Shell Global Solutions

The well kept secret of Successful Automation

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The Business

Feedstock sourcing
Production investments
Logistics investments

Feedstock acquisition
Production planning
Distribution planning

Storage
Blending
Production scheduling
Unit optimisation
APC
DCS
Field

Time

Demand driven

Supply
Production Optimisation
Distribution

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Automation

- Stable/smooth operation
- Within constraints
- Maximising an economic objective function
Automation in layers

• **Base Layer Control**
  - *Regulatory, ~ 1 second frequency or less*
  - *Control of Compressors, Fired Equipment, Distillation, Levels “Surge Volumes”*

• **Advanced Control**
  - *Multivariable, model based predictive control, Quality prediction, 1-2 minutes frequency*

• **Optimisation**
  - *Rigorous modelling, 30-40 independents, 300-500 dependents, ~ 3-4 hours frequency*
Benefits of Automation

- Specification or limit
- Operator target
- Standard deviation of controlled variable

- BEFORE APC
- APC ONLINE
- SETPOINT MOVED CLOSER TO LIMIT

Base Case | Stabilise | Exploit

Benefits of Automation
Results from a Catcracker SMOC Project

- Expected increase in CCR 0.6 t/min
- Actually achieved improvement of around 1 t/min
- For the 3 months after commissioning, the average uptime for all SMOC controllers exceeded the required 95%
- Also, the minimum performance guarantee (x $/ton) was exceeded
Source of APC Benefits

Other benefits:

- Less maintenance (wear and tear)
- Less operator attention

Reference: APC for Chemicals Masterplan (Oct. 98)
Benefits - APC Improves Reliability

Source: Solomon
Control/Optimisation Software Products

- SMOC - Shell Multivariable Optimising Controller
- AIDA - Advanced Identification and Data Analysis
- RQE - Robust Quality Estimator
- COAST - COntrol Applications STandards
- MD - Monitoring and Diagnosis
- SPOT - Shell Plant Optimisation Technology
Control Performance Monitoring

• Why monitor control system performance and benefits?

• Advanced controls
  • Incentive to sustain loop performance at an optimum level, which requires high uptime and close proximity to targets.

• Base layer controls
  • Loop performance has a major impact on unit stability and operability, and therefore on APC and economic performance.

• The monitoring and diagnosis tools are designed to:
  • Provide advanced tools for detailed analysis (MD<sup>Pro</sup> Offline).
  • Automatically distribute basic control system performance data (MD<sup>Pro</sup> Online).
Advanced Control & Optimisation survey 2002

- 68 Customers
- 46 refineries, 6 gas plants and 16 chemical sites.
- Refinery capacity: 6,200,000 bbl/day
- New: Six non-Shell customers included
Advanced Control & Optimisation Benefits

- APC Implementation Index / Benefits
  - 71% in refineries
  - 59% in Chemicals
  - 59% in LNG / Gas plants
- 35 unit optimisers, 1 refinery wide optimiser
- Benefits
  - APC: about 300 million US$ p.a.
  - and more......
Trends (1)

- Integration of APC and Optimization and other technologies
- Runs on commodity hardware (Pentium PC) (APC in DCS)
- Software is Microsoft compliant (windows 2000, XP)
- Interfaces based on open standards (OPC, ODBC)
- Migration from obsolete Vax/HP9000/Unix to new systems
Trends (2)

- Inferred measurements (e.g. RQE) have found their way to customers.
- Remote servicing/monitoring opportunities explored (e.g. MD).
- Newer applications are solution driven (e.g. green gas oil, MCHE, ethylene).
- Next growth expected in plant optimization (30% per year according to ARC).
Best practices (1)

- ‘Get the Basics right’
- Justify project in monetary terms
- Follow a project approach (team, schedule, commitments, etc.)
- Ensure management commitment
- First implementation must be a success (low hanging fruit)
- Train local staff and transfer ‘know how’
- Get operator involvement throughout project
- Build on proven experiences and process know how (standard documents)
Best practices (2)

- Standardise on proven products
- Lower threshold for users
  - Integration in existing systems and workprocesses
  - Easy user interface
  - PC based packages
  - No user code
- Ensure maintenance focus after project (e.g. manpower)
- Use Monitoring and Diagnosis tools for control performance monitoring
- Share experiences between sites and projects
Conclusion

- Automation achieves good ROI (typically 6 – 12 months pay back)

- Successful implementation needs:
  - Excellent products/solutions
  - Efficient project approach
  - A comprehensive framework of best practices
  - Dedication, commitment and …. time

- Automation for the process industry moves into new territories as petrochemicals, LNG, fine chemicals, cement, etc.

- Technology moves towards tighter vertical integration

- Shortage of qualified Automation engineers remain major constraint for progress
Thank You!