

UNICOS CPC NEW DOMAINS OF APPLICATION: VACUUM AND COOLING & VENTILATION

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ABSTRACT

The UNICOS (UNified Industrial CONTROL System) framework, and concretely the CPC (Continuous Process Control) package, has been extensively used in the domain of continuous processes (e.g. cryogenics, gas flows) and also in others specific to the LHC machine as the collimators environmental measurements interlock system. The application of the UNICOS-CPC to other kind of processes: vacuum and the cooling and ventilation cases are depicted here.

One of the major challenges was to figure out whether the model and devices created so far were also adapted for other type of processes. Both scenarios will be illustrated emphasizing the adaptability of the UNICOS CPC package to create those applications and highlighting the discovered needed features to include in a future version of the UNICOS CPC package.



UNICOS



LHC cryogenic compressor room



Pump rack of the LHC experiments Gas Control System

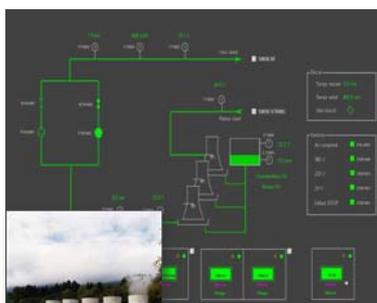
The UNICOS framework was born in 1998 and was firstly used in the LHC cryogenic system and the Gas Control System for LHC experiments, both applications developed on Schneider PLC.

After some evolutions, UNICOS was then adapted and developed for the Siemens PLC platform. The Collimators interlock system was one of the first Siemens application built with the UNICOS framework



Collimators environmental measurements interlock system

COOLING AND VENTILATION



STP18 control system

Domains of application:

- ✓ Compressed air
- ✓ HVAC
- ✓ Cooling plants

Improvements:

- ✓ New widget library
- ✓ Interlock handling
- ✓ Regulation structures integration
- ✓ Operator Local Panel

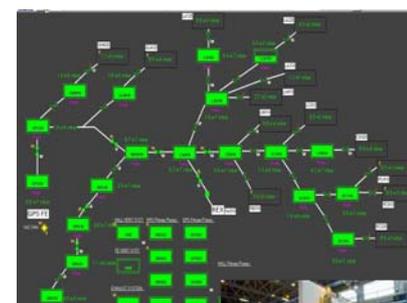
ISOLDE VACUUM

Vacuum processes:

- ✓ Discrete systems
- ✓ No feedback regulation
- ✓ Special measuring devices

Improvements:

- ✓ Full automatic code generation and synoptics
- ✓ Object functionalities
- ✓ New object types identification (e.g. TPG300)



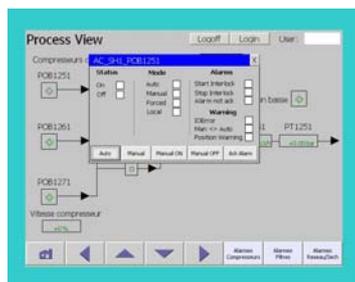
ISOLDE control system



TPG300 widget joint panel

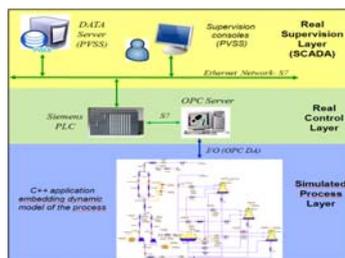
Pirani and Penning gauges combination

LOCAL OPERATION



- ✓ CPC compliant solution using industrial panels
- ✓ Automatic generation of device address mapping
- ✓ Integrates alarms and access control

VIRTUAL COMMISSIONING PRINCIPLE



COMMISSIONING CONSTRAINTS

- ✓ Critical Processes
- ✓ Reduced availability
- ✓ Machine safety risks

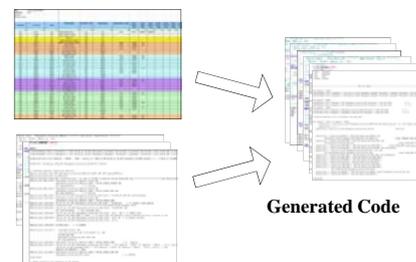
ADVANTAGES

- ✓ Control logic validation in simulation : Risk of Plant damage mitigated
- ✓ On-site Commissioning time minimize

AUTOMATED CODE GENERATION

- ✓ Efficiency when dealing with highly repetitive processes
 - Similar control logic
 - HMI Panels creation
- ✓ Reduces hand-provoked errors (e.g. typing, addressing, ...)
- ✓ Ease maintenance (e.g. upgrades and reduced teams)

Device Parameterization driven by models



Templates

Generated Code

CONCLUSIONS

The ISOLDE control application for vacuum systems, RFQ4 and STP18 for cooling systems were successfully implemented using UNICOS-CPC framework. For all projects, the UNICOS principles applied during the operation and the SCADA features were quickly understood by the operators. The UNICOS-CPC application architecture has been assimilated by vacuum control experts, and since the first implementation, they are autonomous and able to develop and maintain their own control projects. This generic way of control system programming shows its high versatility and its easy learning in different domains of engineering.

The UNICOS-CPC v6 framework will cover missing functionalities identified during the development of both, vacuum and HVAC, control systems. Moreover, the new framework reinforces the local operation by using appropriate industrial devices. It also provides new tools able to create new types and a generic interface to perform virtual commissioning using a simulator.

