Model Based Control

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Background

- State of existing process controllers
  - Allen-Bradley / Siemens
  - Device communication
    - Profibus, SERCOS, Devicenet
- Current state of computer modeling
- Sensor technology
- Motion applications

Objectives

- Demonstrate the OMAC on a small scale crystallizer
  - Acquire a fundamental understanding of the crystallization process
  - Incorporate the computer model
    - Predict the particle size distribution
    - Predict optimized operating parameters to consistently produce the target particle size distribution
    - Lessons learned / digital knowledge base
- Establish a TIME Wide Area Network Connection to the model, laboratory scale, and pilot scale crystallization facilities.

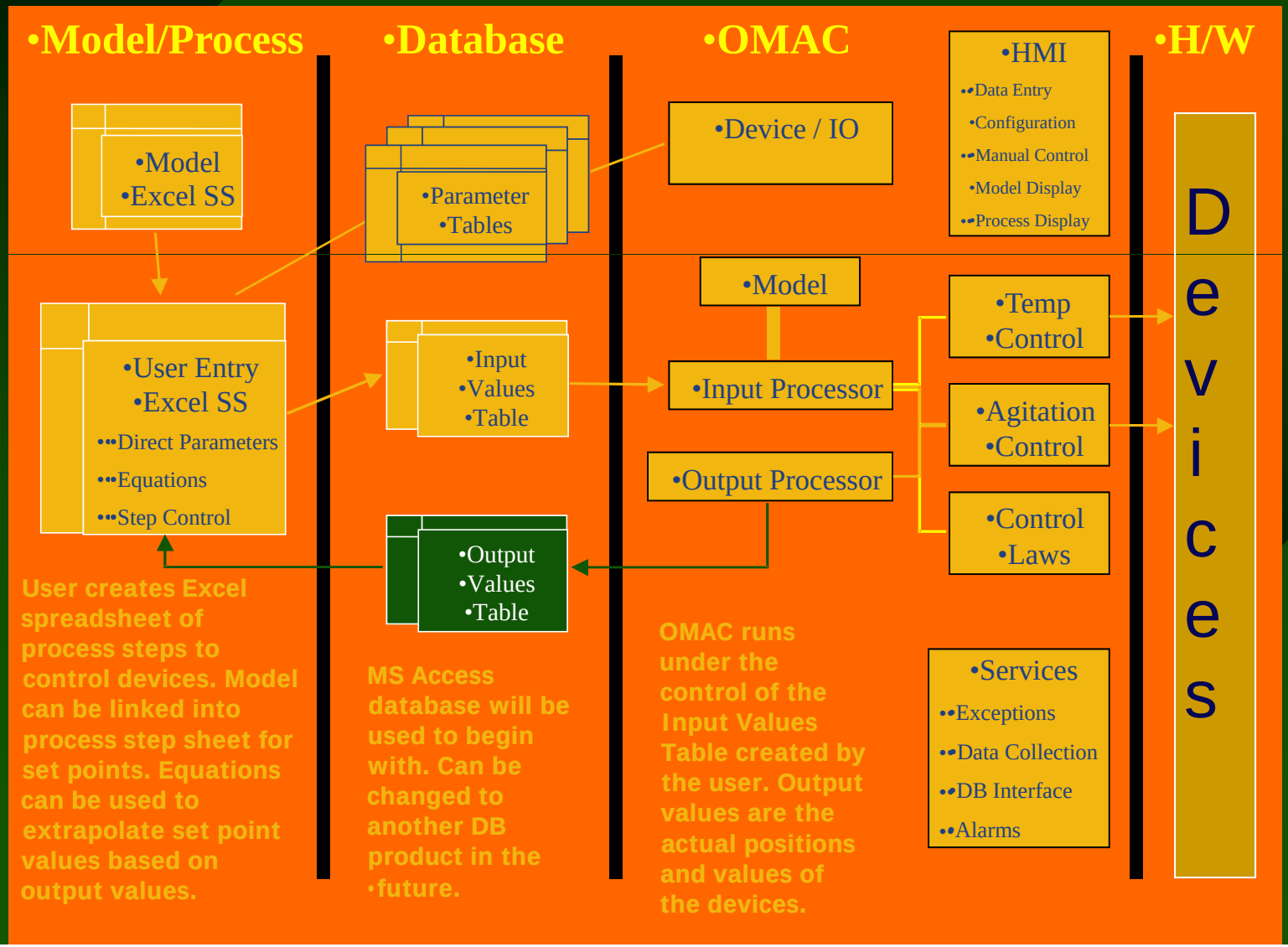
Benefits

- Increased reproducibility and reliability of the product by eliminating variability introduced by operators
- Particle size control increases uniformity of product and eliminates the need to grind material to desired size
- Reduced development time required for scaling up from laboratory to pilot to production size quantities
- Model maintains the knowledge base / lessons learned of the process
- Improved communications between the developer and producer will result in a rapid and accurate transfer of technology

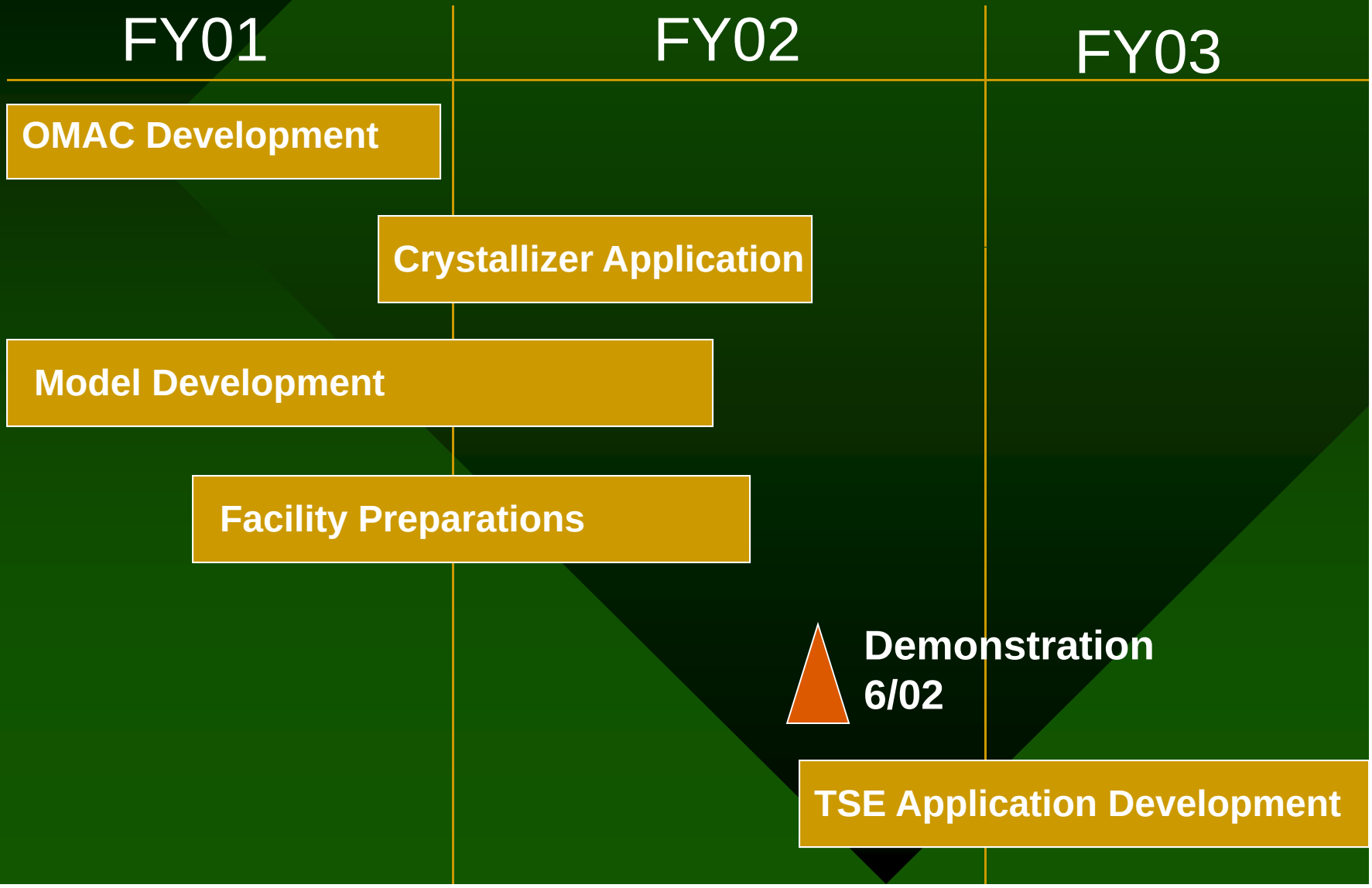
Strategy

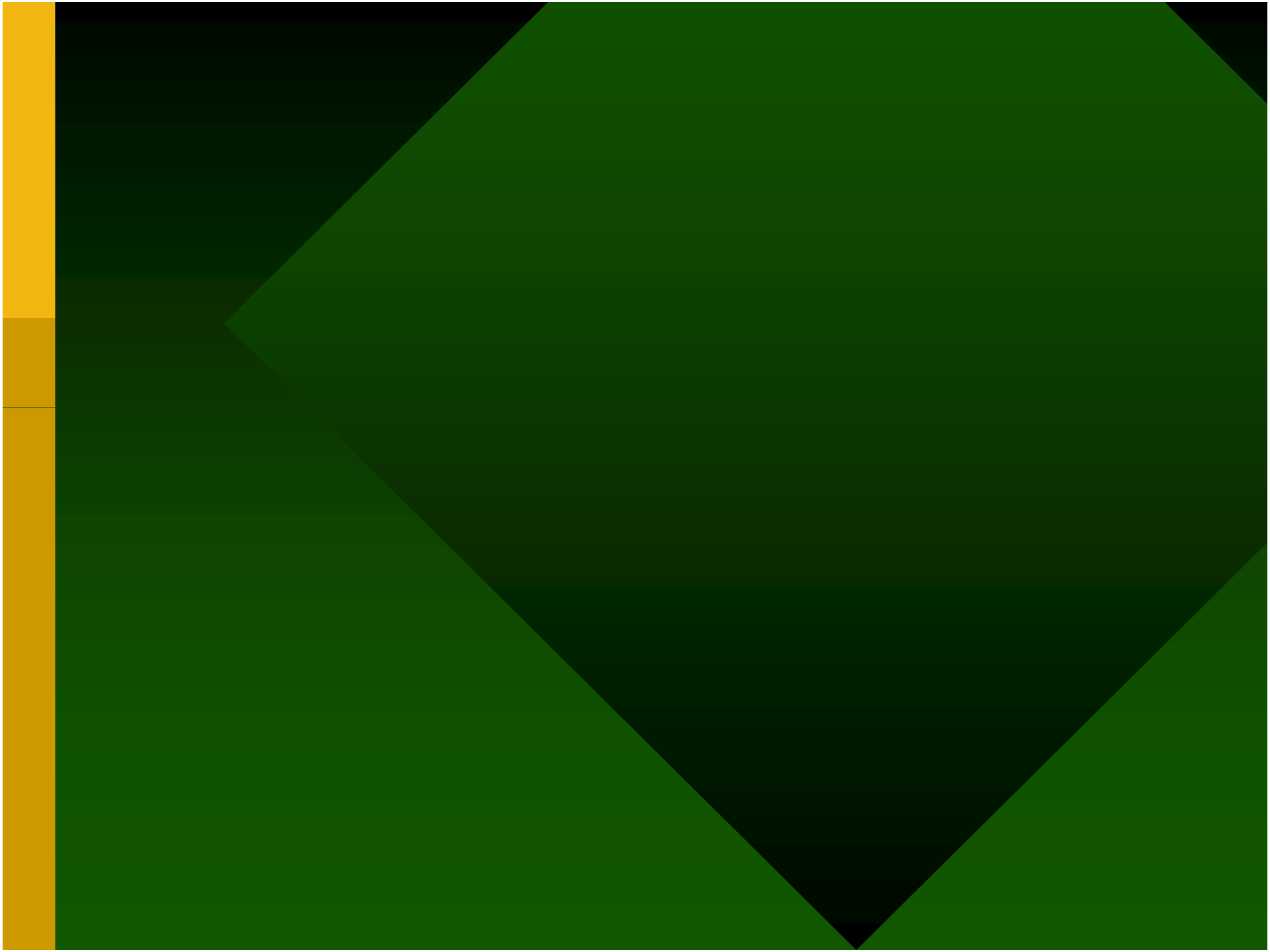
- Open Modular Architecture Controller (OMAC)
- RDX – Crystallization Process
- Twin Screw Extrusion

Implementation



Schedule

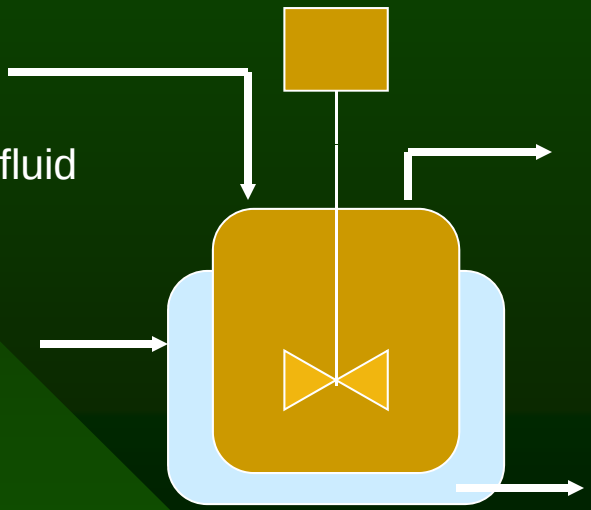

FY01
FY02
FY03
OMAC Development
Crystallizer Application
Model Development
Facility Preparations
Demonstration
6/02
TSE Application Development



Crystallization Model

Inputs

Anti-solvent addition rate
Temperature of heat transfer fluid
Flowrate of heat transfer fluid
Agitator speed
Seed crystal flowrate
Seed crystal size distribution
Turbidity
Refractive index
Measured temperature
UV Probe
Torque/Power
Pressure
Crystal size distribution



Computed by Model

Solubility as a function of time
Nucleation rate
Growth rate
Size distribution
Energy equation
Solvent/solute concentrations
Total volume as a function of time

Constraints

Rate of change in temperature
Rate of change in supersaturation
Rate of anti-solvent addition