

The ExxonMobil logo is positioned in the top right corner. It features the word "Exxon" in a red, sans-serif font with a stylized 'x' that has a diagonal slash, and the word "Mobil" in a black, sans-serif font to its right. The background of the entire slide is a close-up of a car's rearview mirror and side mirror, overlaid with a complex, multi-colored digital grid pattern in shades of blue, purple, and red.

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DMC3 Builder Experience in ExxonMobil

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Outline

- Why we chose DMC3 as our Next Generation APC
- What we've done
- What we've learned
- Summary

Why we chose DMC3 as next gen APC

- **Our linear APCs are all DMCplus**
 - Hard to run and maintain by Site AEs that do not do lots of projects.
 - Large and small revamps create high demand on DMC experts.
- **Calibrate**
 - Simplifies and speeds testing, particularly for re-tests.
 - We've presented 2 user group presentations and 2 webinars on it.
- **DMC3 Builder**
 - Contains numerous improvements (Model ID, SmartTune, Workflow)
 - Maintenance would shift to site and Service Factors would improve
 - This would free specialist resources for doing more new projects

What we've done with DMC3 Builder

- Two projects
 - DMCplus pre-test, DMC3 v9 test and commissioning (Project 1)
 - 2 Migrations of DMCplus to DMC3 v10 + 1 from scratch (Project 2)
- Project 1:
 - Size: 8 MVs, 17 CVs, 3 FFs (DVs) – 1min frequency; 180min TTSS
 - Seed model developed in DMCplus, then migrated to DMC3 Builder.
 - Testing/Commissioning using Calibrate - completed in 2 weeks.
- Project 2:
 - Revamps – Migrated from DMCplus:
 - 18 MVs, 31 CVs, 4 FFs (DVs) – 30sec frequency; 240min TTSS
 - 10 MVs, 15 CVs, 3 FFs (DVs) – 1 min frequency; 180min TTSS
 - New: 4 MVs, 7 CVs, 5 FFs (DVs) – 1 min frequency; 720min TTSS
 - Testing & commissioning done in 3-4 weeks (on-site work: 2 weeks)
 - Utilized some old test data with new modeling features
 - Constrained model ID was very helpful, particularly for parallel CVs

What we've learned

- **Systems Installation: Important to get right**
 - Project 1 – done right; no system issues, still running well.
 - Project 2 – done differently; caused aggravation during testing.
 - Thanks to excellent support from AspenTech it is now running well.
- **Migrating from DMCplus works well**
 - Project 1 team streamlined the migration procedure.
 - Based on Aspen's "APC Validated Process v9 ver7"
 - Project 2 - no problems migrating to DMCplus using that procedure.
 - There were issues, but these were related to systems installation.
- **Building from scratch was painful for us**
 - XOM DCS I/F is complex, current DMC3 template inadequate.
- **V10 (without CP1) had a number of issues**
 - Thanks to Lucas Reis and team for excellent support during effort.
 - Nearly all of the issues resolved in CP1.

More of what we've learned

- **DMC3 Builder is easy to use and understand.**
 - Much more accessible to unexperienced practitioners.
 - Structured work flow.
 - SmartTune: Novice engineers find this much easier to use than SS costs.
 - Simplified and improved modeling environment.
 - Constrained model ID.
 - Easy to access uncertainty plots / model grades.
 - Integrated and improved near-colinear analysis / repair.
 - Integrated transform development environment.
 - Simplified calculation language – simpler to understand than CCF calcs.
- **Quite different from DMCplus**
 - Experienced practitioners need to learn new software and workflow.
 - Custom tools for DMCplus not working in DMC3 environment.
- **Some areas to be improved still:**
 - Large data set handling & data collection (we're using DMC Collect).
 - DCS interface tag mapping / templates.

Summary

- **Positive experience with DMC3 Builder**
 - Particularly helpful in allowing new process control engineers to successfully maintain their DMCs.
 - New modeling features.
 - Structured workflow.
 - SmartTune.
 - Example: site control engineers can quickly change economic prioritization while keeping DMC running successfully.
 - New features are also “addictive” for the experienced practitioner.
 - Constrained model identification.
 - Improved near-colinear repair algorithm.
- **Plan to roll out DMC3 Builder v10 CP1 soon.**
 - Migrate all controllers to DMC3 Builder over next few years.

Back-up DMC3 Builder Screen Captures – Features we like

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Modelling – Case Definition

- NewModel
 - Master Model
 - Configuration
 - Optimization
 - Simulation
 - Calculations
 - Deployment
- Datasets
 - Controllers
 - Composite
 - Online

Subspace Trials + Add Edit Delete Template: 15 to 120

	Master	Time to Steady State	Oversample	Max Order	Prediction	Uncertainty	Time Uncertainty
	<input type="checkbox"/>	60	1	30	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	90	1	30	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input checked="" type="checkbox"/>	120	2	30	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Gain Constraints:

	7P103PV
DIF0601SP	
DIT1704SP	

Gain Ratios -- Gain(Input 2, Output 2) / Gain(Input 1, Output 1) = Ratio:

Ratio	Input 1	Output 1	Input 2	Output 2	Description
1.3	DIT1704SP	7P103PV	DIF0601SP	7P103PV	Example

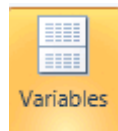
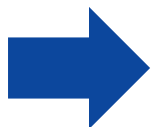
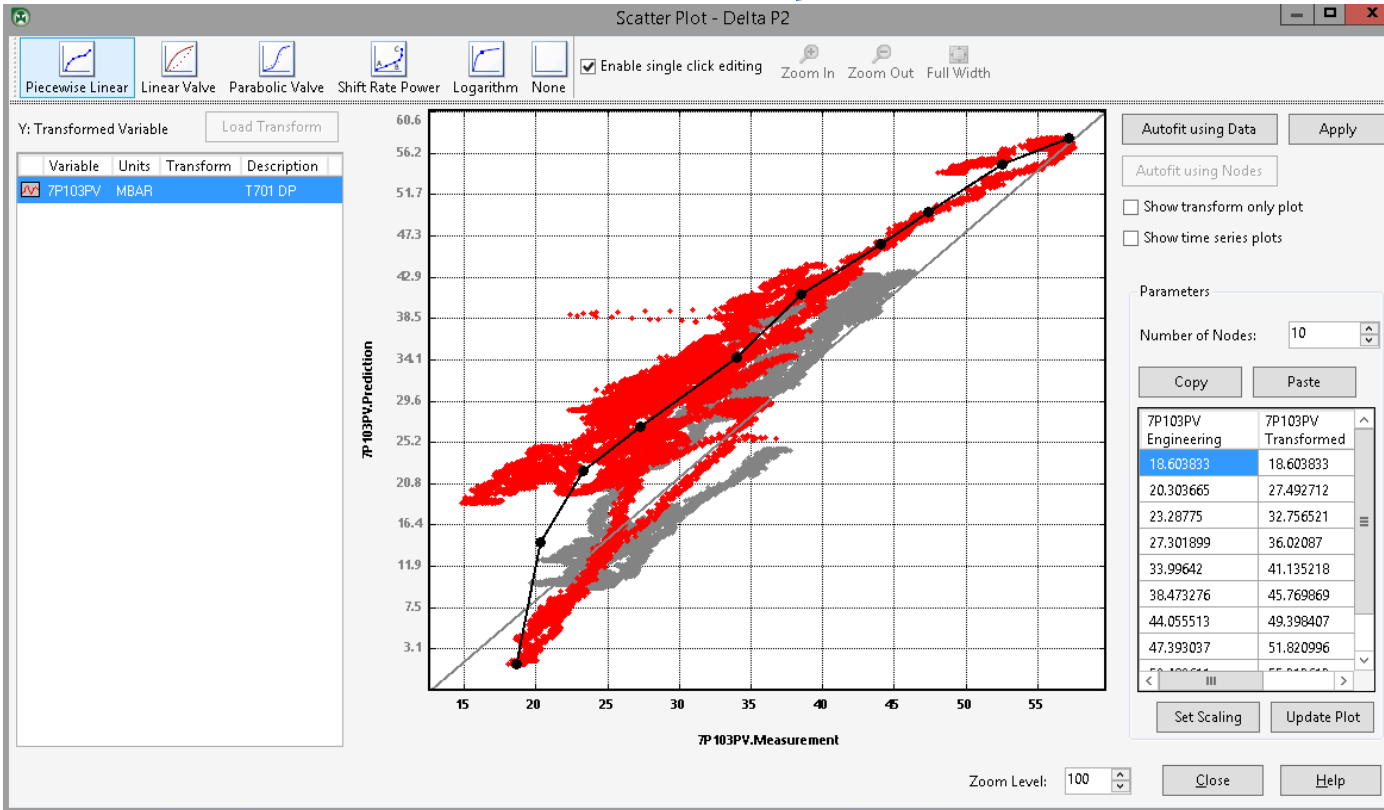
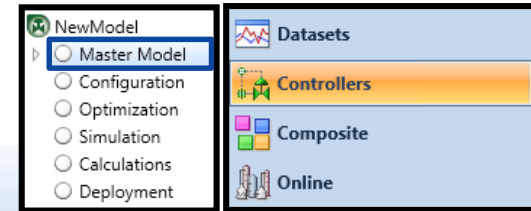
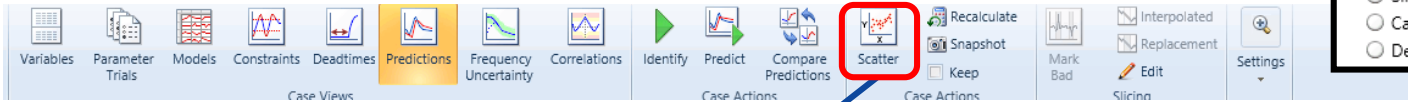
Configuring parallel CVs

Select Gain Ratio

	7P103PV
DIF0601SP	Numerator
DIT1704SP	Denominator

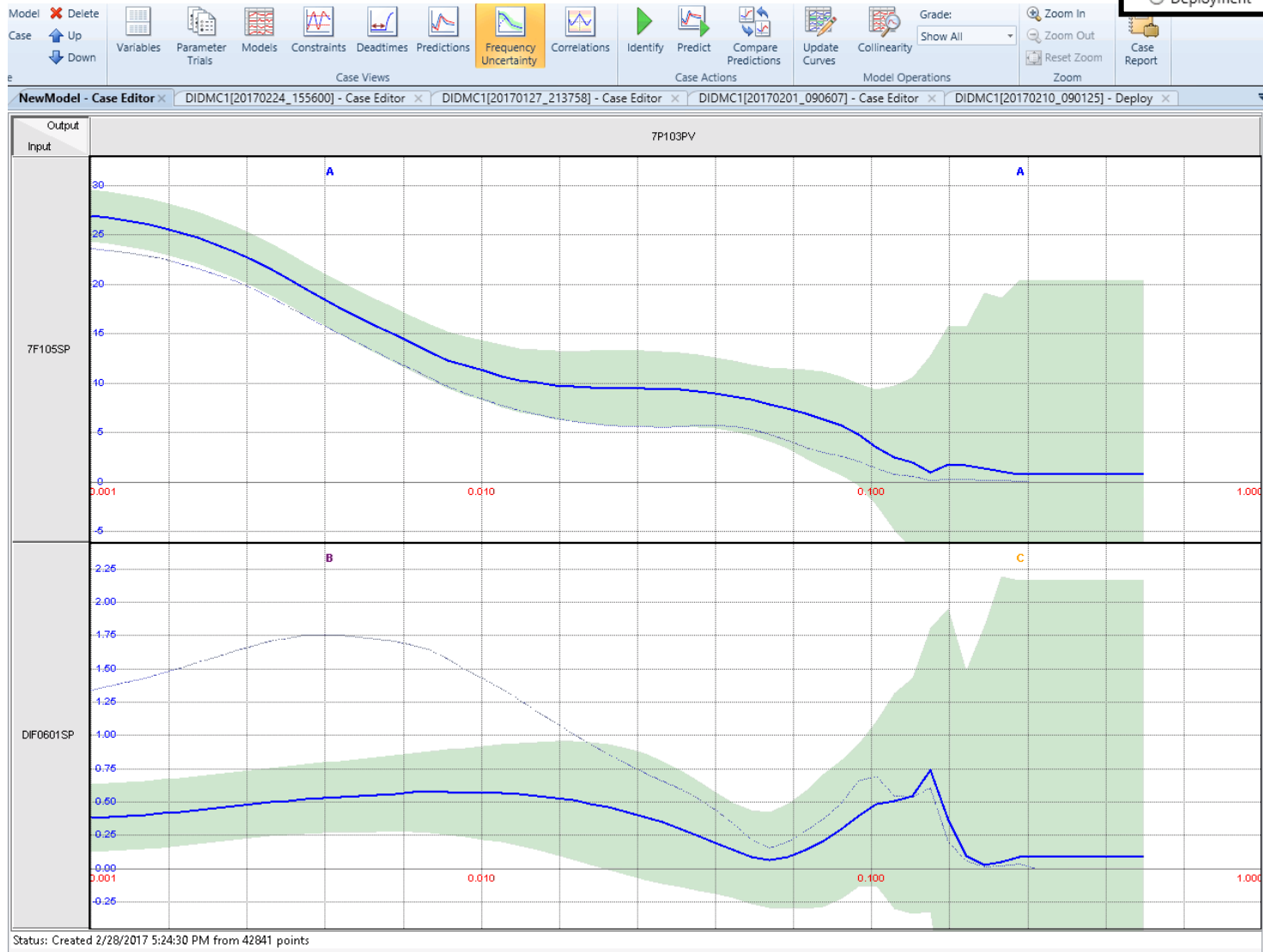
Buttons: Select Numerator, Select Denominator, Clear Selection, OK, Cancel, Help

Modelling – Transformations



Output	Description	Units	Stability	Transform	Filter	Filter Minutes	Minimum	Maximum	Standard Deviation	Dataset
7P103PV	T701 DP	MBAR	Stable	Piecewise Linear Transform			14.7982	57.6043	7.098	7P103PV[Jan17]

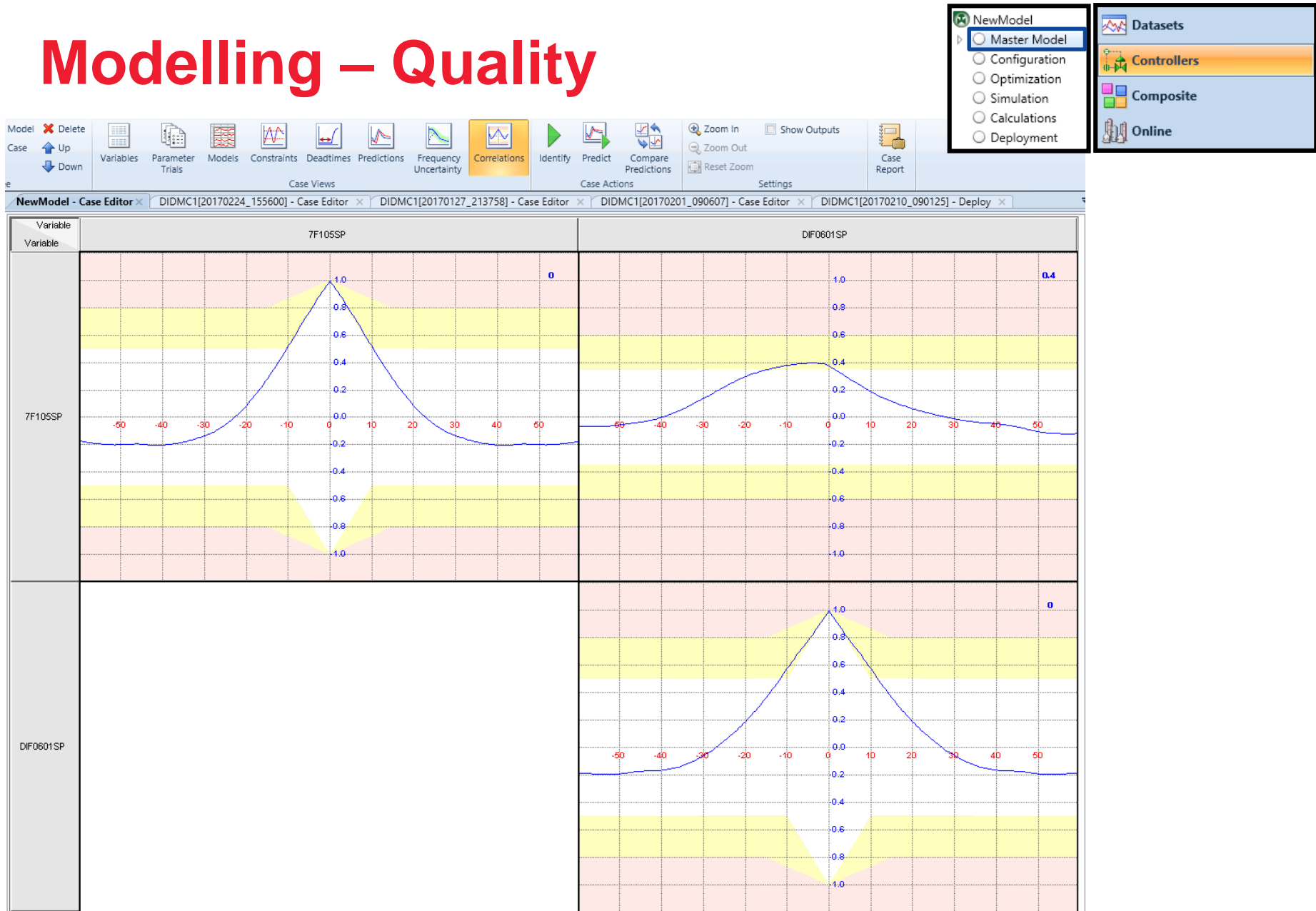
Modelling – Quality



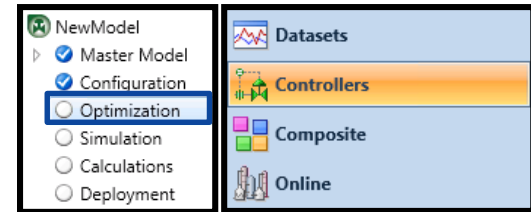
- NewModel
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Modelling – Quality



Tuning - SmartTune



Smart Tune Workflow

1. Define Structure
2. Select CV Ranks
3. Select MV Preferences
4. Prioritize MVs
5. Select CV Constraints
6. Evaluate Strategy
7. Initialize Tuning

This page is used to set the economic priority order of subcontrollers and MVs. First set the priority order of the subcontrollers and then set the MV priorities within each subcontroller. The controller will sequentially solve a set of optimization problems, starting with the most important MV in the most important subcontroller.

Subcontroller Priority	
1	SUB1
1	SUB2

Set Priority for MVs			
Priority	Input	Description	Units
2	7F105SP	HPS TO E701	T/H
1	DIF0601SP	T701 TOTAL FEED CTRL	t/h