Shell Global Solutions

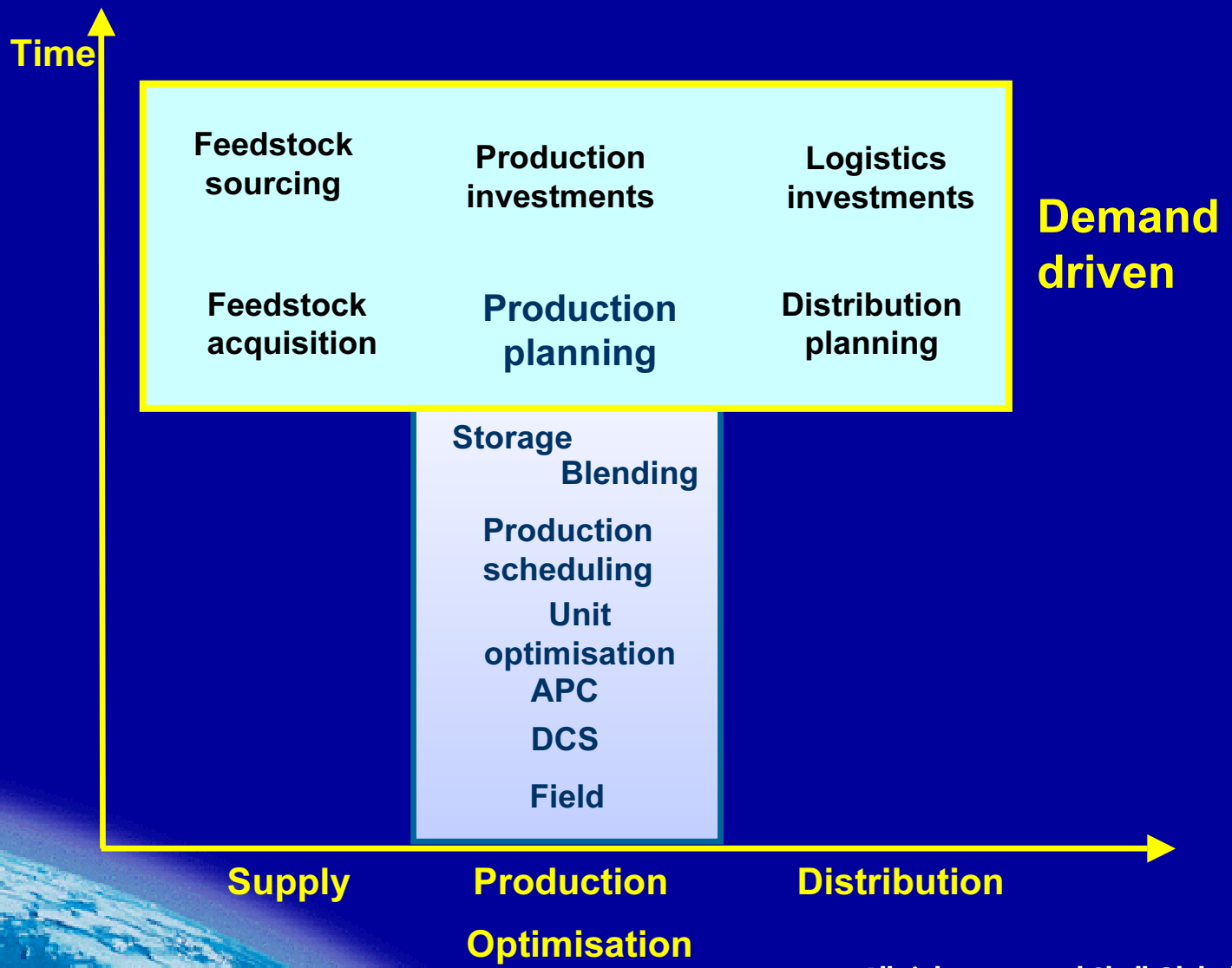
The well kept secret of Successful Automation

Guido ten Hacken

Business Group Manager

Process Control and Plant Optimisation

The Business



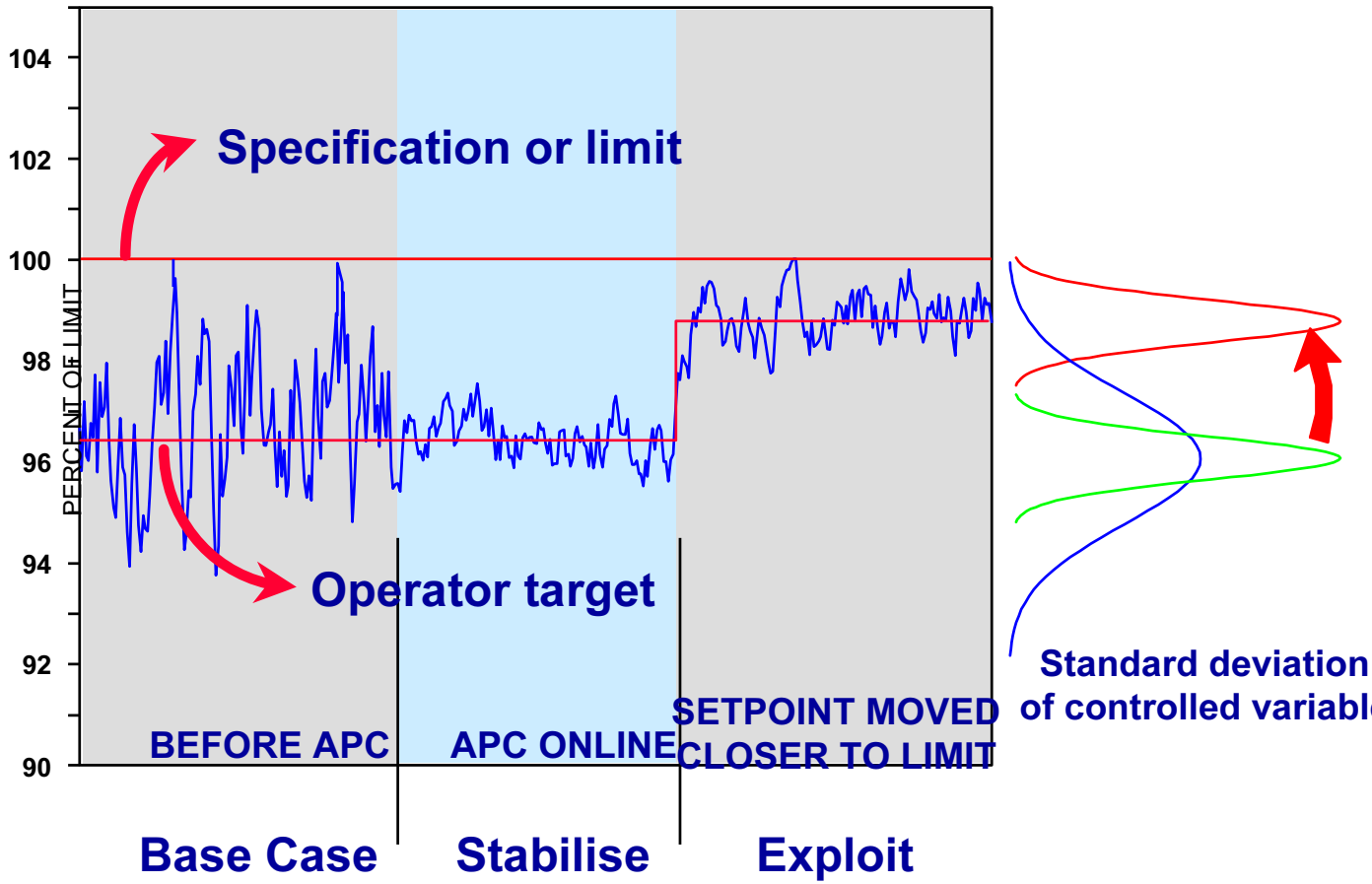
Automation

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

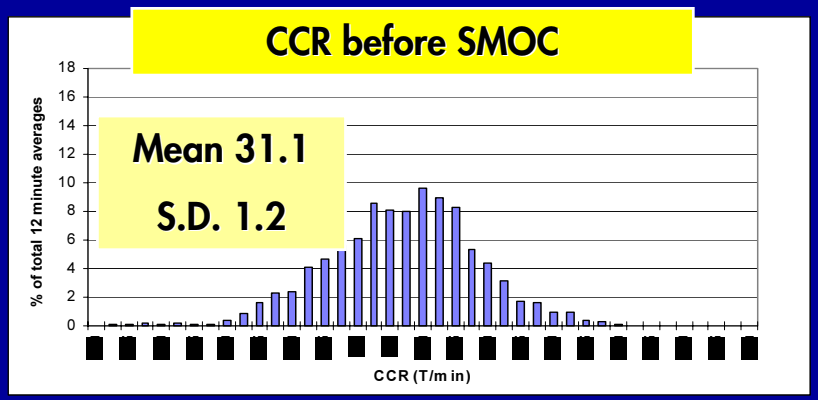
Automation in layers

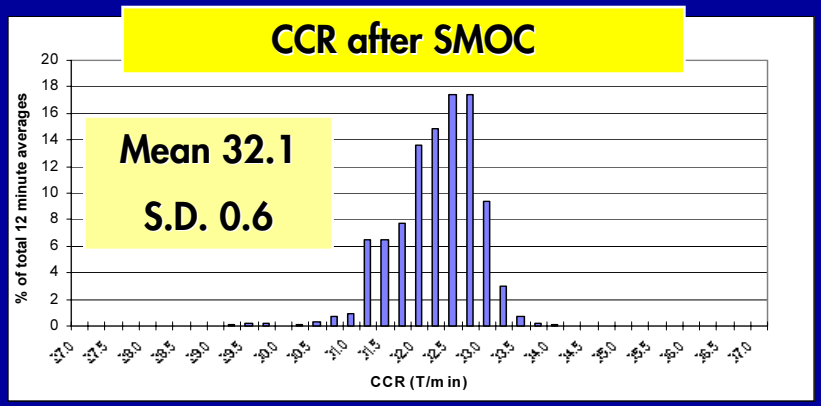
- Base Layer Control
  - *Regulatory, ~ 1 second frequency or less*
  - *Control of Compressors , Fired Equipment, Distillation, Levels "Surge Volumes"*
- Advanced Control
  - *Multivariable, model based predictive control, Quality prediction,1-2 minutes frequency*
- Optimisation
  - *Rigorous modelling, 30-40 independents, 300-500 dependents, ~ 3-4 hours frequency*

Benefits of Automation



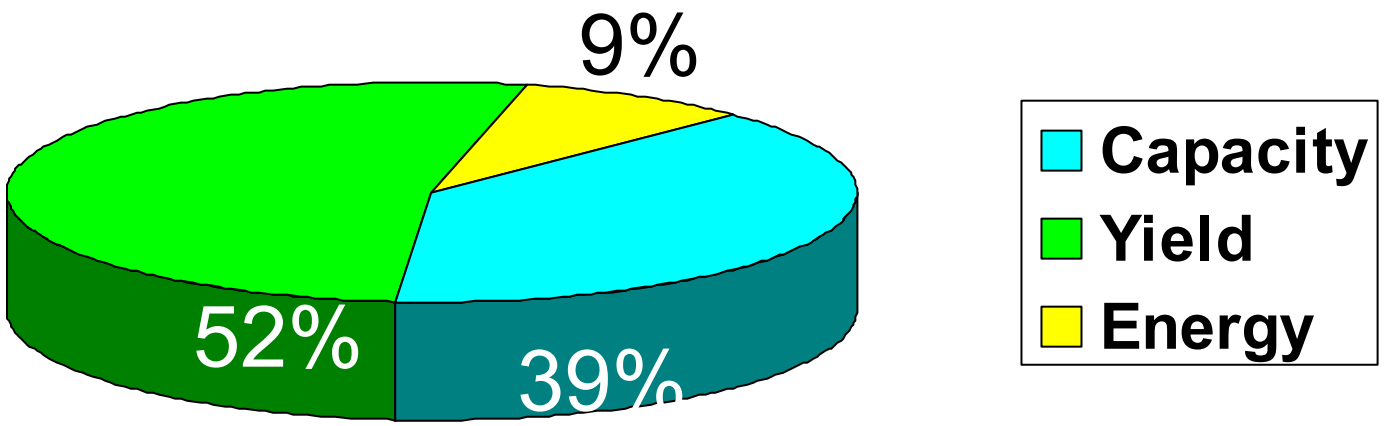
Results from a Catcracker SMOC Project





- 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

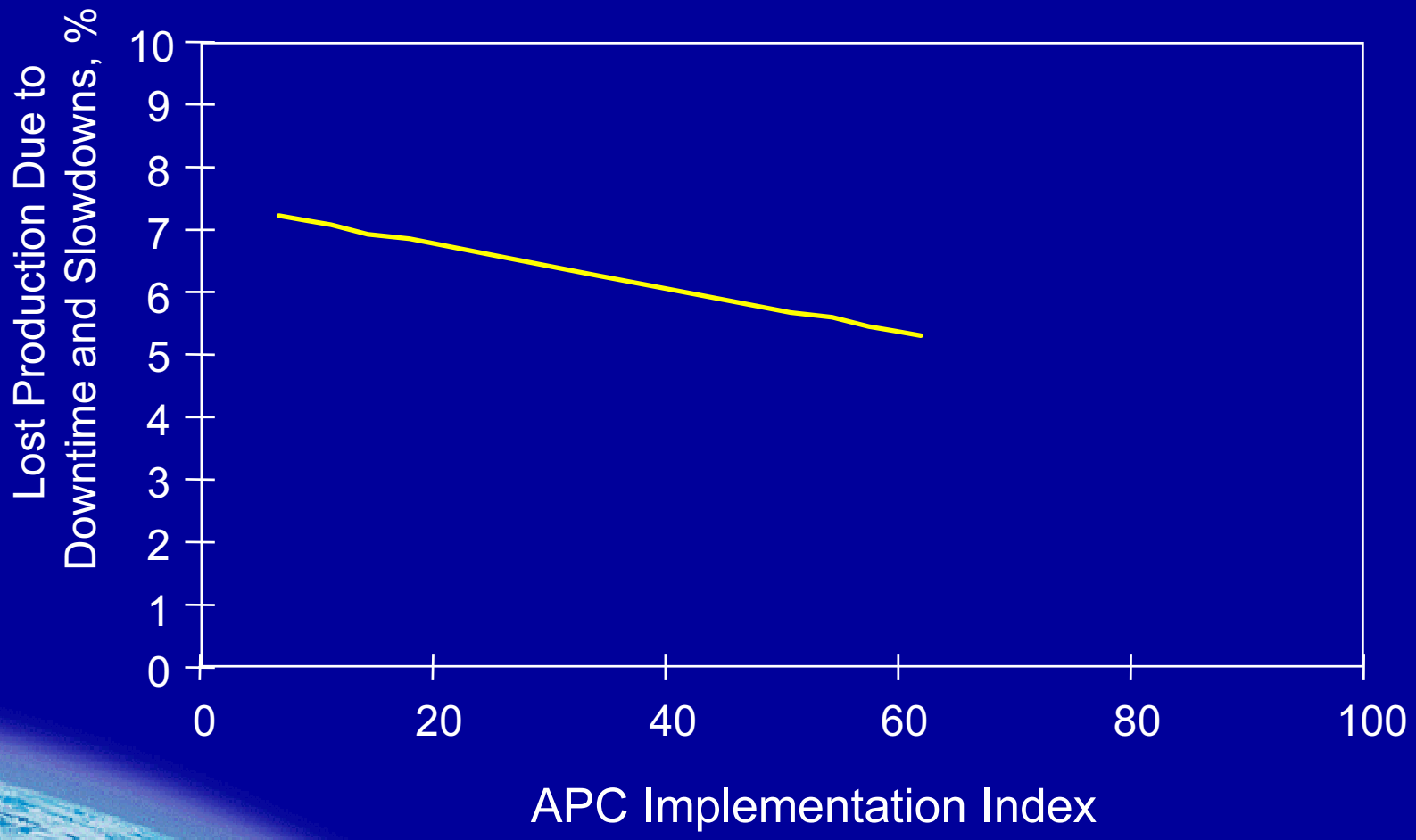


Other benefits:

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

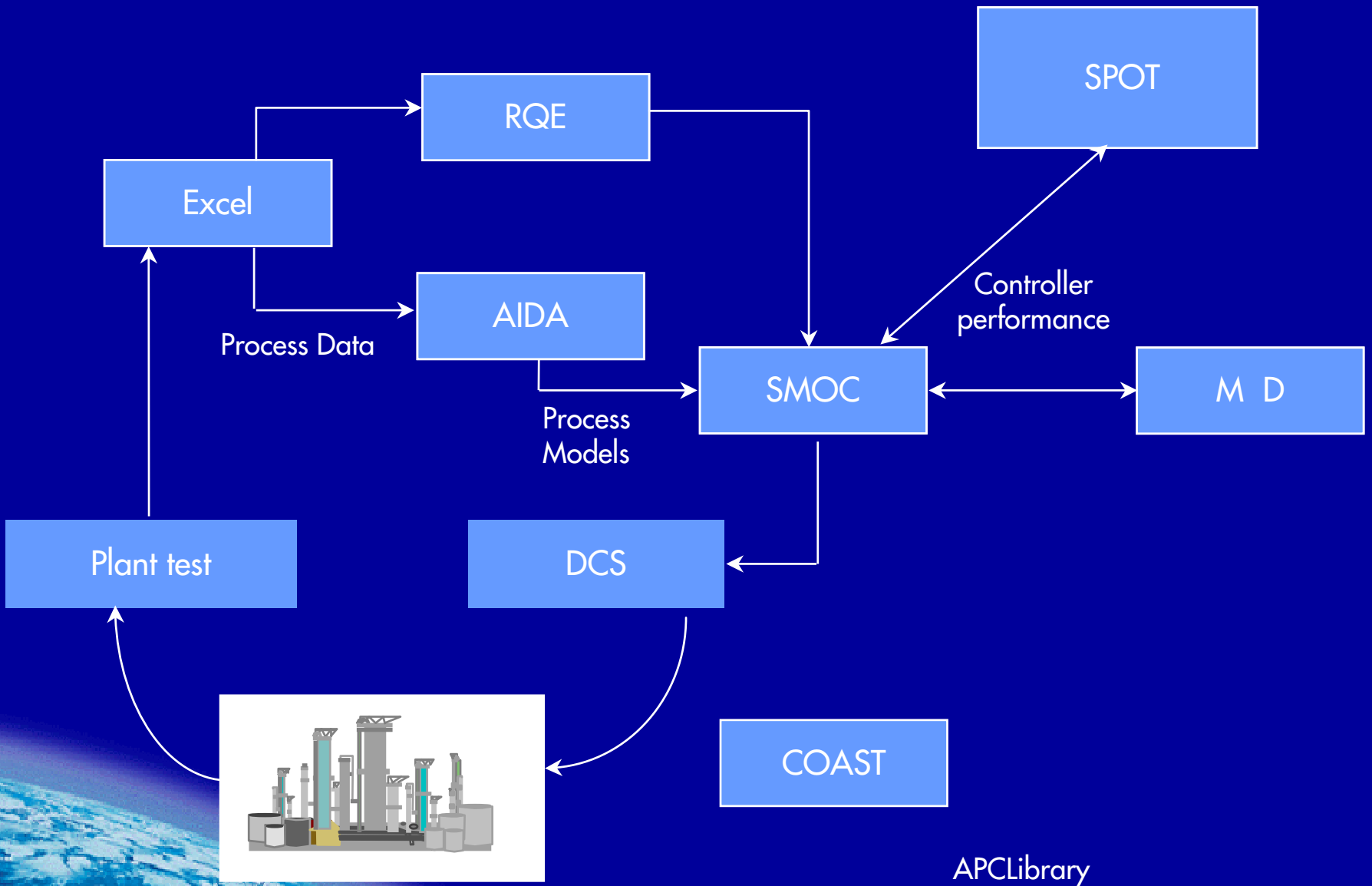
Reference : APC for Chemicals Masterplan (Oct. 98)

Benefits - APC Improves Reliability



Source: Solomon

Automation products



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

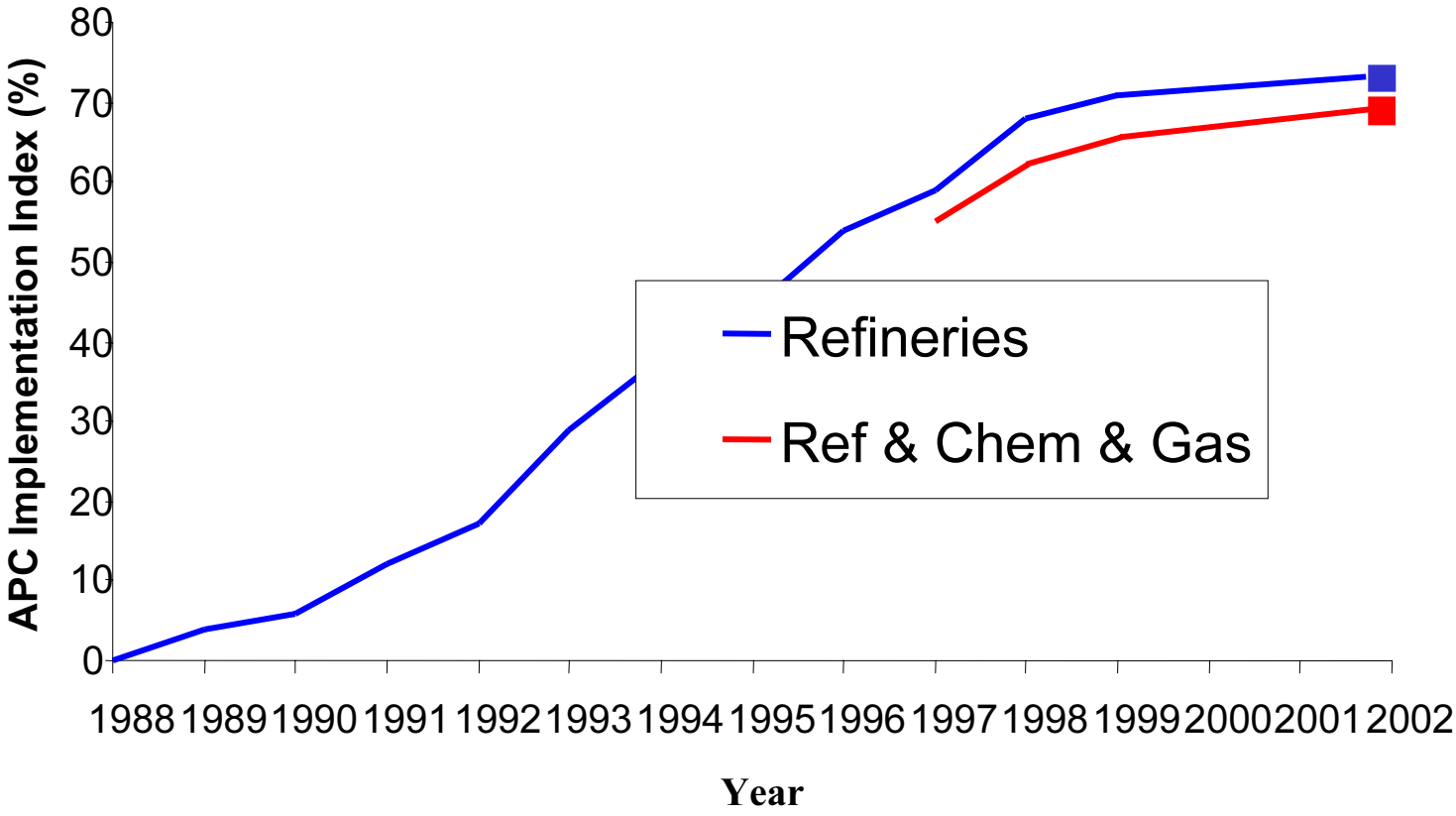
Control Performance Monitoring

- 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*Pro* Offline).
  - Automatically distribute basic control system performance data (MD*Pro* 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

APC implementation progression curve



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.
  UO : about 50 million US$ p.a.
- Full Potential: APC : >500 million US $ p.a.
  UO & RWO: >250 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!