

PID

inca AptiTune

MULTIVARIABLE PID TUNING AT
THE TOUCH OF A BUTTON

THE CHALLENGE

Tuning PID loops by trial and error takes up valuable time that engineers can ill afford. In addition, modern PID algorithms can have 5 tuning parameters to adjust. Interactive PID loops can cause the tuning on one PID loop to change the performance of other loops interacting with it. A 3 x 3 tuning challenge (such as the coil outlet temperature on an ethane furnace) can have up to 15 parameters to adjust, each parameter affecting the response of every loop.

Doing this well requires a proven package, INCA AptiTune is field proven in every continent and on every DCS.

TESTED!
Tunes up to
10 PID loops
at once

6 REASONS TO FINE-TUNE YOUR PID LOOPS

Process Realism: Tuning starts with collecting data from tests whether directly via an OPC connection or via file import. After preprocessing the data a model is derived with the same engine that powers the state of the art INCA Discovery package. Starting the tuning session based on a smooth model with a process realism is key.

Tuning that Takes Equipment Constraints into Account: It is straightforward to achieve closed loop behaviour that is tailored to the specific requirements of the process. INCA AptiTune uses a state space model of the open loop process, DCS specific PID equations and a non-linear optimiser to achieve the best possible trade-off between design objectives such as stability, setpoint tracking and disturbance rejection while dealing with dynamic interactions between the loops.

Detailed Control Design Objectives: The user can limit Process Variable (PV) overshoot to a setpoint response as well as limit the amount of output movement for a specified setpoint change. A loop can be made faster at the expense of another loop or the disturbance rejection can be improved at the expense of the setpoint tracking response. In addition the user can explicitly specify the maximum noise level in the output for a specific amount of noise in the PV. This can be especially useful for tuning fired heater draft pressure controls.

One-Shot Tuning: For many applications INCA AptiTune delivers "one-shot tuning". The user tunes within the safe environment of his or her PC, where the optimiser can try out several thousand possibilities in a matter of seconds. The calculated tuning on all of the control loops can be entered at the same time and will work as predicted. This approach can save days or weeks of engineering effort, while significantly improving the overall process performance.

Loop Stability despite Changes in the Process: By specifying the worst case changes in process gain and dead time, INCA AptiTune uses a robust approach to ensure all of the interacting loops will be stable if the process response changes. This feature provides protection against response model errors.

PID Tuning Optimisation: The user can optimise not only Proportional, Integral and Derivative terms, but also Setpoint Filter and Derivative Filter as required. INCA AptiTune allows the user to pick the best PID equation available and take advantage of all the available tuning parameters in confidence.



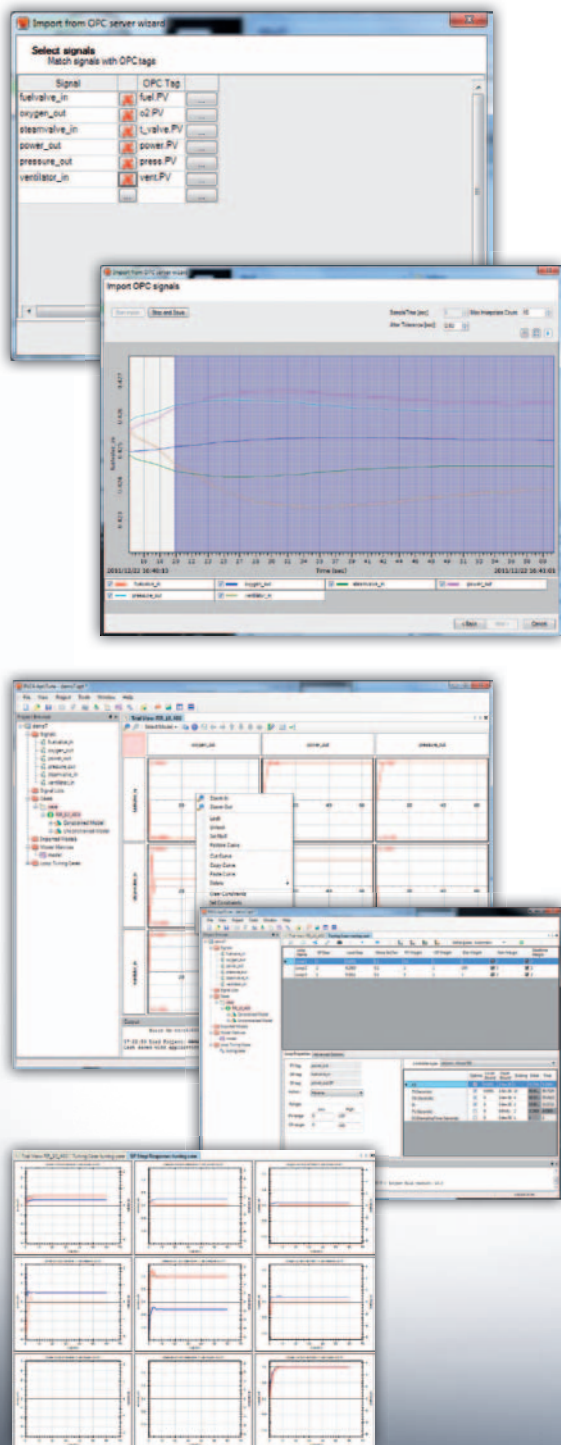
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inca
SUITE

SPECIFICATIONS



Input Data

In order to perform the modeling process data can be imported by:

- An OPC connection to any OPC server linked to the DCS/PLC. Just connect, browse on the OPC server, link the OPC tags to the INCA AptiTune signals and start the data collection.

- Retrieving process data from files (many different file formats are supported)

All data pre-processing functionalities like slicing, filtering or other mathematical manipulation is possible. Grouping signals in signal lists helps in organising the project with multiple tests, multiple signals etc.

Modeling:

Models can be imported from other packages or can be obtained with the built-in modeling tool based on the INCA Discovery technology:

- Standard FIR Algorithm: Both smoothed and unsmoothed
- Transfer Function Method: By converting the FIR models into a state space model with pure dead time. Smoother models result.
- Prior to all system identification steps constraints can be imposed on the models. You can impose deadtimes, gains, etc for each individual model based on your process knowledge. You can also impose relations between gains or complete response curves of different models. These relations can express mass or energy balances.

PID Loop definition

The user needs to specify, as a minimum:

- Instrument Ranges (OP and PV)
- PID Equation
- SP and Load Steps
- Optimization weights (PV, OP, Disturbance)
- Gain and Dead Time Margins for Robustness

The user can specify additional constraints

- OP noise limit
- Maximum OP Change and PV Overshoot
- Minimum Damping Ratio
- Desired Rise Time
- PV Deviation and Return Time (for disturbances)

PID Tuning Visualisation

PID loop visualisation of the loop performance includes:

- Setpoint change
- Load disturbance rejection
- Noise simulation
- Robustness

Simulation capabilities

The user can define ad-hoc disturbances that are likely to impact the process and therefore the PID loop, such as:

- PV, SP and OP signal generators
- Step, impulse, ramp, zero and noise