Industry Sector	RTD Thematic Area	Date
PROCESS & MANUFACTURING		13/11/2001

Process and manufacturing
Summary of issues

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Industrial requirements

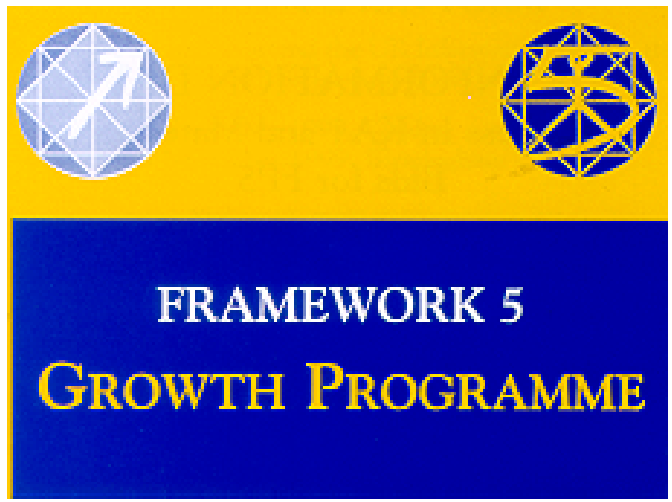
- Variety of processes
- Variety of materials
- Human/cultural aspects (role of experience)
- Time constraints
- Process simulation as part of the design chain

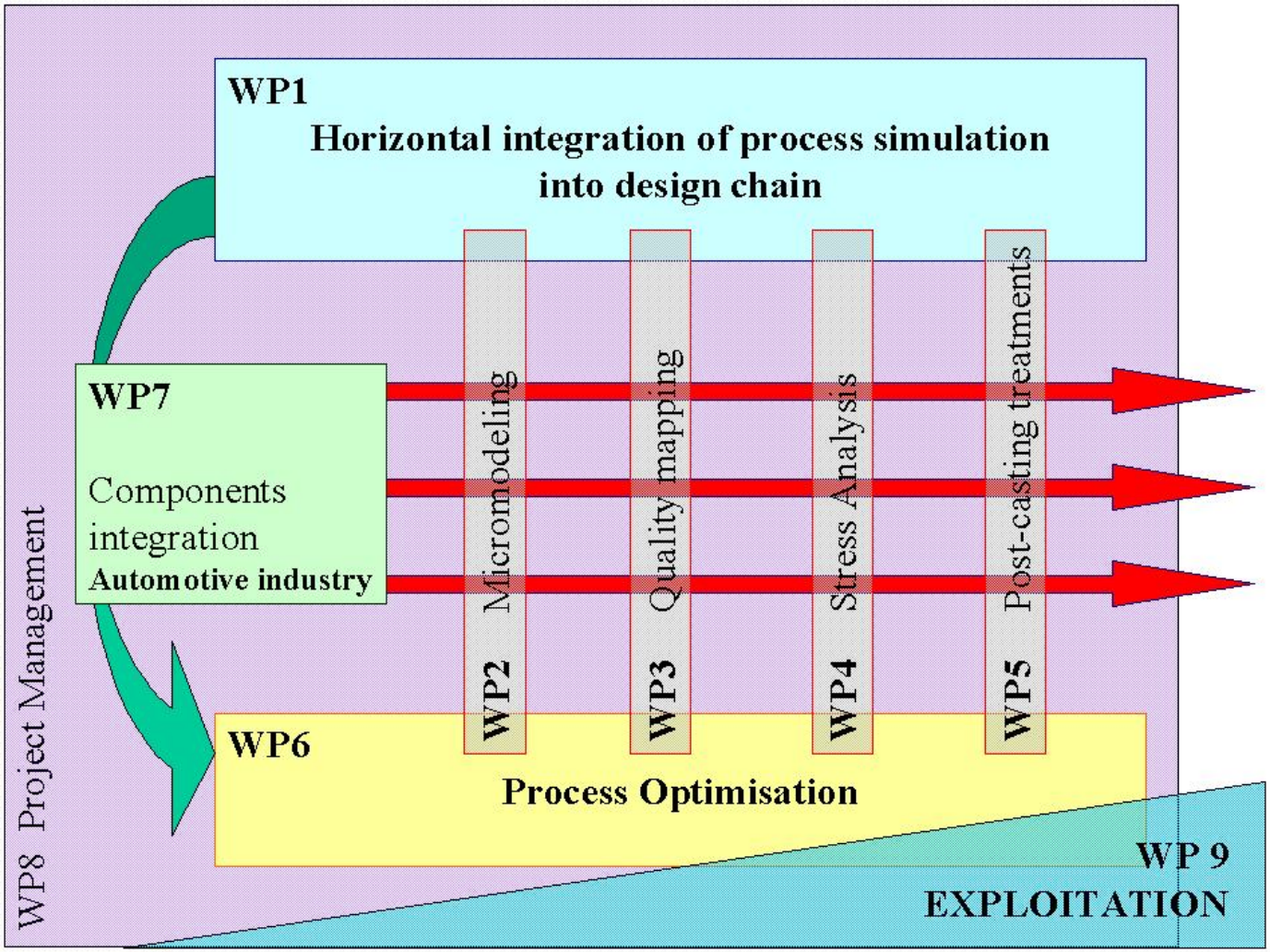
Summary of issues

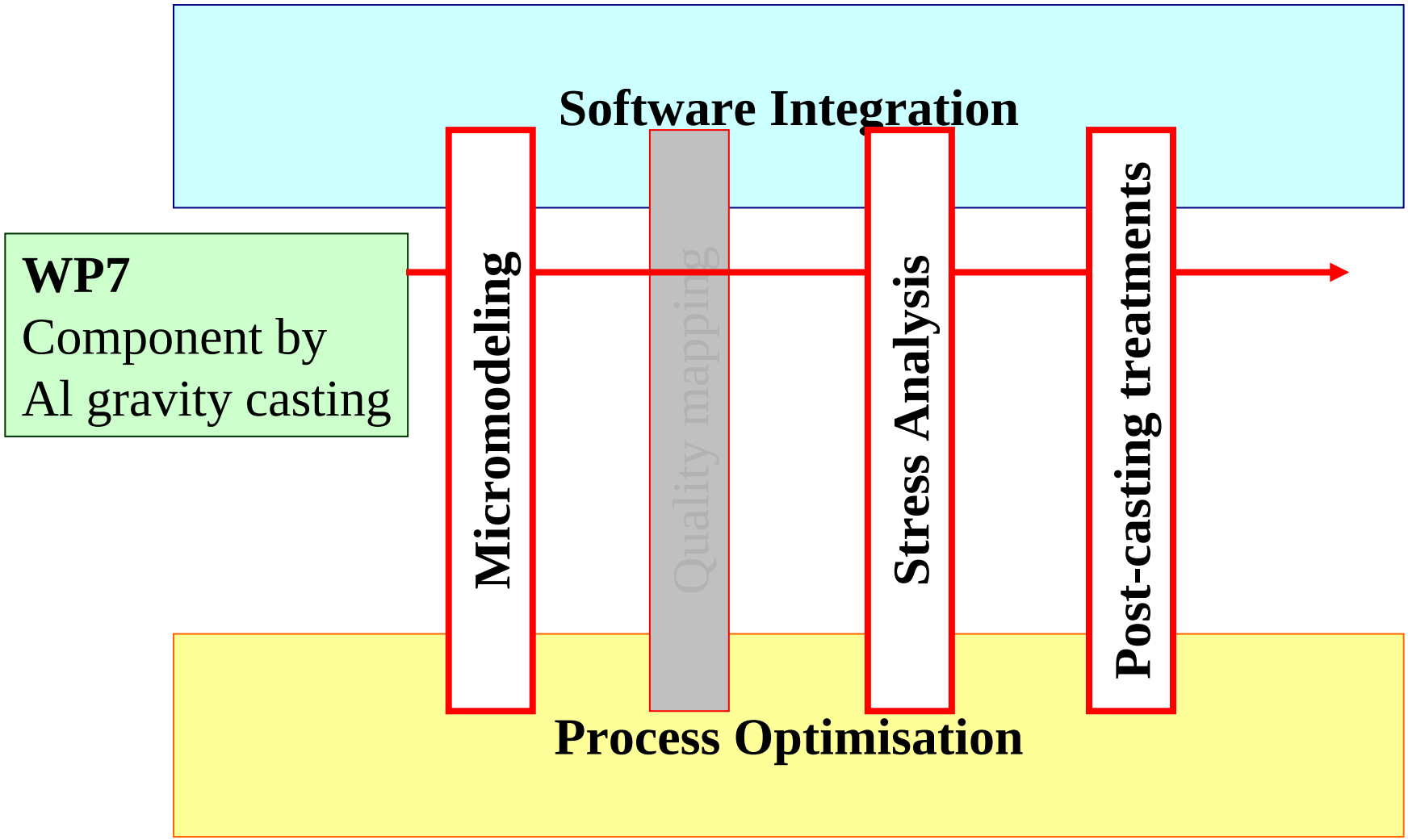
- To incorporate empirical knowledge in analytical (FEA) tools
- How to obtain reliable validation and verification data
- Multi scale modelling
- How to couple various commercial and/or proprietary programs
- How to extend product life through process optimisation
- How to obtain and apply failure criteria (forming limit diagrams)
- Fundamentals of material models
- How to obtain material data in strain, temperature, strain rate range of process
- How to obtain process data (friction, heat transfer coefficients..)
- How to analyse multi (2) phase systems with commercial codes
- How to translate material properties that are generated during the process into final product performance

IDEAL

Integrated **De**velopment Routes for Optimised Cast **Al**uminium Components




WP1
Horizontal integration of process simulation into design chain
WP7
Components integration
Automotive industry
WP2 Micromodeling
WP3 Quality mapping
WP4 Stress Analysis
WP5 Post-casting treatments
WP6
Process Optimisation
WP8 Project Management
WP 9
EXPLOITATION


Software Integration
WP7
Component by
Al gravity casting
Micromodeling
Quality mapping
Stress Analysis
Post-casting treatments
Process Optimisation

Conclusions

Developments - Four levels

(For each item to be taken into account)

- Definition of general criteria (i.e. level of understanding of the principles and roles each item plays in simulation procedures)
- Theoretical developments (i.e. level of understanding of the physics and of numerical approach which is suitable for each item)
- Experimental work (to obtain data which are necessary to perform simulation incorporating the corresponding item in a reliable way)
- Availability of the various items in simulation codes (continuous upgrade of the codes taking into account the given item)

Conclusions - Cont.

Developments - Four levels - Example

(Source: COPROFOUND Project)

ITEM	Definition of general criteria	Theoretical developments	Experimental work	Availability into simulation codes
Thermophysical properties	OK	OK	In progress	Up-grade
Heat Transfer Coefficients	OK	OK	In progress	Up-grade
Evaluation criteria	OK	OK	In progress	Up-grade
Micromodelling and/or property prediction				
- steel	OK	OK	OK	Now
- cast iron	OK	OK	OK	Now
- light alloys	OK	OK	In progress	4 years
New processes				
- semi-solid casting	OK	OK	OK	Now
- squeeze-casting	OK	In progress	In progress	3 years
- vacuum diecasting	OK	OK	OK	Now
- lost foam	In progress	In progress	In progress	2 years
New materials	In progress	In progress	In progress	4 years
Optimisation	OK	OK	In progress	2 years

Conclusions - Cont.

Role of education

- Continuing vocational training
- Different disciplines (material science, industrial processes, numerical methods, information technologies)

Simultaneous engineering approach

First Level

- Second Level
  - Third Level
    - Fourth Level
      - » Fifth Level