INSTITUTE “MIHAJLO PUPIN”

PLANT AUTOMATION FOR
HYDROMETALLURGICAL PROCESS OF
MATERIAL RECOVERY FROM WEEE

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Hydrometallurgical process of material recovery is defined by the following:

- Type of input raw material to be processed
- Required reagents needed for process
- Variable steps that process input material. Each step is defined by:
  - Active reagents and raw material(s) that form the step
  - Apparatus used in step
  - Time of processing
  - Temperature
  - Other process variables
- Order in which the reagents add in process
- Output product with certain quality properties (such as material purity and absence of unwanted elements such as mercury or lead)
- Plant capacity
RUNNING A PROCESS

- Process complexity increased
- Demand for increased availability
- Uniform product quality
- Higher production capacities
- 3 shift operation
MANUAL PROCESS HANDLING

Major issues with manual handling:

- Inability of human operator to monitor and control multiple variables
  - In process steps with multiple apparatus human cannot perform simultaneous apparatus actions
  - Process parameters are difficult to be maintained at desired level; this directly affects end product quality
  - Quick processes beyond operator actions
- Operator’s focus on process drops down as shift time elapses
- Continuous plant operation requires at least 3 shifts.
- Different programs handling – technological know-how
- Operator’s handling of critical situation – safety issues
Most of downsides of manual control successfully handled by automation system:

- Various degrees of process complexity easily covered by appropriately selected equipment
- 24/7 plant operation without effect of human fatigue
- Different programs available by plant’s topology easily selectable by predefined recipes
- Automated reports generation
- Product quality unified / deterministic
- Critical situations due to out of range parameters or primary equipment failures handled in most efficient way
- Manual mode available for tests/research/optimisation
Stationary plant - RELIGHT

- No physical obstacles between parts of plant

- Distributed system
- Process oriented distribution
- Fully automated process steps
- Operator interactions only in defined steps for material handling
- Remote control from office location
Mobile plant - Greentronics

- Physically divided into two separated containers
- Power distribution cubicle is separate for each container
Major process functional areas

**REACTOR:**
- Provides chemical reaction with variable speed mixing
- Overfill protections
- Dosage control
- Maintaining of process temperature

**Filter press:**
- Solution recirculation
- Filtrating solids
- Indirect detection of end of filtration process
Material route through plant

CONTROL

POWER

Reactors and points:
- FP 1
- Reactor 1
- FP 2
- Reactor 2
- FP 3
- Reactor 3

Flow of material and reagents:
- Raw input / office / operators
- REAGENTS
- Time, oper
- temp, time oper
- REAGENTS
- TEMP, TIME, OPER

 legend:
- CONTR
- OL
- POWER
- OFFICE / operators
OPERATOR INTERFACE REPRESENTATION

- Main HMI picture with all important information about process divided in six FG blocks.
- FG with START command button and edit boxes for setting batch names.
- Starting condition
- Commands and signalization for utilities processes which run in background of main processes.
Each part of the process has its own HMI pictures, on which the operator can monitor the progress of the reaction. If during the process, occurs fault in the system, it activates audible alarm.
- Algorithms that contain information on amounts of substances, temperatures and timings are stored in control panel in form of recipes
- Recipe management provides usage of large number of recipes, where each of them is identified with unique, easily recognizable name
• Reports greatly simplifies way of adjusting the right recipe for the process optimization.
• Reports are available on-line and also are stored in panel memory for off-line analysis.
Thank you for your time

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