UNIVERSITY OF BRESCIA
RISE LABORATORY
Research & Innovation for Smart Enterprises

TCO OF MELTING FURNACES FOR DIE CASTING

Summary of the research project

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MELTING FURNACES

Production of molten metal as an input to other operations:

- predefined chemical composition
- optimum fluidity for the casting process

If the required production output is high:

- maximum production rate
- maximum cost effectiveness among foundry processes

Uneven cost subdivision among lifespan stages:

- high monetary and “hidden” utilization costs
- purchase and commissioning costs are negligible

RESEARCH CONTEXT

PRODUCTS

- Products of secondary metal melting

MATERIALS

- Aluminum alloys
- Brass
- Other non-ferrous metal alloys (zinc, magnesium, etc.)

PROCESSES

- Die casting

GEOGRAPHIC AREA

- Metallurgical districts located in Lombardy and North-Eastern Italy: Brescia, Vicenza, Lecco, Bergamo, Mantua, Cremona, etc.

DIE CASTING COMPANIES IN ITALY

202 companies
6,587 employees
2,402 M€ turnover

113 companies
4,979 employees
1,069 M€ turnover

42 companies
816 employees
208 M€ turnover

38 companies
1,440 employees
382 M€ turnover

44 companies
1,241 employees
294 M€ turnover

Total:
439 companies
15,063 employees
4,355 M€ turnover

SOURCE:
Bureau van Dijk's AIDA Database
2009-2013 data processing

TCO OF DURABLE GOODS: AN EXAMPLE

- Total equipment costs
  - Ownership costs
    - Delivered price
    - Facilities capital cost of money
    - Miscellaneous ownership costs
  - Operating costs
    - Explicit operating costs
      - Energy sources consumption
      - Operator's wage
    - Implicit operating costs
      - Maintenance
        - Service maintenance
        - Repair maintenance
      - Out of service lot revenues
      - Wearing parts costs

TOTAL COST OF OWNERSHIP

ADAPTED FROM:
Chen S., Keys L.K., "A cost analysis model for heavy equipment", Computer and Industrial Engineering n. 56, 2009, pp. 1276-1288

POSSIBLE APPLICATIONS OF TCO METHODOLOGY

Producers and suppliers of products and services

- Support to product design
- Improvement of product/service offer
- Definition of marketing strategy
- Support to customers and final users during product/service purchasing

Customers and final users

- Evaluation of commercial offers
- Evaluation of durable goods investments
- Selection of after-sale services
- Economic analysis of alternative operational modalities or utilization habits

BENEFITS FOR COMPANIES

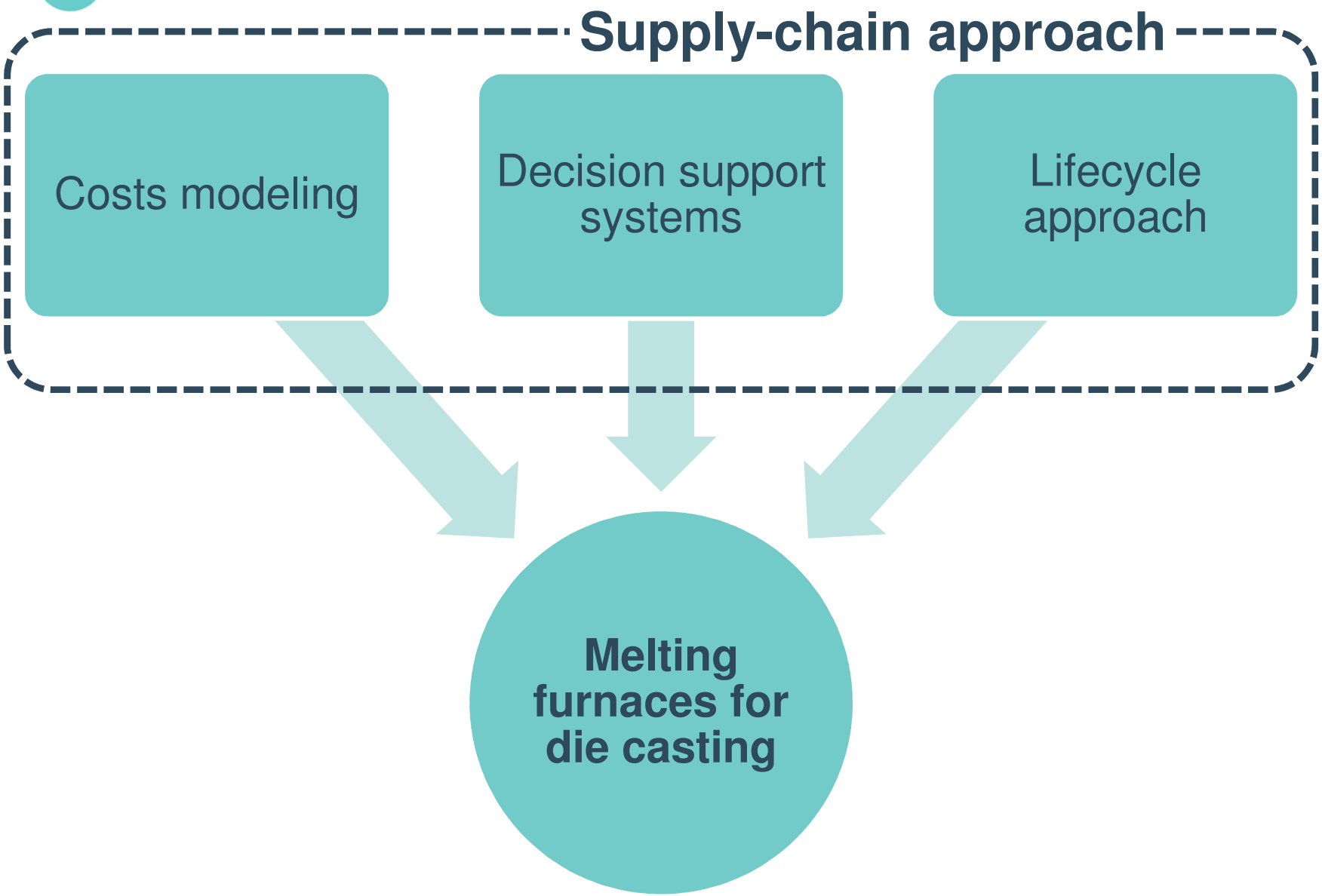
Increased decision support to both manufacturers and final users of melting furnaces

Quantification of the lifecycle economic impact of melting furnaces and melting processes

In-depth knowledge of the operating principles of melting furnaces through relevant costs analysis

Increased awareness of monetary and "hidden" costs of melting furnaces

KEYWORDS


Supply-chain approach
Costs modeling
Decision support systems
Lifecycle approach
Melting furnaces for die casting

OBJECTIVES

TO ANALYZE

- current applications of the TCO methodology in manufacturing and service companies
- technologies and business processes applicable to die casting companies

TO IDENTIFY

- the need for lifecycle-oriented decisions regarding the acquisition and utilization of melting furnaces by die casting companies

TO MODEL

- relevant cost items along the lifespan stages of a melting furnace
- input data necessary to calculate cost items (constants, variables, parameters)
- the relationships among the input data and the cost items

TO VALIDATE

- a prototypal calculation tool for the TCO of melting furnaces

STRUCTURE OF THE TCO MODEL

Input data → Calculation model → TCO of the melting furnace

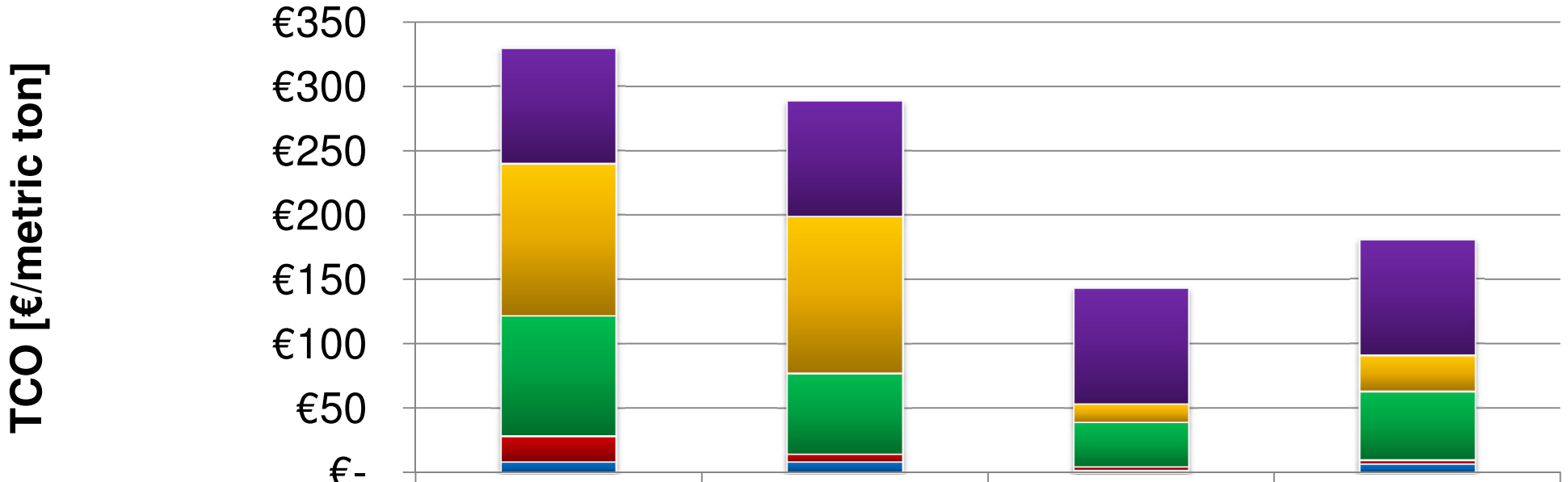
Data categories:

- Technologies / Technical parameters
- Human resources
- Materials
- Tools & machinery
- Energy
- Operating modalities of the furnace
- Maintenance activities

Lifespan stages:

1. Research & selection
2. Purchase & commissioning
3. Utilization
4. Maintenance
5. Decommissioning

RESULTS: AN EXAMPLE



	A	B	C	D
Materials	€90,00	€90,00	€90,00	€90,00
Labor	€117,96	€121,90	€14,14	€27,89
Energy	€93,55	€62,67	€34,67	€53,11
Tools & machinery	€19,95	€6,07	€2,82	€3,14
Furnace	€8,49	€8,58	€1,81	€6,76

Furnace ID

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Thank you for your attention!

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