THE POWER TO KNOW.®

Maintenance Strategy For time based to risk based

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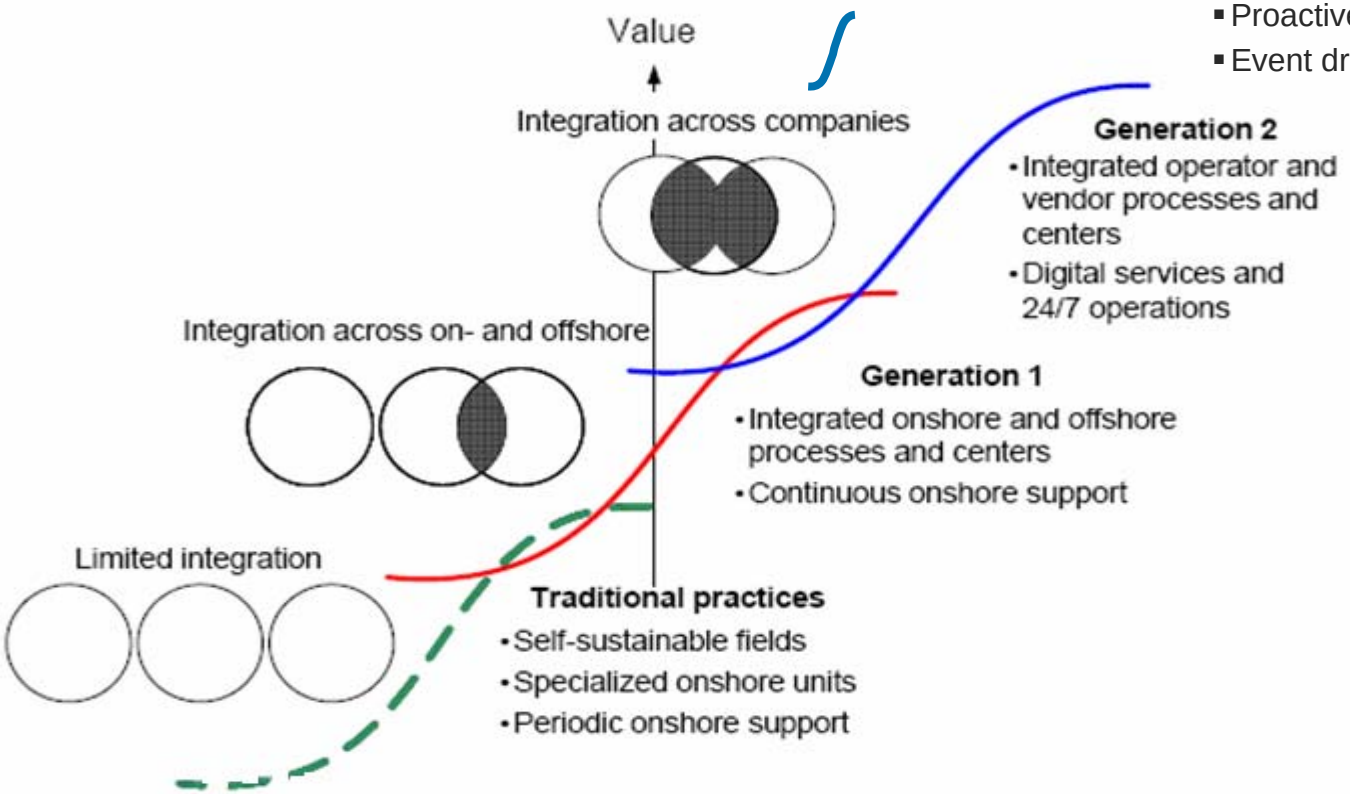
SAS Oil & Gas

SAS' experience with Integrated Operations on the Norwegian Continental Shelf

IO evolution on the NCS

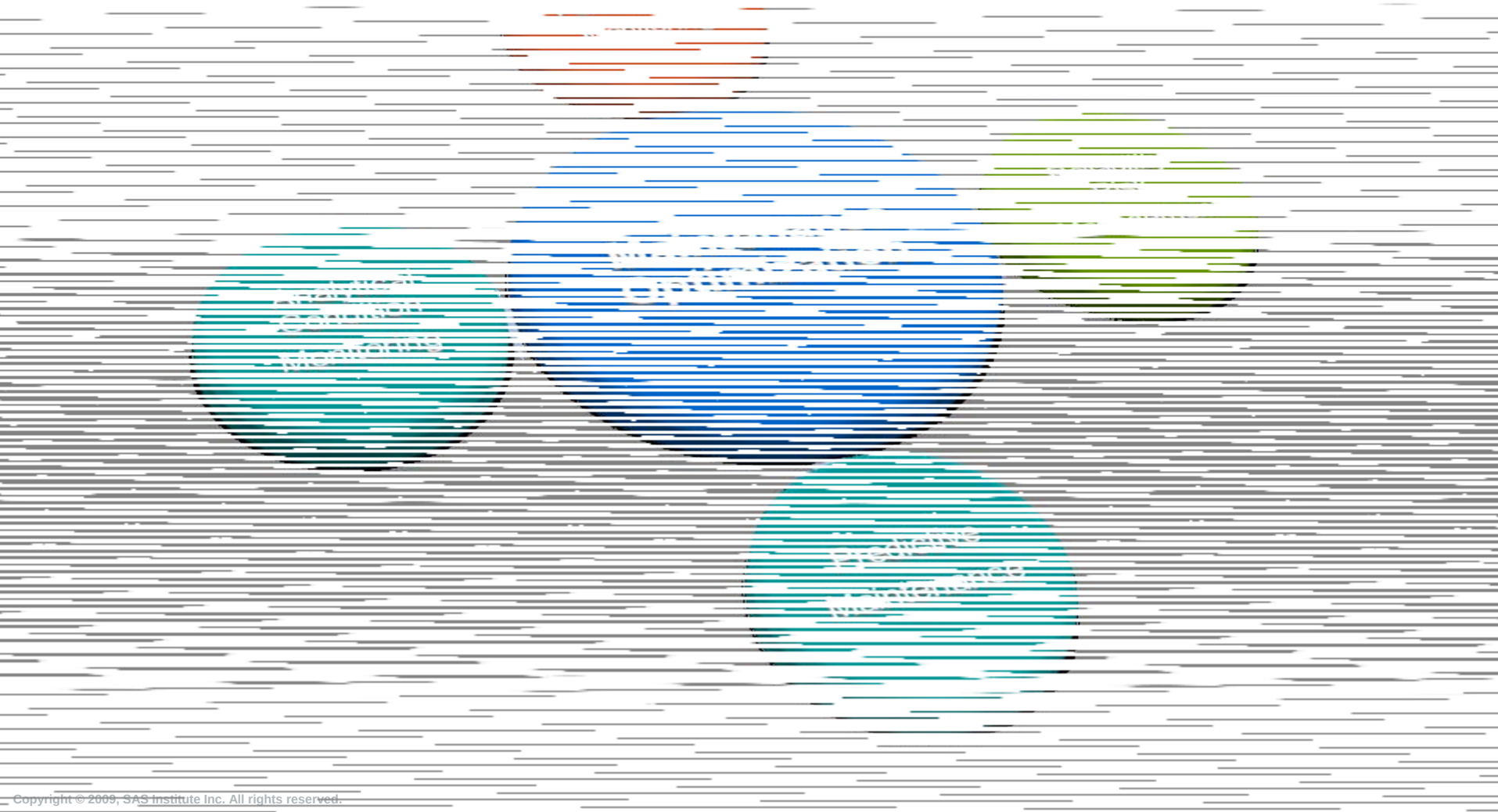


Generation 3

- Predictive analysis
- Proactive decision making
- Event driven optimization

Source: OLF

Maintenance Optimization – Asset Performance Management



Analytical Condition Monitoring

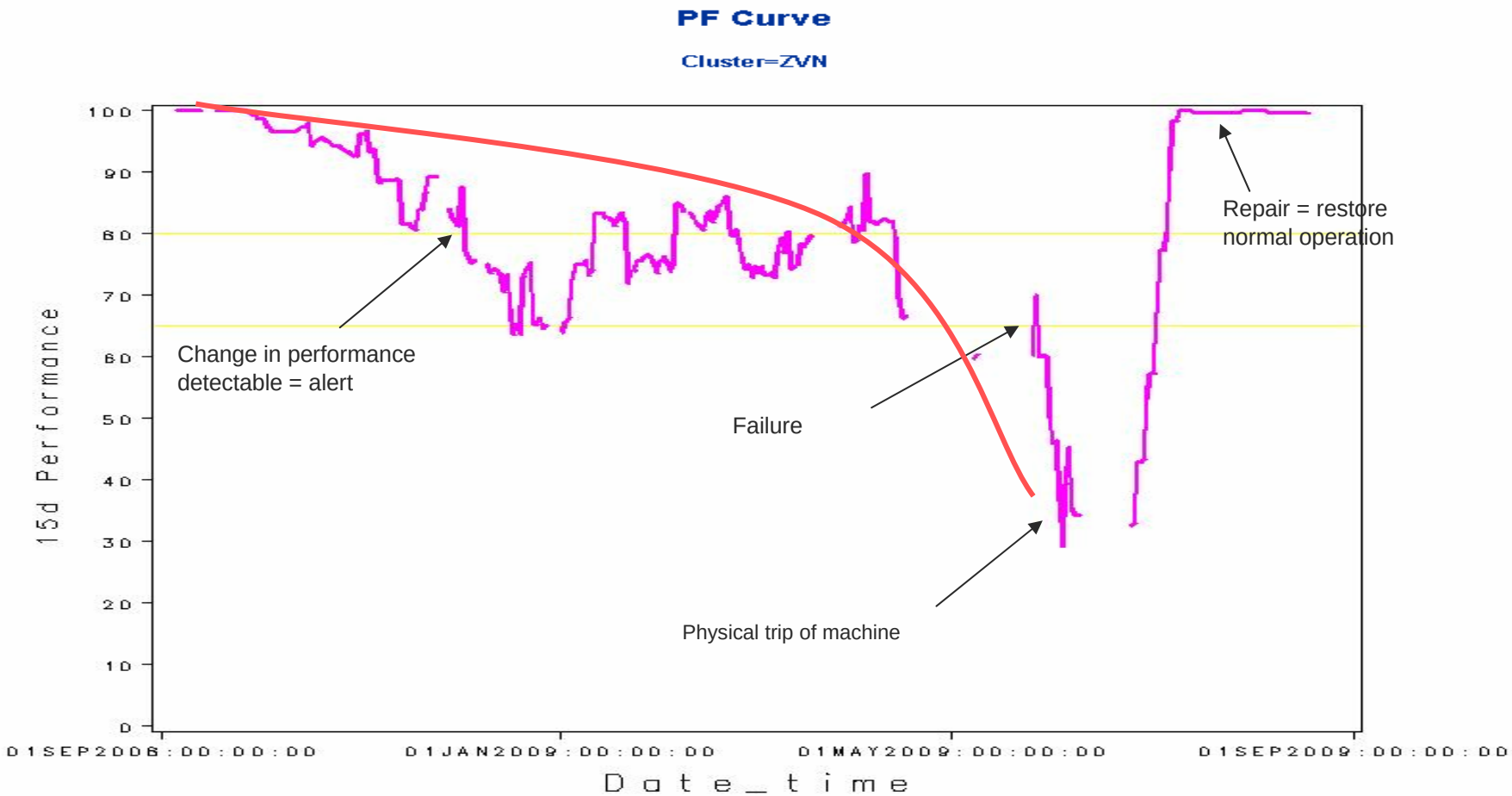
Condition Monitoring: Is the functionality of my equipment normal or abnormal? Is the health state of my equipment as it should? What Indicators to use to show the Condition State?

•Analytical Condition Monitoring is a solution that would help in detecting a potential incident with the health state of the equipment or Facility.

•This is an important and big step towards the avoidance / resolution of the potential health state decline / performance degradation before it happens.

Analytical Condition Monitoring

- Analytical Condition Monitoring is an important and big step towards the avoidance / resolution of the potential health state decline / performance



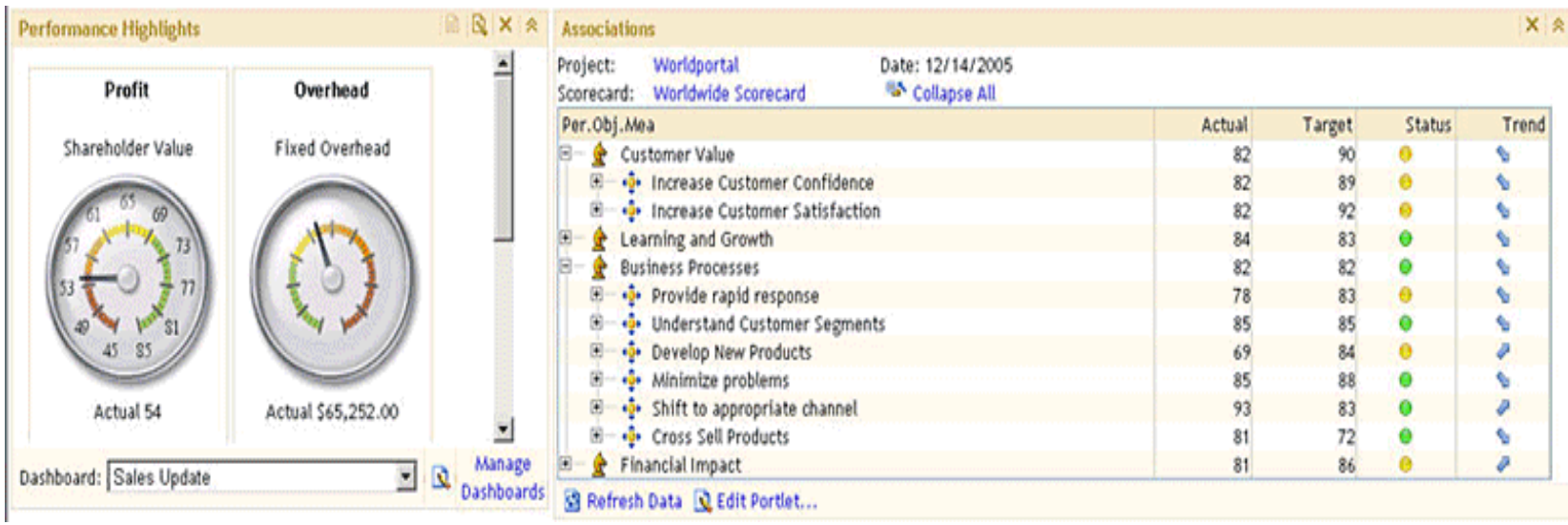
Reliability Risk Management

- The SAS Reliability Risk Management solution enables the user to identify measure, monitor, aggregate, evaluate and report operational risks to help mitigate and control these risks and comply with corporate / regulatory requirements.

- The Reliability Risk Management will help in assessing the risks of potential events coming in the future and giving the help the end-user takes a more accurate decisions.

Process Performance Management

• SAS Process Performance Monitoring helps organizations manage their strategy and supporting measures and initiatives to build alignment and better execute on their goals and objectives. From this application, business managers can track progress against objectives, understand underperformance and impacts, prepare for the future and take action when needed.



What if you could deliver the following?

- Reduced unplanned down-time – up to 80%
- Reduced planned down-time – up to 15% “MAJOR SHUTDOWNS”
- Lower Operation Costs – up to 10%
- Improved Collaboration – up to 20% increase in productivity
- Reduction in Loss Time to Injury, leading to improved HSE

Published by ConocoPhillips, at the IO Conference Stavanger, May 2007

Introduction to Predictive Maintenance

- A solution that has the capability to provide early alerts of undesired events that will occur in the future

- The Predictive Maintenance uses data mining techniques to detect patterns and develop data driven statistical models required to monitor and avoid the undesired events

SAS Solution IT Architecture

Data Integration

- Data Gathering:
  - oPI
  - oSAP Workorders
- Data Quality / Data Check

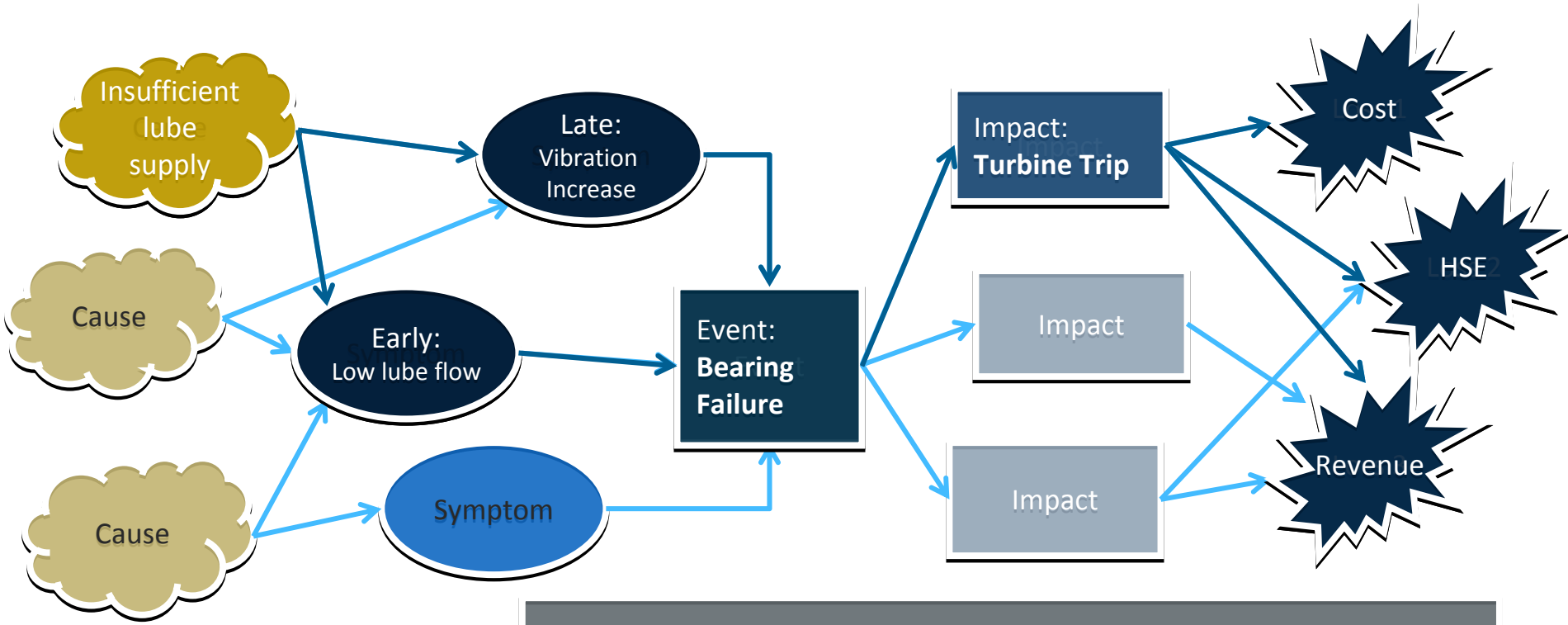
Data Mining Engine

- Developing Statistical Models
- Predicting Undesired Events
- Assessing Risks

Dashboard / Reporting

- KPIs
- Alerting
- Monitoring

SAS Predictive Asset Maintenance Framework



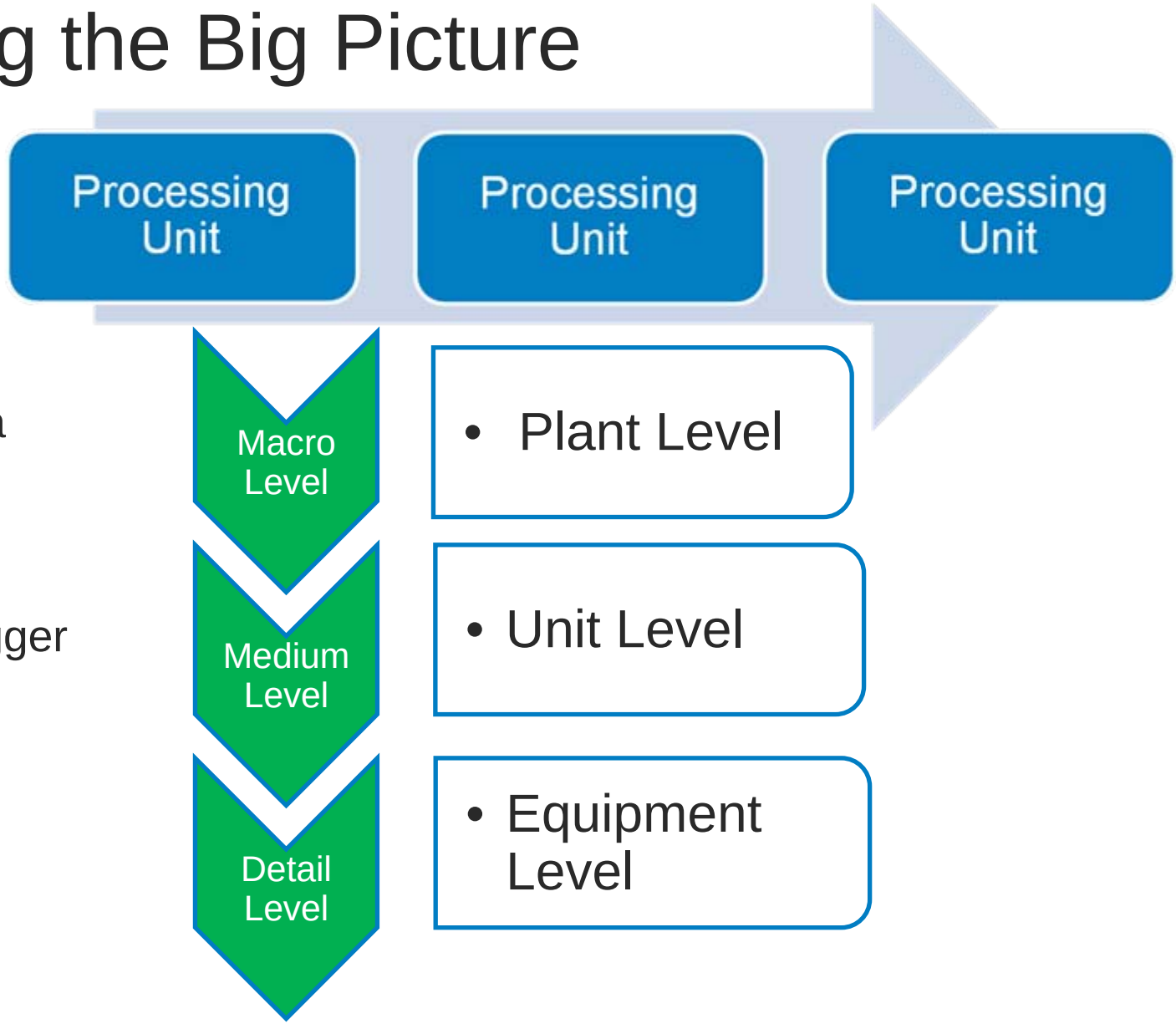
Benefits Framework

- Solve more Event driven problems , not possible to solve before
- Solve more Event driven problems in a shorter period of time
- Rapid root-cause analysis for a longer term solution
- Deploy accurate predictive models for efficient prevention
- Reduce corrective maintenance and refine preventive maintenance & uncover new maintenance requirements.

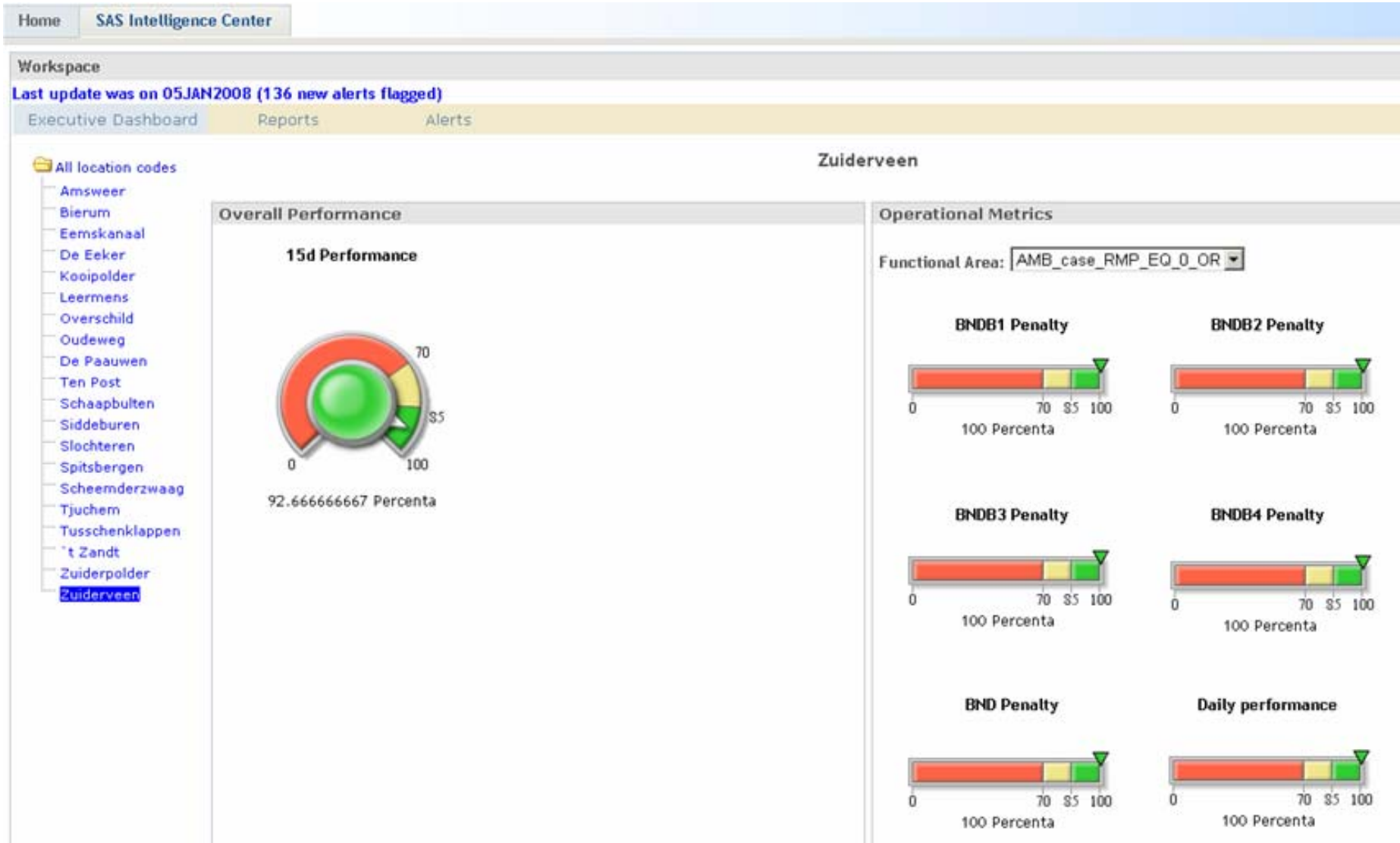
Facilitating the Big Picture

Combining:
- Process Data
- Mechanical Data
- Automation Data

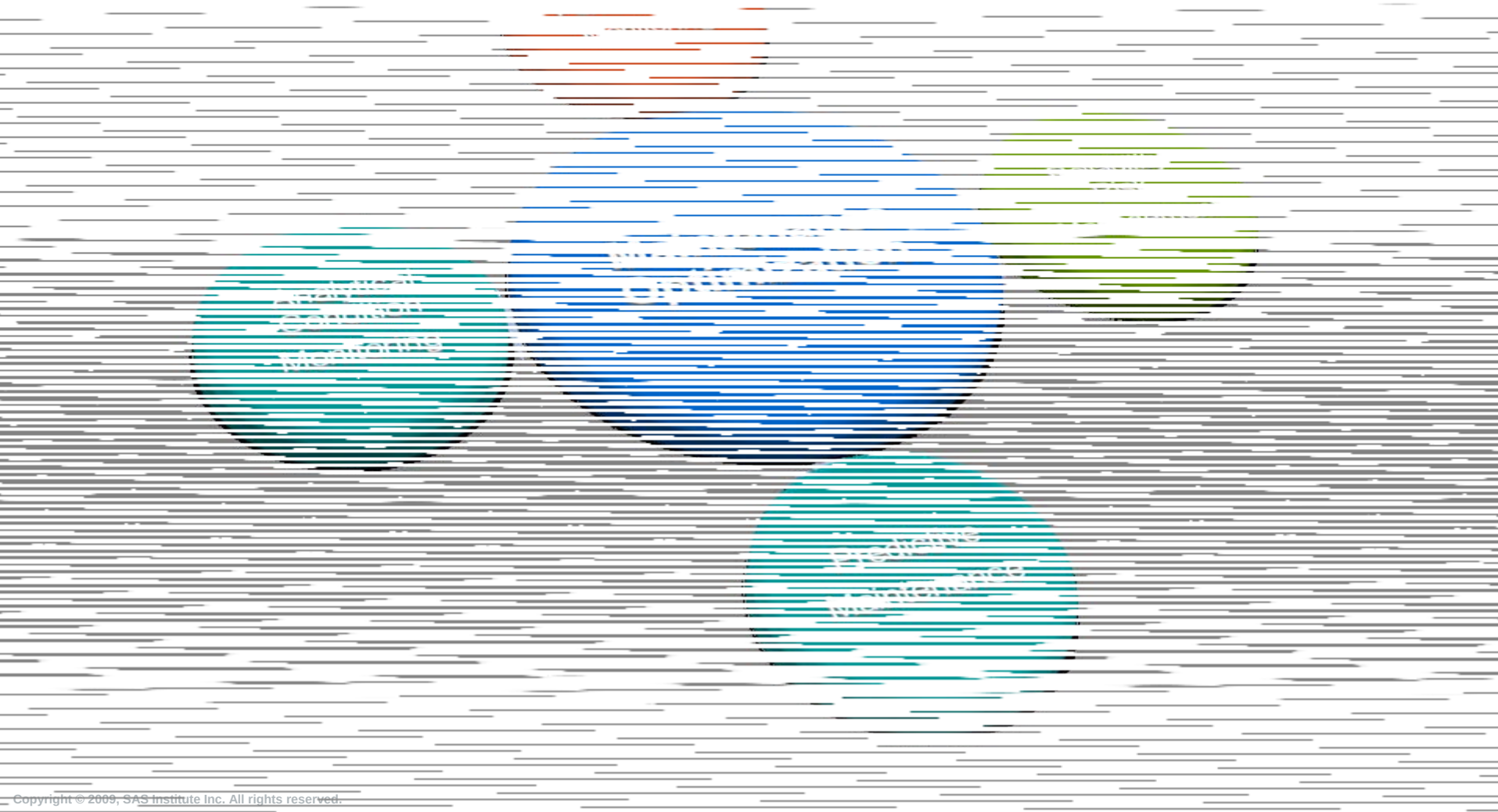
& other data to understand the bigger picture



Monitoring & Reporting



Maintenance Optimization – Asset Performance Management



Success Story

SAS recent success story with a Super Major in Europe

Challenges

- Unexpected break downs of their compressors/rotating equipment
- Unable to predict Glycol usage in their production process
- Inability to define a lifecycle of a new type filters, filters were replaced on time based intervals “Time Based Maintenance”

Solution:

- The compressor’s Magnetic bearings sensors functions are monitored predicted and alarmed
- Glycol usage within the process will be monitored, predicted and alarmed
- Pressure drop over the filters is monitored, predicted and alarmed “Risk Based Maintenance”

Benefits:

- Prevent production loss; avoid large replacement cost of the compressor’s core.
- Avoid paying SLA penalties to their gas transport customers for producing gas with too much Glycol,
- Reduce HSE risks, production loss and avoid replacing their new type of filters too soon,

Q&A

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