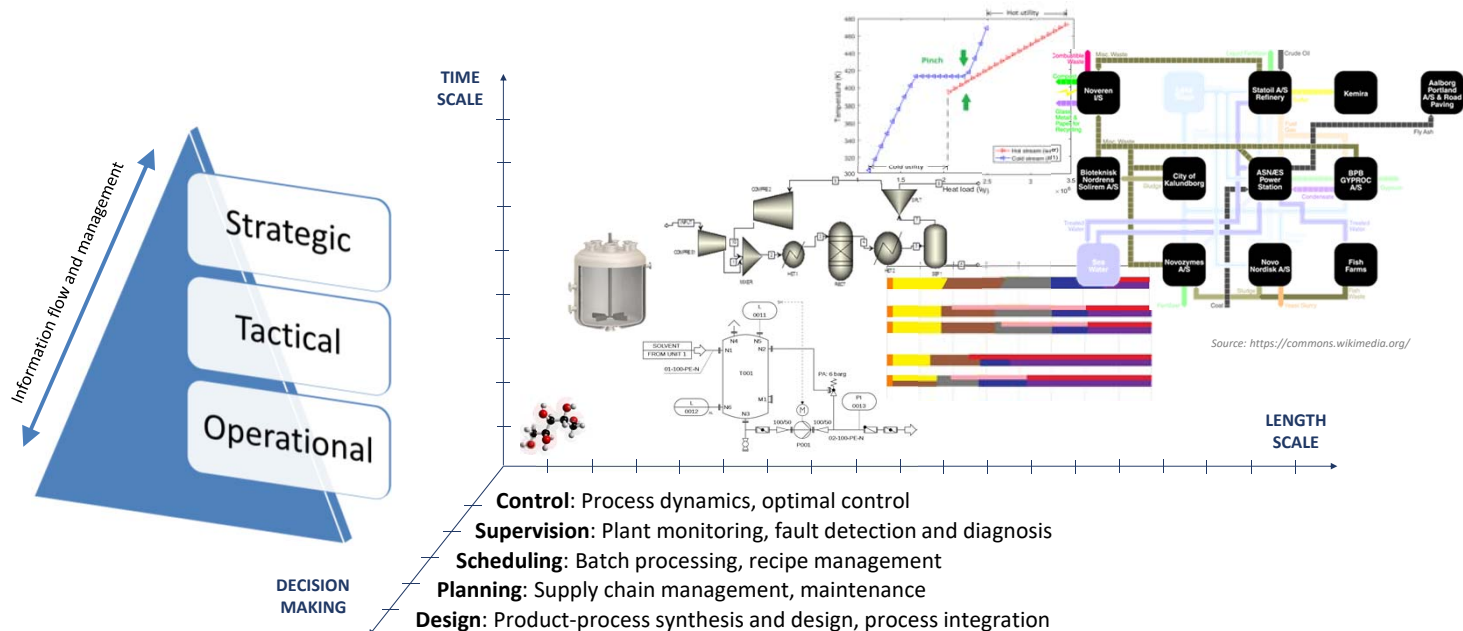


## Process Systems Engineering (PSE)

Holistic modelling approach and systematic methods and tools for decision making support in Process Systems



> Process flowsheeting  
 > Metamodeling  
 > Machine Learning  
 > Multi-scale modeling  
 > Ontologies and knowledge models

**MODELING AND SIMULATION**

$$\min f(x)$$

$$s. t.$$

$$g_i(x) \leq 0$$

$$h_j(x) = 0$$

> Operations Research  
 > Mathematical Programming  
 > Meta-heuristic methods  
 > Multi-objective optimization

**OPTIMIZATION**

> Total Cost  
 > Net Present Value  
 > Controllability  
 > Robustness  
 > Toxicity  
 > CO<sub>2</sub> emissions  
 > Life Cycle Assessment

**PERFORMANCE ASSESMENT**

Data acquisition, treatment and storage

Fault Diagnosis in Control Loop

**COMPLEMENTARY COMBINED RESOLUTION**

Supervision

Schedule execution

Regulation

Monitoring

OPERATOR

DSS

> Energy integration  
 > Water networks  
 > Industrial Symbiosis  
 > Circular Economy  
 > Advanced Oxidation Processes

**APPLICATIONS**

MBR

ISAS

TWT

K1

K2

K3

K4

K5

K6

K7

K8

K9

K10

Data on-line: pH, ORP, DO, Conductividad, Temperatura

**Indicators (for 3 years period)**

- ✓ 40 Papers (30 first quartil: Chemical Engineering)
- ✓ 550 quotes
- ✓ 9 PhDs

- ✓ 150 Conference contributions
- ✓ Interchanges (Purdue Univ. , Carnegie Mellon University, Imperial College, Campinas...)
- ✓ Results transfer: TRAGSA / ADASA / AENOR / ASPEN / CO-LaN
- ✓ Local entities (enviromental control)
- ✓ Punctual Projects : IDOM, TRADEBE, ...