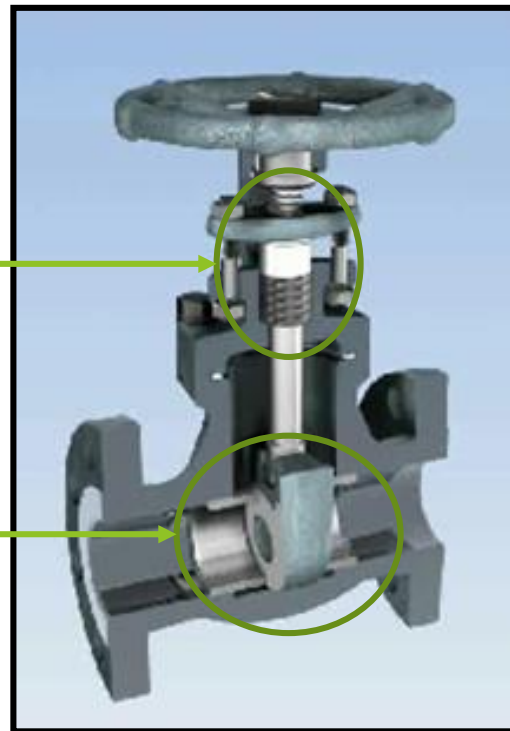
# Traditional LDAR versus Acoustic Monitoring LDAR



- ▶ Steve Probst
- ▶ Chairman
- ▶ Sage EHS International

Traditional LDAR  
(ppm to atmosphere)

Acoustic Monitoring LDAR  
(Tons to Flare)



# Method 21/OGI LDAR



Steve Probst

Chairman

Sage EHS International

## ► Method 21

- The Method 21 LDAR method requires a Flame Ionization Detector which is used to monitor the emissions from a valve stem
- Bottom Line: The focus is on the emissions from the valve stem





# Acoustic Emissions LDAR



Dave Anderson

Director

Score Diagnostics  
Limited

## ► Acoustic Emissions

- Quantifying the amount process leak to the flare via acoustic monitoring of the valve seat

- Bottom Line: The focus is on the valve seat



# Emissions Monitoring : Question



Where are we likely to make the biggest impact and best gains?

# M21 LDAR versus Acoustic Monitoring LDAR

## ► Component Count Difference

### ► M21 LDAR

Equipment Counts	
Valves	10000
Connectors	30000
Pumps	100

### ► Acoustic Monitoring LDAR

Equipment Count	
Valves	200



# M21 LDAR versus Acoustic Monitoring LDAR (Emissions)

## ► Emissions Leakage Comparison

### ► M21 LDAR

Baseline Emissions (tons) per year		
Equipment	Component Count	Emissions
Valves	10000	219
Connectors	30000	240
Pumps	100	9
Total	40100	468.2

### ► Acoustic Monitoring LDAR

Baseline Emissions (tons) per year			
Equipment	Component Count	Emissions From Flare (tons)	Acoustic Emissions to Flare (tons)
Valves	200	36	1800

# M21 LDAR versus Acoustic Monitoring LDAR

- Difference of Component Count, Emissions Leakage, and Financial Impact

- M21 LDAR

Baseline Emissions (tons) per year			
Equipment	Component Count	Emissions to Flare (Tons)	Potential Financial Impact at Propylene .33/lbs
Valves	10000	219	\$ 144,540.00
Connectors	30000	240	\$ 158,400.00
Pumps	100	9	\$ 5,940.00
Total	40100	468.2	<b>\$ 309,012.00</b>

- Acoustic Monitoring LDAR

Baseline Emissions (tons) per year				
Equipment	Component Count	Valves Leaking to Flare	Emissions to Flare (tons)	Potential Financial Impact at Propylene .33/lbs
Valves	200	36	1800	<b>\$1,200,000.00</b>

# M21 LDAR versus Acoustic Monitoring LDAR

## ► Difference of Leak Rates of Pre-LDAR and Post LDAR

### ► M21 LDAR

LDAR Leak Rates	
Pre LDAR Implementation	Post LDAR Implementation
8%	2%

### ► Acoustic Monitoring LDAR


LDAR Leak Rates	
Pre Acoustic Monitoring LDAR Implementation	Post Acoustic Monitoring LDAR Implementation
15%	0%

# Evolution of LDAR

## Where do we go from here?

- If Acoustic Monitoring has greater return, then why not implement this first... or at least side by side?

## Case Studies



### Offshore Operator Saves Over £100k

by taking a Condition Based Maintenance (CBM) approach to Valve Management, as guided by MIDAS Meter® Survey on 52 flare line Blow Down Valves (BDV's)

**Background**

Score showcased their valve diagnostics products to the customer and it was decided that an Acoustic Emissions (AE) survey, using MIDAS Meter® would be carried out on an offshore production platform's Blowdown Valves (BDV's).

The work scope was agreed for certified Score survey technicians to carry out the non-invasive MIDAS Meter® survey on 52 BDV's on the main platform, to identify which of the valves had through seat leakage and were contributing to the significant losses being incurred on the Low Pressure (LP) and High Pressure (HP) flare line systems. It was noted that the survey was to be completed without interrupting production on the rig.


The 52 BDV's targeted for the MIDAS Meter® survey were all ball valves.

**Test Results**

As a result of the survey, it was concluded that 8 of BDV's had detectable leakage and 34 off had no detectable leakage. The remaining 10 BDV's could not be surveyed due to the presence of insulation / lagging or the lack of any differential pressure across the valve seals.

In the 8 off valves working on gas service which had detectable leakage recorded, the through seat leakage was estimated to be as follows:


Tag Number	Estimated Leakage on Gas (Std. litres/minute)	Estimated Leakage on Gas (Million std. litres/year)
BDV-0351	29.3	15.4
BDV-0270	215	113
BDV-0309	47.9	25.18
BDV-0262	80.3	47.48
BDV-0685	12.5	6.73
BDV-0645	42.4	22.29
BDV-0246	34.9	49.89
BDV-0650	16.5	8.72
<b>TOTAL Losses Calculated</b>	<b>543.2</b>	<b>286.66</b>




**Benefits Realised by Survey**

The survey was carried out on the offshore platform over 4 days, at a direct survey cost of £8,000.

The 8 off BDV's with detectable leakage were estimated to be generating a loss of £64,705 over the course of the year at the calculated leakage rates.





### Major Chemical Company Realizes Immediate Benefits from MIDAS Meter® Survey

**The Customer's Challenge**

The leadership of a major chemical company created a focus to minimize losses through their flare systems. The motivation for this project was threefold: reduce the volume of lost product to the flare, reduce (or remove) the demand for a recovery system, and reduce overall site emissions.




A standard approach for the industry up to this point had been the addition of a "recovery system" that captured these losses and returned them to the process. The approximate cost for this solution was \$2.5m. The R&D team was challenged to find a better solution. They began investigating the potential of stopping the problem at the source, by finding a technology that could specifically identify which valves were leaking the product to flare. This potential solution would meet their leadership's objectives and, if proven, would offer tremendous savings as well as added value throughout the entire plant.


**Flare Stack Emissions Survey Case Study**

Through their research, the R&D team discovered the MIDAS Meter® from the Score Group of companies. The MIDAS Meter® has a proven track record in the Oil & Gas industry and it is used by almost 50% of the Nuclear Power production companies in the United States. Before moving forward with a company-wide program, they wanted to prove the concept within their facilities. They selected a test set of valves at one of their 7 plants in Texas, USA. The 62 target valves were selected for their ease of accessibility and suitable differential pressure. These valves were directly lined up to the flare.

**Survey Results**

Of the 62 valves surveyed with MIDAS Meter®, which were lined up to the flare, 12.9% (8) were found to have excessive leakage. Outside of any USA Environmental Protection Agency (EPA) penalties, the customer calculated that they were losing **\$342,709** in product annually through these leaking valves. The charts (over) document the losses incurred per valve.





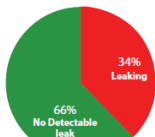
### Pre-Shutdown Planning Survey Case Study

Specifying Score Diagnostics' MIDAS Meter®, a customer commissioned a survey on critical blowdown system valves in conjunction with a planned shutdown on three sites. At the time of the survey, several pressure safety and manual isolation valves were also added to the work scope.

The survey provided the following results for 81 valves that had been targeted for maintenance work during the planned shutdown period at three process sites:

**53 Valves had No Detectable Leakage**  
**28 Valves had Detectable Leaks**

**Valve Survey Results**



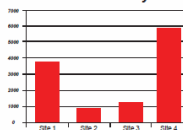
By examining the results, the survey gave the customer's Operations and Maintenance personnel the information they required to prioritise valves for maintenance and order spare parts and replacement valves ahead of the outage, avoiding any risk of extending the planned shutdown periods.

The survey results also allowed the customer's Operations and Maintenance personnel to confidently dismiss 66% of their planned valve repairs – based upon the evidence that those valves did not have any detectable leaks – resulting in a direct repair costs saving of £126,765, plus labour costs associated with the removal, testing and reinstatement of £23,220.

By engaging in these condition and performance monitoring activities, Midas Meter® has taken this customer from reactive maintenance "just-in-case" to proactive maintenance "with cause". Helping them focus and prioritise budget expenditure and actions on valves where maximum benefits could be achieved and avoid unnecessary repairs, delivering major cost savings.

Looking at the leakage rates 99lit per site, the customer could also easily identify which valves and sites should be prioritised for maintenance, with Site 1 offering the best available return on maintenance investment, being the cause of the majority of the losses.

**Product Losses by Site**




The MIDAS Meter survey highlighted that the total process fluid losses, based on the calculated leakage rates, were:-

- 6,200 litres/minute of gas leaking to flare, through damaged valves.
- 19.2 litres/minute of liquid, leaking to drain, through damaged valves.

These leaks represent an annual commercial loss value equivalent to **£207,642**, on the basis that the sites were operational for 50 weeks per year.

With survey costs of £18,613 and maintenance cost savings of £149,985 taken into account, **this survey helped the customer save £339,014 for the trading year.**



# Flare Gas Recovery

## TX-7 Valve Survey

As part of the compliance plan, the business has promised to survey valves connected to the flare and fix and/or replace leaking valves.

This has a 3-fold benefit:

1. Reduce the amount of losses to the flare
2. Reduces the size of the FGR Unit.
3. Reduce undesirable components recycled to the process or Fuel Gas



# Flare Gas Recovery

## TX-7 Valve Survey

### Acoustic Emissions (MIDAS Meter®)

#### Valve Survey Scope

##### Survey Goal:

- Detect and quantify valve leak-by of flare valves and in-service PSVs lined up to large flare.

##### Valves in Scope (62):

- Valves in-service (lined up to flare) accessible via existing platform, ladder or ground level

##### Out of scope: \*per SSIS checklist:

- Valves with less than 30 psig dP
- Valves that required scaffold or lifelines to access
- Valves out of service or not lined up to flare
  - Example: Spare in-line PSV where inlet valve was closed

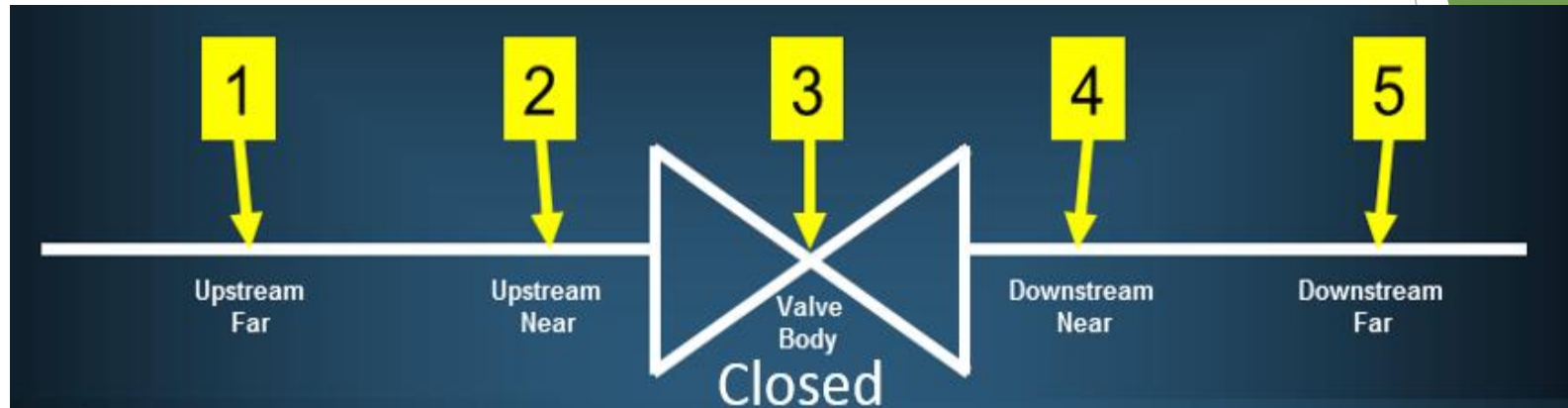


# Flare Gas Recovery

## TX-7 Valve Survey

### Valve Survey Details

Sampling locations:



### SCORE Generated Survey Report:

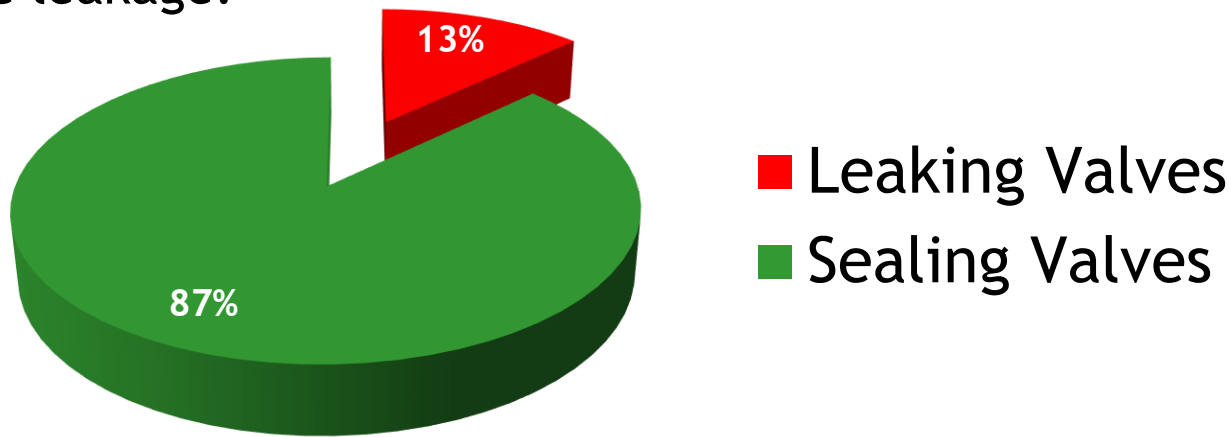
Identification			Operating Conditions				Readings						Leakage		
Date	Tag Number	Valve Type	Fluid	Fluid Density	Upstream Pressure	Downstream Pressure	Back-ground	Far Up-stream	Near Up-stream	Valve	Near Down-stream	Far Down-stream	Estimated Leakage	Allowable Leakage	
8/18/2016	D-38	Ball	Gas	N/A	415.00 PSI	0.00 PSI	21	22	22	22	22	21	0.0000 cfm	0.00cfm	
Valve Comments		LOCATION D-38 TO FLARE UPSTREAM 415													
8/18/2016	PV37A02	Gate	Gas	1.20kg/m3	320.00 PSI	0.00 PSI	21	34	23	39	27	26	5.110 kg/hour	0.00kg/hour	
Valve Comments		LOCATION D52 FLARE VLV UPSTREAM 360													

# Flare Gas Recovery

## TX-7 Valve Survey

### *MIDAS Meter<sup>®</sup> Survey Results*

Of the 62 valves surveyed with MIDAS Meter<sup>®</sup>, which were lined up to the flare, 12.9% (8) were found to have excessive leakage.



***Customer calculated that they were losing **\$342,709** of product annually, through these leaking valves.***

Note : This sum represents product losses only and is outside of any Environmental Protection Agency (EPA) penalties that may be incurred

# Flare Gas Recovery

## TX-7 Valve Survey

The table below shows the losses incurred per valve :-

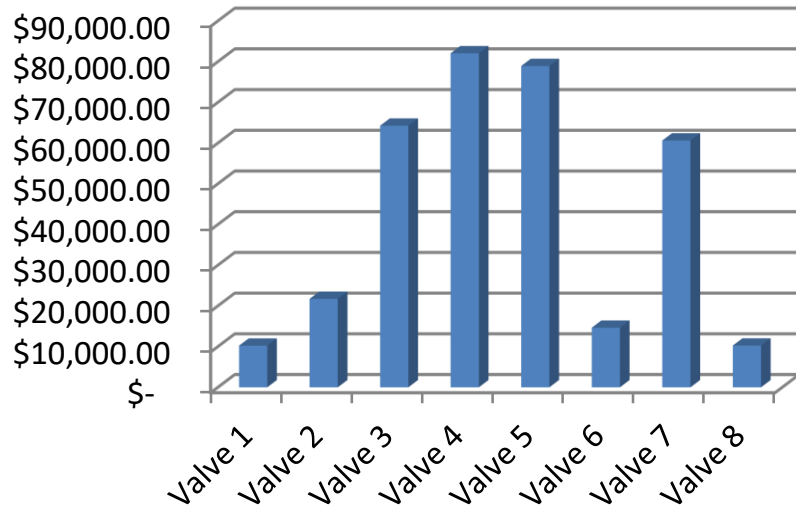
Location Description	Valve Tag Name	Lb/hr leakby rate	\$/Lb HVC	\$ lost/year
T38A/B to Flare	CV-33B36	11.7	0.10	\$10,233
D-52 Flare Valve	PV-37A02	11.3	0.22	\$21,720
C30 Discharge PSV	PSV-36A	22.2	0.33	\$64,262
C30 Discharge PSV	PSV-36B	28.4	0.33	\$82,058
C30 Discharge PSV	PSV-36C	27.3	0.33	\$78,928
D-20C PSV	PSV-20H Bypass	6.7	0.25	\$14,633
T-10 PSV	PSV-10C	34.6	0.20	\$60,619
E-27 export PV	PV-4912	5.1	0.23	\$10,256
	<b>Total Losses</b>	<b>147.3</b>		<b>\$342,709</b>

# Flare Gas Recovery

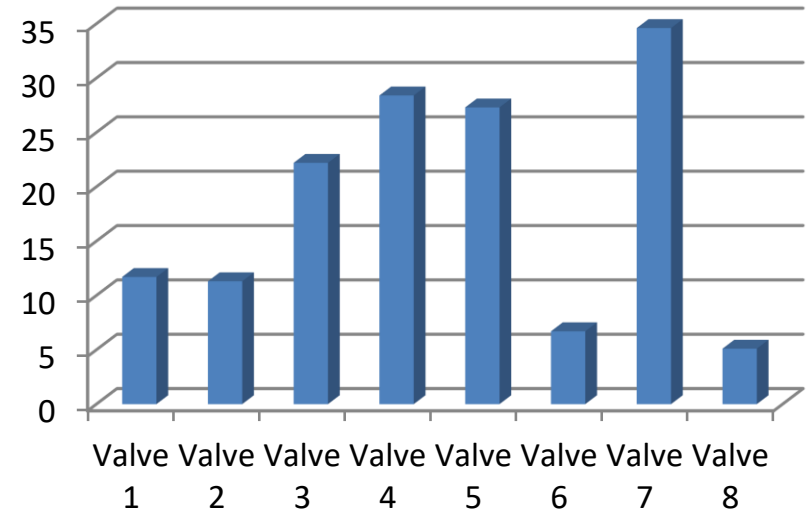
## TX-7 Valve Survey

The charts below visualize the losses incurred per valve :-

*Annual Losses of Product to Flare  
from Leaking Valves*



*lb/hr of Lost Product*



# Flare Gas Recovery

## TX-7 Valve Survey

### **The benefits of using the MIDAS Meter® were:-**

1. Valves' condition and performance was monitored quickly, easily and non-invasively, ensuring minimum disruption to production.
2. The sources of lost profits from through-valve product leaks were identified and targeted for recovery.
3. Targeted and prioritised maintenance interventions were possible, based on evidence / known condition of each individual valve.
4. Plant operating efficiency was maximised with smaller than “expected” investment, since all unnecessary spend and losses were eliminated.

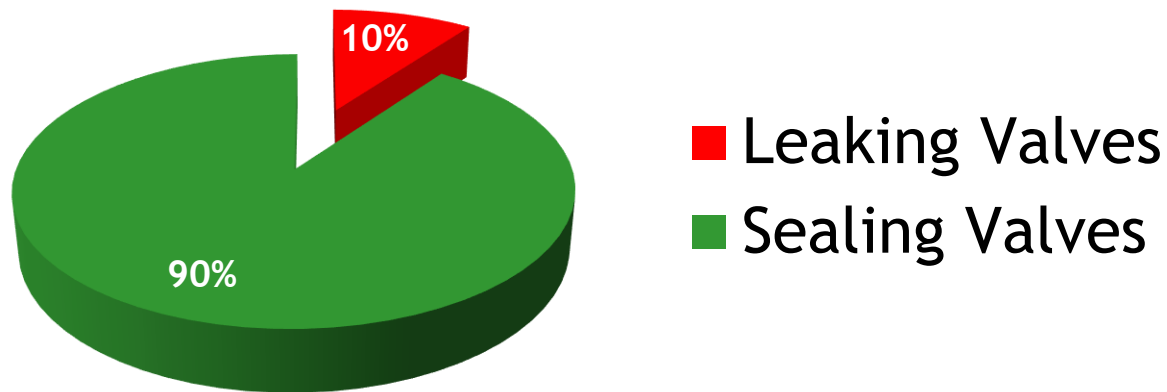
# Flare Gas Recovery

## St, Charles Valve Survey

### *MIDAS Meter® Survey Results*

Of the 50 valves surveyed with MIDAS Meter®, which were lined up to the flare, 10% (5) were found to have excessive leakage.

MIDAS Meter® Survey Results



*Total calculated losses of **81 lbs/Hr** of product leaking through these valves.*



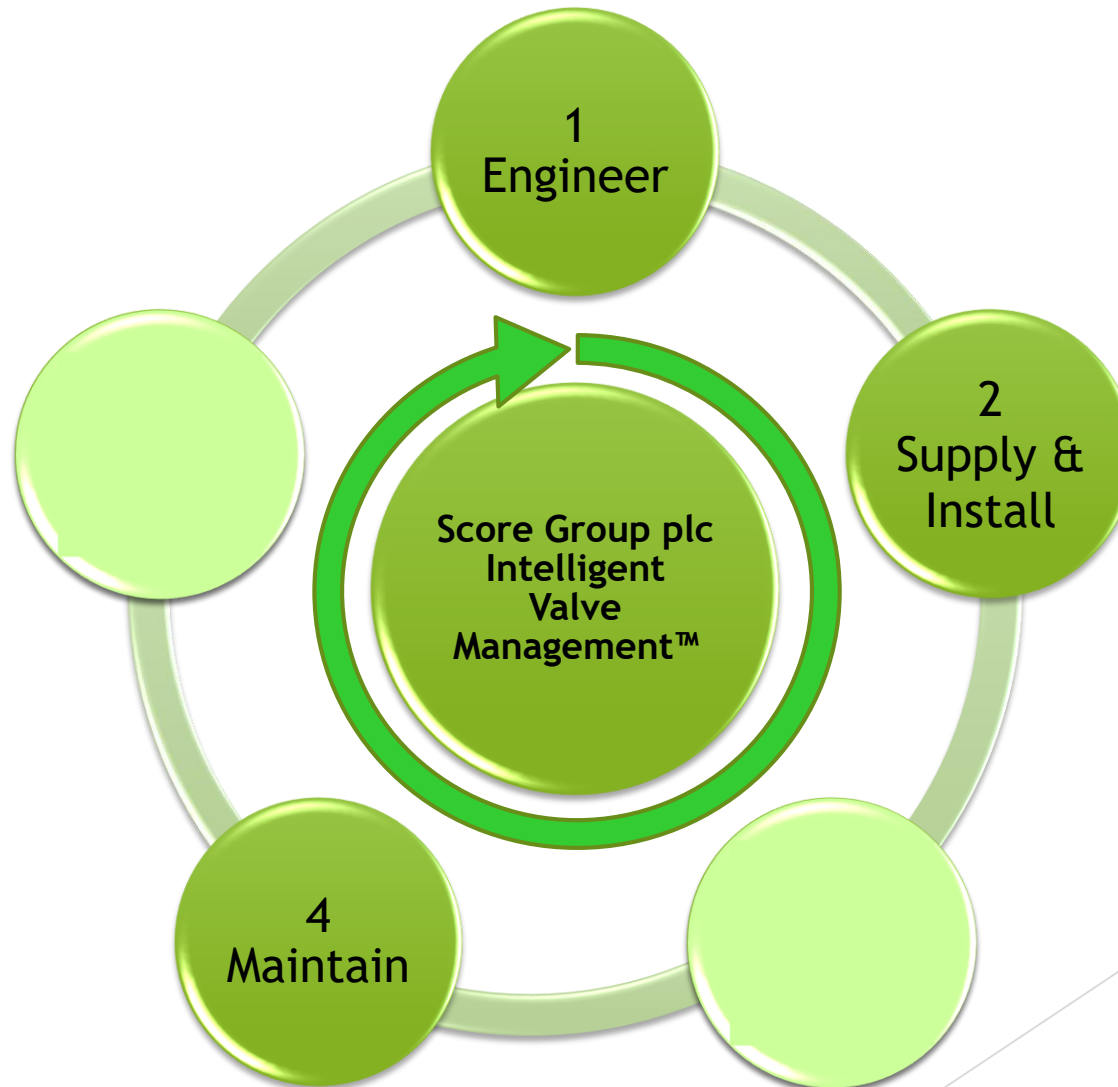
# DISRUPTION :-

*Work in different (NEW) ways  
to achieve different (BETTER)  
operational outcomes (RESULTS)  
and (PEAK PERFORMANCE)*

Thought Leadership...

# Conclusion : “Close the loop” with *Intelligent Valve Management™*

*The Virtuous Circle of Continuous Improvement*



# ***Any Questions?***

[midas.enquiries@score-group.com](mailto:midas.enquiries@score-group.com)

[www.midasvalvediagnostics.com](http://www.midasvalvediagnostics.com)

[www.score-group.com](http://www.score-group.com)

**Tel : +44 1779 485508**