

# MPC

# inca MPC

ADVANCED  
PROCESS CONTROL

## GAIN FLEXIBILITY AND EFFICIENCY

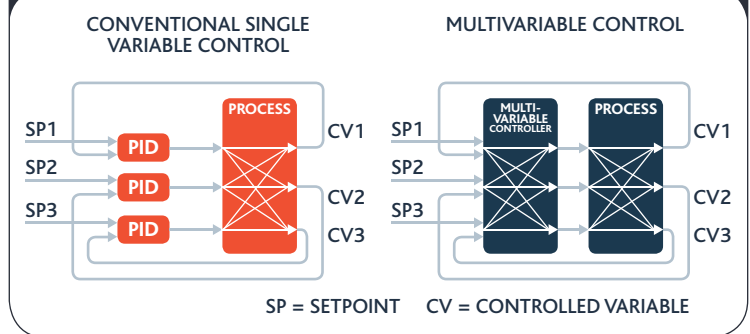
The process industry is facing more intense competition and increased pressure to cut costs. The imperative is to reduce cycle times, keep tied-up capital to a minimum, improve quality and optimize processes. INCA MPC is a model-based predictive controller that allows companies to reduce fluctuations in process variables, minimize scrap and increase throughput. It enables companies to leverage real flexibility and efficiency gains from their processes.

**TESTED!**  
Increases  
your profit

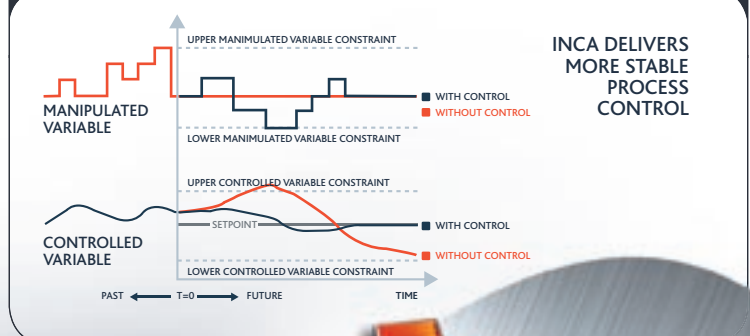
## 5 REASONS TO USE MPC

1. **Multivariable controller:** Takes maximum advantage of the interaction of all relevant process variables.
2. **Model-based:** Handles complex plant dynamics, including long dead times and non-minimum phase behavior.
3. **Constraint handling:** Explicit inclusion of plant constraints on relevant process variables.
4. **Hierarchical and weighted optimization:** Supports complex operation and process management strategies.
5. **Predictive:** Early correction of disturbances. Compensate for outside temperature variations or feed variations before their influence becomes felt.

### DIFFERENCE BETWEEN SINGLE AND MULTIVARIABLE CONTROL

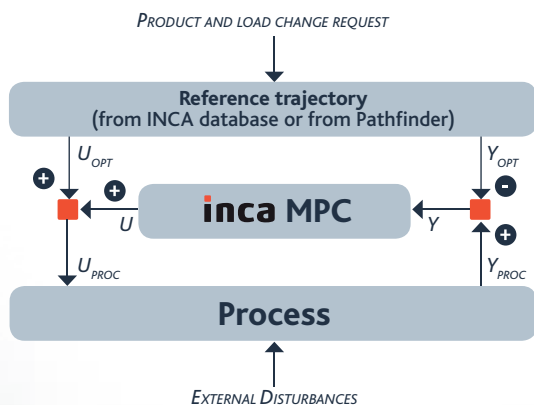
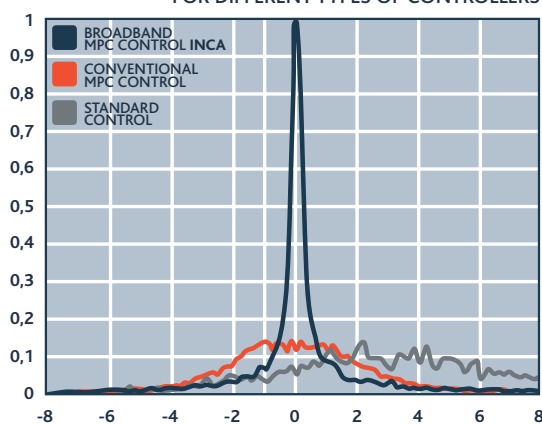


### HOW PREDICTIVE CONTROL WORKS



# MPC, THE BENEFITS ARE OBVIOUS:

QUALITY DISTRIBUTION  
FOR DIFFERENT TYPES OF CONTROLLERS



## Weighted and hierarchical optimization techniques

With INCA MPC, the overall problem is hierarchical: it is divided into specification-classes, each of which has a unique priority and consists of one or more process and operating specifications. The optimization of a specification-class is constrained by the specification-classes with higher priority and has absolute priority over all classes with lower priority. If further degrees of freedom are available then the next lower priority classes will be solved. INCA MPC thus supports complex control strategies such as when:

- Plant safety takes priority over quality
- Quality takes priority over energy saving and cost reductions.

## Excellent control quality

Multivariable controllers incorporate a number of simplifications, which reduce the computation required but negatively impact the dynamic working range available to the controller by reducing its bandwidth. However, bandwidth empowers the controller's ability to correct disturbances and eliminate variability in the controlled system. INCA MPC covers a wider bandwidth than any other type of controller available, ensuring more consistent product quality.

## Multimodel handling and online adaptation

INCA MPC passes bumplessly from one model to another, enabling it to be run across several operating points with different dynamic characteristics. The INCA MPC online adaptation feature enables real-time online adaptation of the gains and dead times of the controller model.

## Modern modeling methods

INCA MPC uses statistical identification methods as well as traditional step tests for modeling. INCA MPC identifies state space and FIR (Finite Impulse Response) models.

## Automatic product and load changes

INCA MPC operates in "delta mode", enabling automatic and consistent product and load change-over based on a predefined trajectory for the relevant process variables. INCA MPC brings the process from one operating point to another by regulating all process variables along their prescribed trajectories. In this way INCA MPC guarantees completely reproducible and fully consistent transitions between operating conditions.

## MPC AT WORK

### Figures from actual projects:

- Throughput increased by 3.5%
- Typical product and load change times cut from 60 to 45 minutes
- Product and load changes done in automatic mode, significantly reducing operator workload
- Greater plant flexibility: where there had been one product change per week previously now two a week is economically viable.