



## Nonlinear INCA platform for the process industry

### How to get more value from your process models

In the past many years IPCOS has invested considerable effort in the development of a model based predictive controller based on nonlinear process models. This has resulted in IPCOS' novel INCA NL-MPC platform, of which several applications are currently running on-line at different industrial sites.

IPCOS is now offering this innovative control platform to its customers, so that they can use it to deploy an MPC application based on their in-house developed process models.

### Why INCA NL-MPC?

MPC based on nonlinear process models adds value whenever these models give a consistent representation of the reality, and in cases where these nonlinear process models outperform the traditionally used linear models. Applications range from batch processes which cannot be controlled with linear techniques, to cases where nonlinearity seriously affects the process control performance.

Nonlinearities are known to be particularly challenging when related to product quality control problems or where-ever processes are being operated in various operating points (load changes, grade changes). Additionally, nonlinear process models can add valuable inferred measurements (also known as soft-sensors) which are important for control, and which cannot be easily measured online or only with a considerable delay.



The bottom line is that a more precise process model will result in higher performance process control, resulting in increased process optimization benefits. IPCOS now offers a platform to its customers to turn these high precision models into value, embedding them into an online optimization scheme realised by a multivariable predictive controller.

# The INCA NL-MPC Platform

## Based on solid technology

IPCOS provides a dedicated INCA environment for the purpose of using nonlinear process models for MPC: 'INCA NL-MPC'. The environment is a solid solution based on the standard INCA platform. The backbone is the same flexible open software architecture, including the full INCA toolsuite (OPC Dataserver, trending, logging, user-defined calculations, etc.) and the standard fail-safe alarm and signal status handling. The INCA platform is being used worldwide as a reliable, high performance industrial Advanced Process Controller. INCA Configurator, part of the INCA platform, enables the customer to easily deploy his own MPC controller, with a low total cost of ownership.

## Nonlinear control features

On top of the standard INCA framework new, innovative features are implemented, providing the nonlinear control functionality. With respect to the embedded control algorithms, IPCOS made a conscious choice to move away from the linear control arena to a generic nonlinear optimization solution.

## Nonlinear model requirements

A prerequisite for the technology to be successfully deployed is to have an adequate dynamic model. The model needs to be validated on the process, calculation time must be guaranteed and in line with the desired controller sample time. The main process input-output directions and process freedom must be modeled properly, since the controller and the embedded optimizer will exploit this freedom.

## Interface

To allow the INCA NL-MPC platform to interface with the customer's process model, a generic MATLAB interface has been developed within which a customer can implement a dedicated interface to an in-house developed process model.

## Proven technology

The INCA NL-MPC platform has been industrially proven as it has been applied to several batch reactors and crystallizers recently. The benefits of exploiting the nonlinearity of the process have enabled our customers to control and optimize on-line what was technically not possible before, and has created great value for them.

