

SIEMENS



Smart Grid Services – Asset Services

2014 Workshop on SF₆ Emission Reduction Strategies Siemens SF₆ Gas Density Monitoring

2014 Workshop on SF₆ Emission Reduction Strategies Siemens SF₆ GDM System - Introduction

The purpose of any Condition Monitoring (CM) system should be to provide information with one aim

*...Present information to enable prediction of the time to intervene
and give guidance on intervention required.*

Our approach to Condition Monitoring to support in the context of a High Voltage Electrical Network focuses on 5 key areas: -

- Optimization of Maintenance regime
- Improved Risk Management
- End of Life prediction
- Knowledge transfer
- Enhanced rating

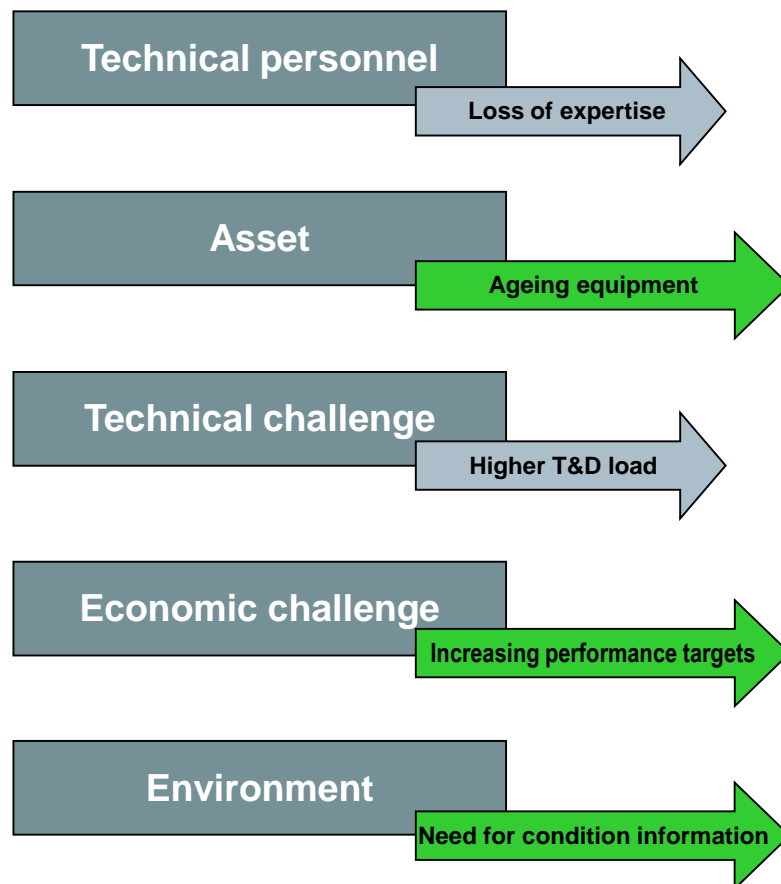
2014 Workshop on SF₆ Emission Reduction Strategies Siemens SF₆ GDM System – Industry Challenges

***“We have survived for over forty years without Condition Monitoring,
.....why do we need it now?”***

- We are facing new challenges and old ones are increasing
- Reaching asset design life
- Environmental impact - us on it.. and it on us
- Moving towards a dynamic network
- Stakeholder expectation - Regulation, Shareholder, Customer, Increased accountability, etc
- Offshore – conventional routine inspections not viable
- Cost reduction – Capital, operational, resource
- Capture and application of knowledge and experience
- Smaller work force

2014 Workshop on SF₆ Emission Reduction Strategies

Siemens SF₆ GDM System – Industry Drivers



Recent European legislation has targeted greenhouse gasses such as SF₆. Current European directive to reduce emissions to 0.5% per annum.

SF₆ Gas Density Monitoring System allows for:

- Proof of performance
- Strict accountability of gas use
- Visibility of primary leaking zones so that they may be targeted
- Planning of maintenance
- Alarm indication before excess gas is lost when first stage alarm is reached
- Quick and easy access to the latest data for all staff.
- Increasing environmental awareness

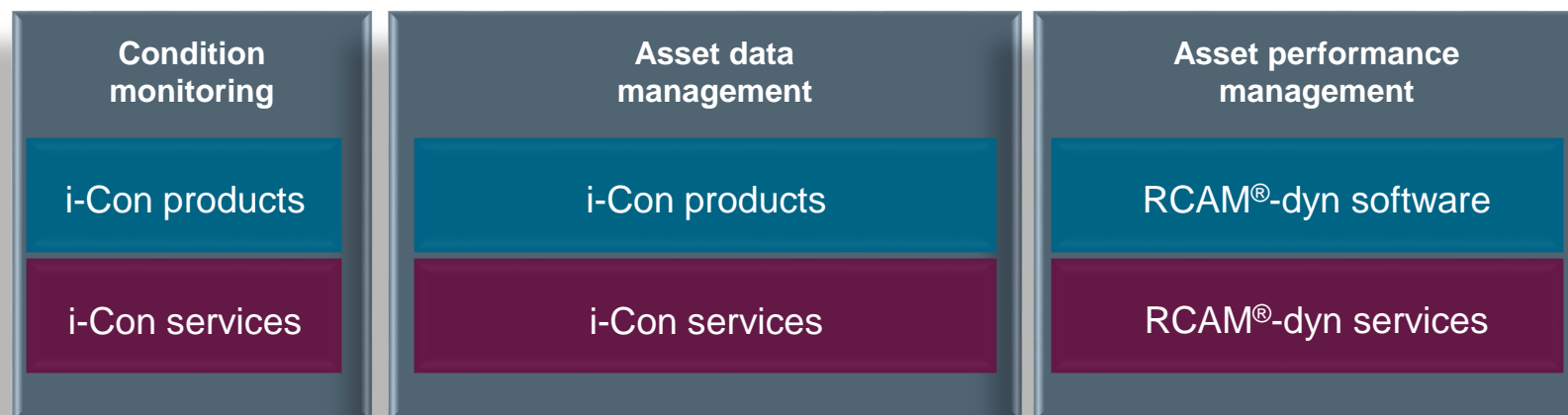
2014 Workshop on SF₆ Emission Reduction Strategies Siemens SF₆ GDM System – Key Lessons Learned

Since 2012 Our Vision and main focus areas remain unchanged, however, we have learned a great deal about what our customers need and more importantly what they don't need. Our key learning points are as follows: -

- SF₆ Monitoring is not suitable for every Substation owner
 - Without Policies & Procedures that govern how to use the data, investment is pointless.
 - Confidence is key – A system alarm should not be met with “What’s wrong with my SF₆ Monitoring system”.
- Front-end System simplicity is essential for wide-scale user buy-in.
- A system is only as accurate as the transducer selection (question anything that claims better than 0.5% accuracy).
- Innovative users want more than just SF₆ Monitoring – Condition Based Asset Management

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Siemens SF₆ GDM System – The Goal is Asset Performance Management

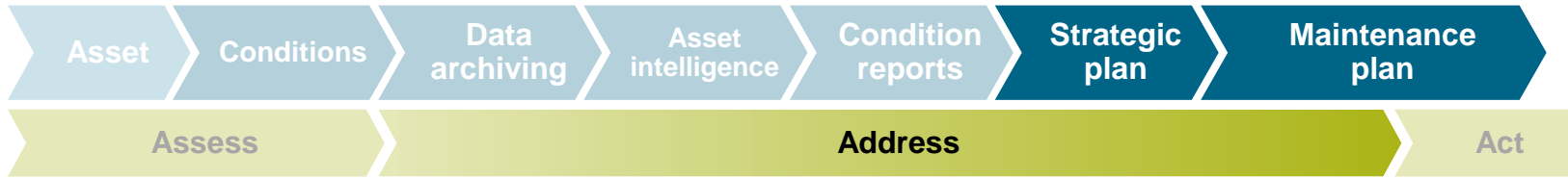


The goal of condition monitoring is asset performance management !

- **Condition monitoring**
Providing peace of mind for *operation* and supply of high quality input for ...
- **... Asset data management**
Providing peace of mind for both *asset management and operation* plus management of all information at one place for ...
- **... Asset performance management**
with most efficient improvements for:
 - maintenance planning
 - asset reliability, risk management
 - asset management (PAS55)
 - CAPEX and OPEX planning
(capital and operational expenditures)

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Siemens SF₆ GDM System – Siemens RCAM^{dyn}



RCAM[®] - dynamic

Risk Centered Asset Management

Offers

- Present health indexes and forecast
- Present risk evaluation and forecast
- Strategic risk analysis
- Next maintenance

Based on

- Online condition parameters
- Offline condition parameters (measurement)
- Asset information (e.g. SAP stored data)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	RISK PRESENT VALUE (€)	INVESTMENT PRESENT VALUE (€)	RISK + INVESTMENT PV (€)
140.65	140.65	202.79	263.72	439.54	439.54	439.54	439.54	439.54	571.40	596.05	608.75	608.75	608.75	904.56	1043.17	1301.03	1301.03	1347.39	4313.23	6000.00	9313.23	
140.65	140.65	140.65	202.79	263.72	439.54	439.54	439.54	439.54	439.54	571.40	596.05	608.75	608.75	904.56	1043.17	1301.03	1301.03	1301.03	3421.76	4322.23	7743.99	
140.65	140.65	140.65	140.65	140.65	202.79	263.72	439.54	439.54	439.54	439.54	571.40	596.05	608.75	904.56	1043.17	1301.03	1301.03	1301.03	3421.76	4322.23	7743.99	
140.65	140.65	140.65	140.65	140.65	140.65	202.79	263.72	439.54	439.54	439.54	439.54	439.54	439.54	571.40	596.05	608.75	608.75	904.56	1043.17	2845.57	3415.07	6260.64
140.65	140.65	140.65	140.65	140.65	140.65	140.65	202.79	263.72	439.54	439.54	439.54	439.54	439.54	439.54	571.40	596.05	608.75	608.75	904.56	2586.57	3104.61	5691.18
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140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	202.79	263.72	439.54	439.54	439.54	439.54	439.54	439.54	571.40	596.05	608.75	2236.47	2585.79	4822.26
140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	202.79	263.72	439.54	439.54	439.54	439.54	439.54	439.54	439.54	1972.36	2320.49	4292.85
140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	202.79	263.72	439.54	439.54	439.54	439.54	439.54	439.54	439.54	1687.28	1977.72	3665.00
140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	202.79	263.72	439.54	439.54	439.54	439.54	439.54	439.54	439.54	1623.54	1752.47	3376.01
140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	202.79	263.72	439.54	439.54	439.54	439.54	439.54	439.54	439.54	1533.15	1533.15	3066.30
140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	202.79	263.72	439.54	439.54	439.54	439.54	439.54	439.54	439.54	1424.26	1448.32	2872.58
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140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	202.79	263.72	439.54	439.54	439.54	439.54	439.54	439.54	439.54	1020.00	1053.77	2073.77
140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	202.79	263.72	439.54	439.54	439.54	439.54	439.54	439.54	439.54	940.00	973.77	1913.77
140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	202.79	263.72	439.54	439.54	439.54	439.54	439.54	439.54	439.54	860.00	893.77	1753.77
140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	202.79	263.72	439.54	439.54	439.54	439.54	439.54	439.54	439.54	780.00	813.77	1593.77
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140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	202.79	263.72	439.54	439.54	439.54	439.54	439.54	439.54	439.54	540.00	573.77	1113.77
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140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	202.79	263.72	439.54	439.54	439.54	439.54	439.54	439.54	439.54	300.00	333.77	633.77
140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	202.79	263.72	439.54	439.54	439.54	439.54	439.54	439.54	439.54	220.00	253.77	473.77
140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	202.79	263.72	439.54	439.54	439.54	439.54	439.54	439.54	439.54	140.00	173.77	313.77
140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	140.65	202.79	263.72	439.54	439.54	439.54	439.54	439.54	439.54	439.54	60.00	93.77	153.77

Questions?