Fast and cost-reduced commissioning by right-first-time engineering

Roger Knüttel
Dipl. Ing. (BA) Elektrotechnik
Manager Control Engineering Department & Senior Developer

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The Sorg Group

Sorg is the leading independent supplier of glass melting furnaces and glass conditioning systems.

EME Maschinenfabrik Clasen GmbH is a leading supplier of batch and cullet handling systems and equipment for the glass industry.

We offer solutions from the raw material feeding to the hot glass
Virtual Commissioning

- **Virtual commissioning in the office**
  - The test of all the signals to the correct connection in the program. This is important for failsafe inputs / outputs.
  - Partial and modular tests already during engineering.
  - The test of the manual operation level and its interconnections.
  - On site only the signal check from the field signals to the control cabinet needs to be carried out.
  - For the commissioning of the plant, this means, when the last signal was tested in the field, the system can go into production.

- **Plant Simulation**
  - Detection of almost all technical and functional software errors.
  - Tests, without the plant itself is involved.
  - The risks of the software commissioning on site are nearly eliminated.
  - Potential software errors and faults no longer lead to severe consequences, costly damage to equipment, endangering people and project delays are effectively avoided.
  - Test of the entire process in the office including the entire data management.
  - Complex plant software expansion can be tested on the model.

- **Operator Training**
  - Training of the customer staff prior to commissioning.
  - Training also of emergency scenarios, without endangering "real" system.
  - Installing a virtual system environment for the customer.

- **Presentations for the sales department**
Example of a Batch House Simulation
Batch Plant in Automatic Mode
Software and hardware components
Entry Level

- With a „real“ CPU, but without any other hardware components

- Simulation of the signals by specific modules that are included in the program. These are switched on when needed.
  - Advantages
    - No additional costs for simulation software
    - No additional costs for special hardware simulation
    - Possible for any automation system, such as Siemens, Rockwell, Mitsubishi, etc.
  - Disadvantages
    - Severely restricted in complexity
    - Direct effects of the actual system software, high risk of forgotten simulation programs
    - Only very limited with fail-safe signals
    - The sequence of the system is highly deterministic
Software and hardware components
The Premium Solution

- With a „real CPU + a Controller“ to simulate the I/O-signals (e.g. Simba Box)
  - Simulation of signals by SIMIT in combination with the Simba Box.
  - The Simba Box emulates the entire I/O peripherals

- In a Soft-PLC without any hardware components
  - Simulation of signals by SIMIT in combination with the Virtual Controller (VC) or PLCSIM
  - The periphery is simulated by the VC or PLCSIM

- Advantages of both technologies
  - Simulation with any complexity
  - Simulation of fail-safe signals
  - The simulation has no effect on the actual system software, no risk of forgotten simulation programs
  - By non-deterministic simulation models the software can be checked on side effects or errors in the sequence. ([Look here](#))
  - Creating Snapshots to save certain system states and load them again.
  - Sophisticated user interface
  - When using PCS 7 fully automatic generation of simulation

- Disadvantages
  - Additional software and / or hardware ... extra cost

We prefer the Virtual Controller due to its efficiency, the network functions and the ability to create snapshots to save certain system states.
Simulation of a Pneumatically Conveying System with Simit
Summary

- Fast Commissioning
- Higher Engineering Quality
- Lower Costs
- Reduced Risks
- Operator Training
Thank you for your attention.

EME Maschinenfabrik Clasen GmbH

Wockerather Weg 45
41812 Erkelenz

Telefon:  +49 2431 9618 0
Fax:      +49 2431 74687

Stoltestraße 23
97816 Lohr am Main

Telefon:  +49 9352 507 500
Fax:      +49 9352 507 193

www.eme.de
contact@eme.de
Appendix

- Simulation Software SIMIT (SIEMENS)
Example with Simit, Virtual Commissioning of a motor unit
Simulation of a batch silo

Der Komponententyp Ramp inkrementiert oder dekrementiert einen Funktionswert $y$ in jedem Zeitschritt der Simulation um den Wert

$$\Delta y = (UL - LL) \Delta T$$

wobei bei der Schrittweite der Simulation ist: Der Rampenwert $y$ wird um $\Delta y$ inkrementiert, wenn der Eingang "+" (UP) mit eins belegt ist. Ist der Eingang "-" (DOWN) mit eins belegt, wird der Rampenwert $y$ um $\Delta y$ dekrementiert. Sind beide Eingänge "+" und "-" mit eins belegt, dann wird der Rampenwert $y$ nicht verändert.

Beispiel für eine Einstellmöglichkeit:

In der Vorlage sind $T_I = 300$ und $T_d = 20000$

D.h. in 100 Minuten wird der Silofüllstand um 30% dekrementiert, bzw. in 90 Sekunden um 30% inkrementiert.