FINDING THE WAY UP TO THE STANDARDIZATION of HUMAN MACHINE INTERFACE

Giving operation back to unit operators
Unit operation: 3 interleaved complex systems

Process operation is distributed between operators and the CDPS.

Operation activities processed by operators:

- Control data processing system (CDPS)
- Material & Energy processing system (MEPS)
- Sensors
- Actuators

Diagram shows the interaction between human, system, and interface components.
Unit operation activities / control system

Unit operation is not restricted to production, it also includes Start up, Shut down and Maintenance.
Unit operation life cycle

Human Machine Interfaces are engineering and technology driven and focus on production island

User requirements are specified in various ways. Suppliers translate requirements according to their own products. It is difficult to satisfy operation needs and information consistency.
Process operation feedback of experience

58 plants in operation
3 to 4 men.century of feedback of experience
Heavy investments in Human Factors from decades

• Control system :
  • restricted to production
  • **engineering formalized languages**
  • a network of stand-alone control devices
  • heterogeneous presentation of information

• Unit operation :
  • 3 operation islands (production, shut down and start-up, maintenance)
  • **Home made operation languages**
  • Operators have their own mental models
  • Operators waste time to access to the ad hoc information due to the heterogeneity of the information delivered by devices
  • Control device obsolescence is fast
  • operation information needs is increasing : HMI obsolescence is faster
Improving process operation

Breaking the barriers between the standalone teams (start-up and shut down, maintenance, production)

Moving from stand alone information to sharable information

Outage control center

Control room

Improve safety production and reduce environmental impact

Improve maintenance

Reduce start up shut down

Improve safe production

reduce loss of production

maintenance shut down
Process operation perspectives:
tink all together and use sharable information

Outage control center
Shut down, maintenance, start-up

Control room
production

sharable information:
• Situation assessment
• Response planning
• Response implementation
• Monitoring & detection

support critical activities
better process wireless observability
smart padlock alignment real time coordination real time activity follow up

Reduce time, dosimetry and wastes of field activities
we must define process operation information early within the engineering

The definition of needs for process operation information:
• should improve process operability
• should be formalized
• should be upstream the definition of the control system
A process operation language to explicit:

- **Situation assessment**: capability to explicit and represent the situations of the process operation

- **Response planning**: capability to explicit and represent the operation strategy to operate the process for start-up, shut down, production and maintenance

- **Response action**: capability to explicit and represent just the detailed actions of any transition to achieve any situation

- **Monitoring and detection**: capability to explicit and represent monitoring parameters and detection events to determine and locate abnormal process operation
Why a standardized process operation language?

To save time, to reduce environmental impact (and dosimetry for NPP), to reduce maintenance and improve performance and safety

• Engineering studies are restricted to the process and control system, there is a lack for process operability

• HMI regulations and standards allow various interpretations

• There is a lot of “methods” to define HMI

• There is no contractual detailed definition of process operation information with engineering
Characteristics of the process operation language

The process operation language should not be computer sciences nor mechanic’s driven, it should stand on “slang” operation practices. The key characteristics should be:

• Capability to represent the process:
  • Operation schemes, representing relevant operation objects
  • Functional schemes to master the complexity
  • NB: design schemes are engineering driven

• Capability to identify equipment and physical parameters:
  Functional coding to identify operation objects and their location in the unit

• Capability to describe the process operation evolution:
  • “slang” dictionaries and acronyms to describe operation activities
  • Graphic representation and animation rules to describe states and evolution of operation objects
Limit of scope of the standardized process operation language