

## MPC performance monitoring

### PlantTriage Improves MPC Performance

#### An MPC Dashboard in PlantTriage

Expertune's PlantTriage® includes a comprehensive MPC monitoring facility. This facility not only monitors all the important and well known statistics but also includes new innovative performance assessments (high value assessments) to actually detect and track when a controller is making moves which result in cycling between constraints. All of the following MPC assessments are performed automatically for every MPC controller during every assessment interval.

These assessments are used to diagnose issues with Disturbance Variables (DVs), Controlled Variables (CVs), Manipulated Variables (MVs), and the MPC Controller itself. There are over 100 assessments of performance, which allows a high degree of specificity in the recommended corrective actions. Some of the new metrics include: Effective Controller On-time, Controller Health, Time at Constraints, Model Prediction Error, and Oscillation Detection.

#### Works With any MPC Controller

PlantTriage works with any MPC controller. A dedicated MPC configuration wizard guides you through the process of connecting to an MPC controller, and establishing communications links.

You have invested heavily in your MPC system. Make sure it is working for you. PlantTriage makes sure that your MPC controller delivers.

#### MPC—Problem Solvers

Make sure that your MPC controllers are performing well, using the MPC problem-solvers. MPC controllers can be expensive to maintain. Make sure that your in-plant experts have all the information they need to keep your plant running at its optimum.

#### MPC Model Accuracy Decay

This report shows the CV prediction errors for any MPC controller with high overall prediction errors. Use the trend information to identify which CVs are contributing to error. Trends also show if this was gradual problem or sudden event.

#### MPC Controller Performance

Ensure that your MPC controllers are all performing at their best. More importantly, get notified immediately when the control starts to have problems. You can be notified immediately by email or text message.

#### Basic MPC Assessments

Each MPC Assessment provides meaningful information to help you keep your MPC controller humming along at peak efficiency.

#### Model Analysis

Model Analysis checks the mismatch between the actual values and predicted values (Prediction Error). As the process changes over time, the error will start to grow. You will always know how closely the MPC model is to the actual process.

Trend this value over time, and you will be able to predict when you need to update your MPC models.

## **Constraint Analysis**

Percentage of time when MVs are saturated at low or high limits  
Percentage of time when CV violates its low or high limits  
Percent time that the MV moves are at ROC limits  
Assessments for Controlled Variables

### **Each MPC CV has the following loop assessments performed:**

- Variability
- Noise Band
- Target Crossings
- Target Changes
- Average error
- Integrated Absolute Error
- Oscillating
- Oscillating from Field Equipment
- Oscillating from Tuning
- Oscillation from Disturbance
- Variance
- First Period
- Second Period
- Third Period
- Energy from First Period
- Energy from Second Period
- Energy from Third Period
- Assessments for Manipulated Variables
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- MV Standard Deviation
- MV Noise Band
- High Value MPC Assessments

These innovative performance assessments actually detect and track when a controller is making moves which result in cycling between constraints. PlantTriage detects unnecessary moves to the process, unnecessary alerts to the operator and reduced profit from the controller, even one with a high service factor. MPC monitoring from Expertune has highly innovative metrics available with our new monitor and are only available from Expertune.

## **Degrees of Freedom**

A unique Expertune metric. An MPC controller that is managing several CVs at their limits will have lower DOF Assessment values. As more CVs reach limits the DOF Assessment value will decrease to a minimum of zero. This might be viewed favorably if the controller is designed to push to constraints. Larger DOF assessment values may indicate that the MVs limits are too restrictive. Alternatively, it maybe that relatively few CVs tend to govern the entire controller.

By measuring, tracking and trending the degrees of freedom, you will be able to see when control performance has changed. When the DOF drops, the controller is not as capable of performing its job.

## **Controller Entropy**

A unique Expertune metric. A low gradient in the polytropic LP tableau can very often cause high entropy. In layman's terms: The controller can be moving around lot, but no improvements or benefits result. This innovative performance assessment actually detects and tracks when a controller is making moves which result in cycling between constraints. Expertune has developed this metric which gives a composite indication of controller movement and resulting benefit.

## **Controller optimizer Objective function costs**

Monitors the economic value of each MV and the overall cost function for the entire MPC controller.