



# VDEh-Betriebsforschungsinstitut GmbH

Institute for Applied Research  
located at the Stahl-Zentrum Düsseldorf



**Wirtschaftsvereinigung Stahl**  
German Steel Federation

**Stahl-Informations-Zentrum**  
Steel Information Centre

**Informationsstelle Edelstahl Rostfrei**  
Information Centre Stainless Steel

**Edelstahl-Vereinigung**  
Special Steel Association

**>> bauforumstahl e.V.**  
Advisory Organisation for Steel Construction

**Stahlinstitut VDEh**  
Steel Institute VDEh

**Max-Planck Institut für Eisenforschung**  
Max-Planck Institute for Iron and Steel

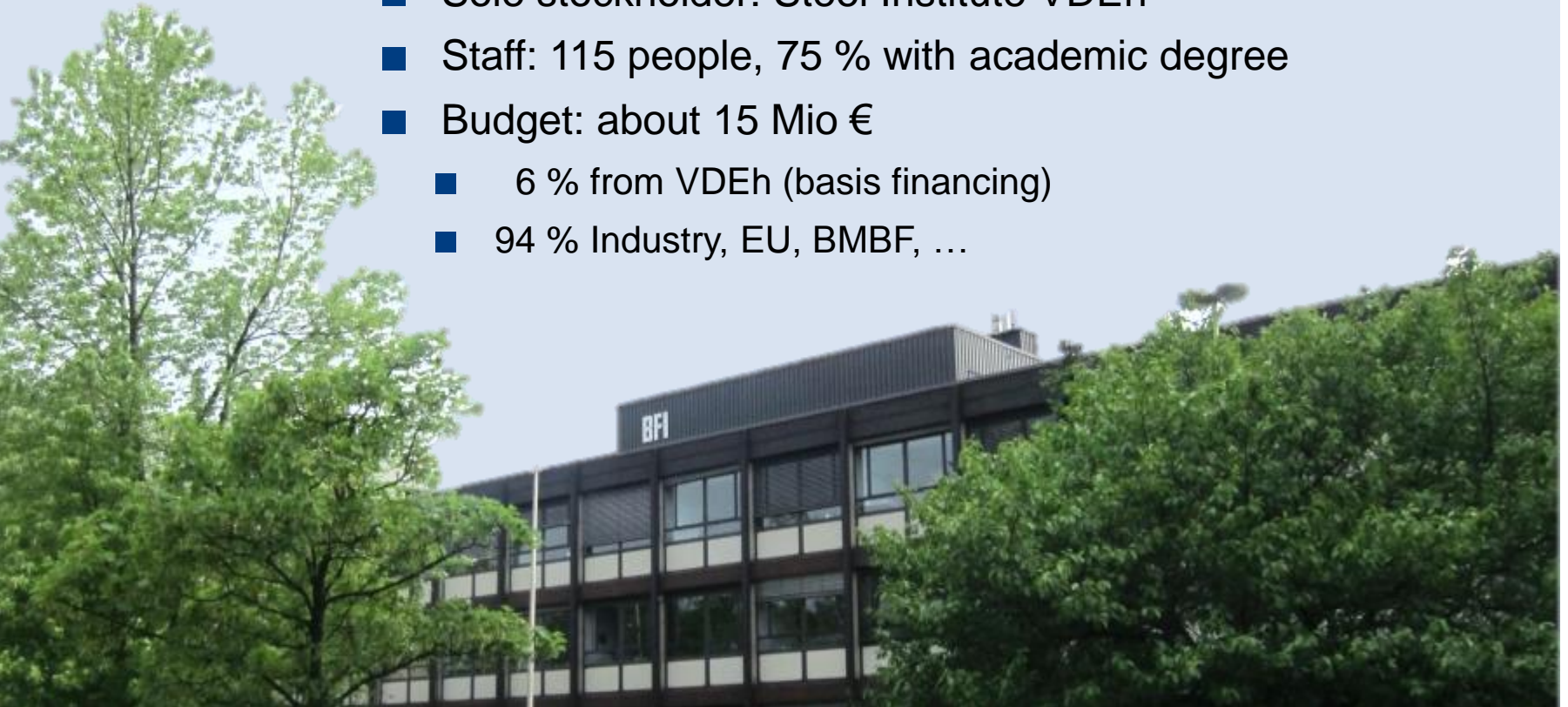
**VDEh-Betriebsforschungsinstitut BFI**  
VDEh Institute for Applied Research BFI

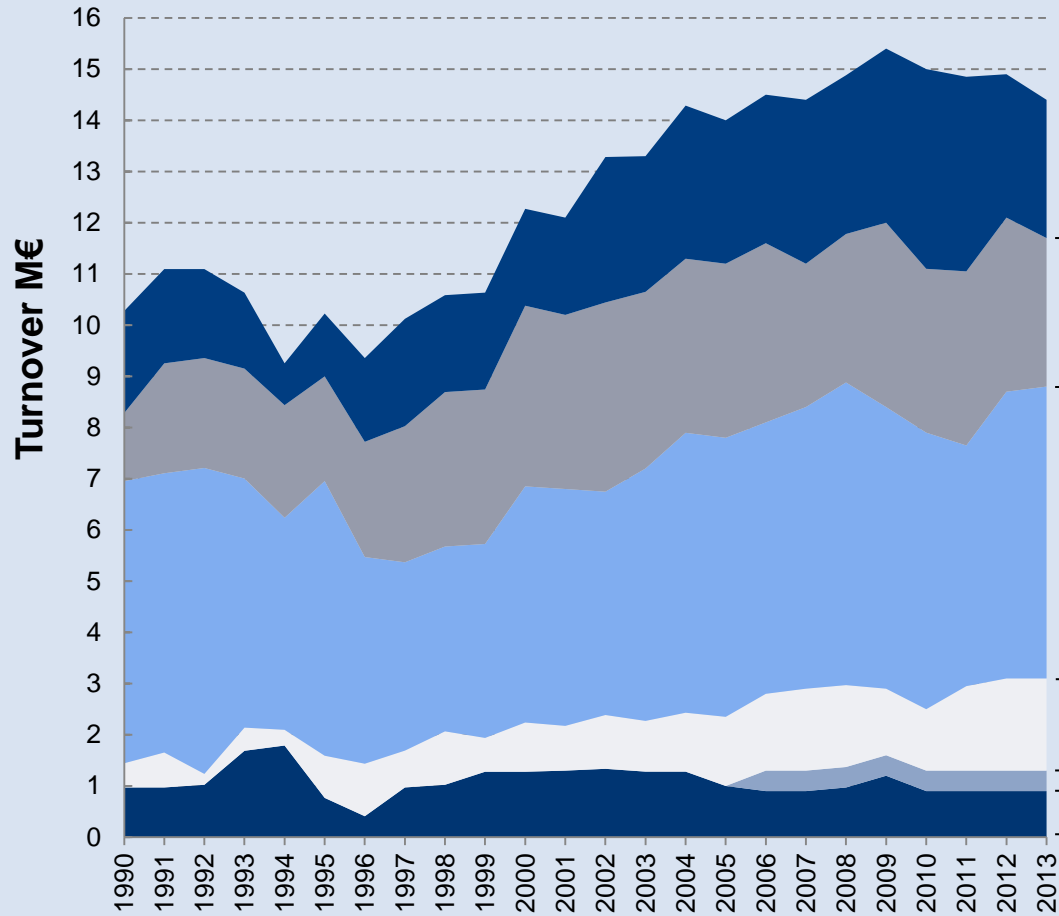
**BFI Betriebstechnik GmbH**  
BFI Betriebstechnik GmbH

**Verlag Stahleisen**  
Publishing House Stahleisen

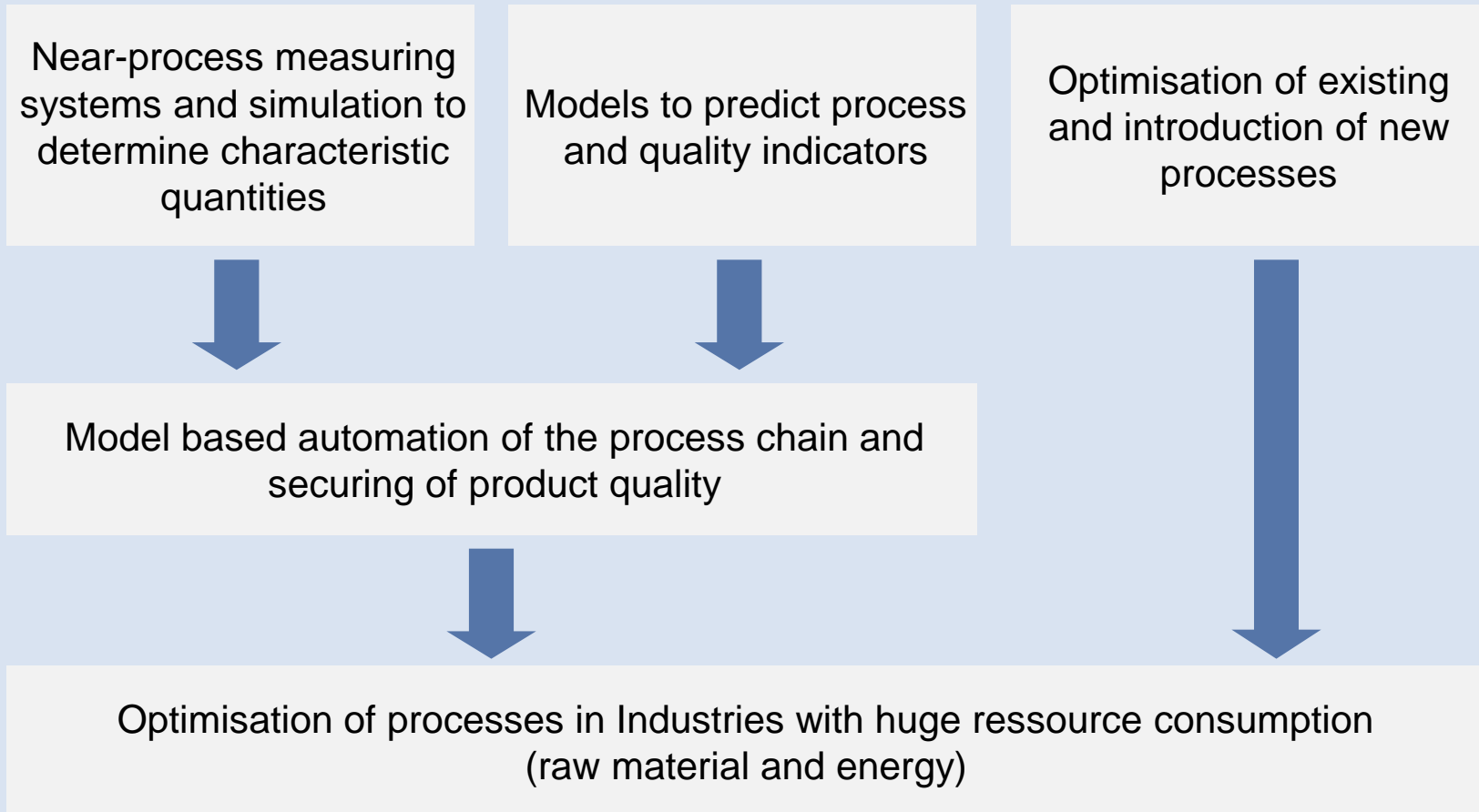
**FOSTA**  
Research Association for Steel Application

- Private research institute
- Founded in 1968
- Non-profit limited liability company
- Sole stockholder: Steel Institute VDEh
- Staff: 115 people, 75 % with academic degree
- Budget: about 15 Mio €
  - 6 % from VDEh (basis financing)
  - 94 % Industry, EU, BMBF, ...

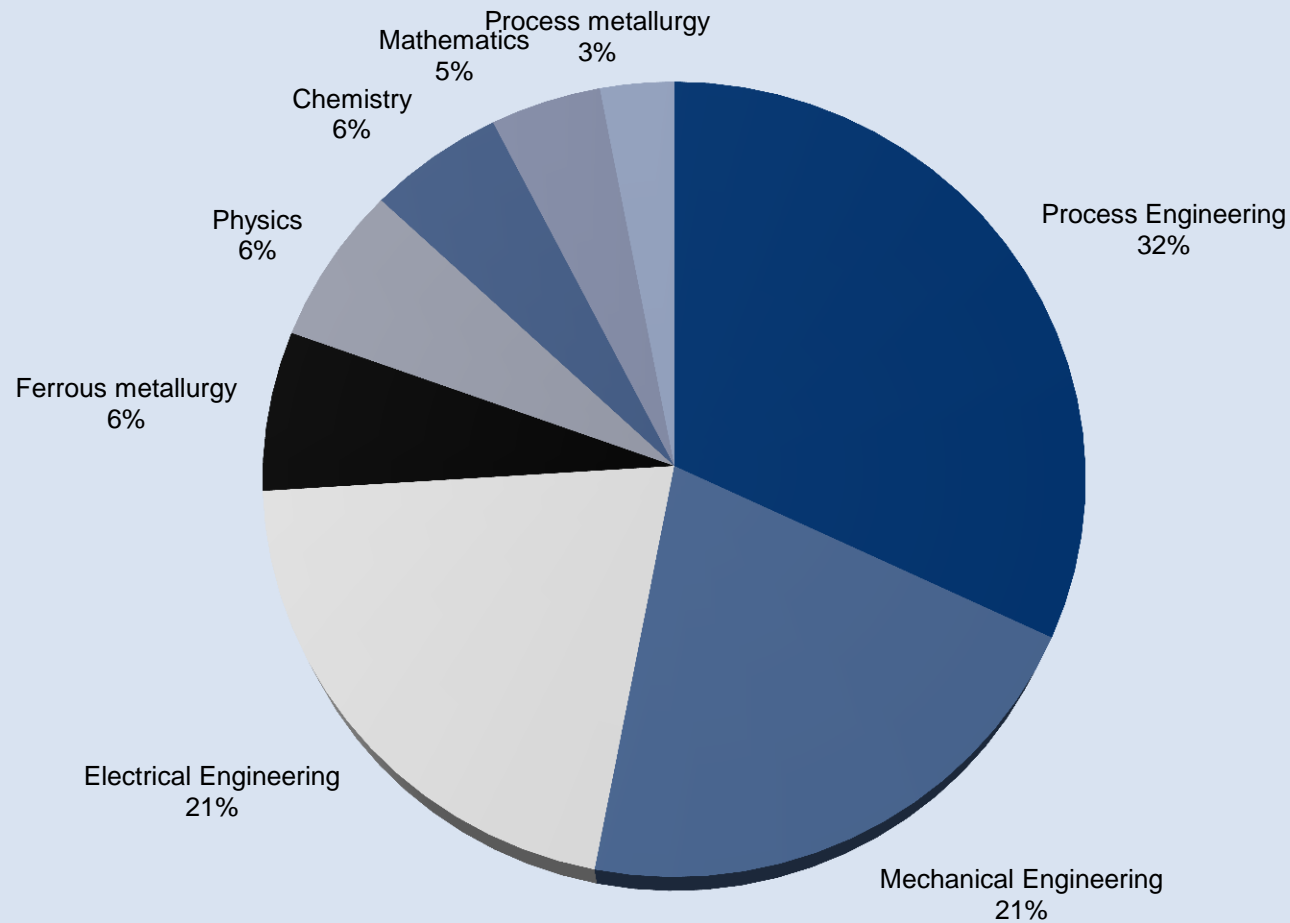




<b>BFI Turnover 2013</b>		
<b>BFI Turnover 2013</b>	<b>14,4 M€</b>	<b>100%</b>
Project funding national / regional	2,7 M€	19%
Project funding RFCS / EU	2,9 M€	20%
Contract research, industry contribution	5,7 M€	39,5%
Royalties	1,8 M€	12,5%
Dividends	0,4 M€	3%
Basic funding VDEh	0,9 M€	6%

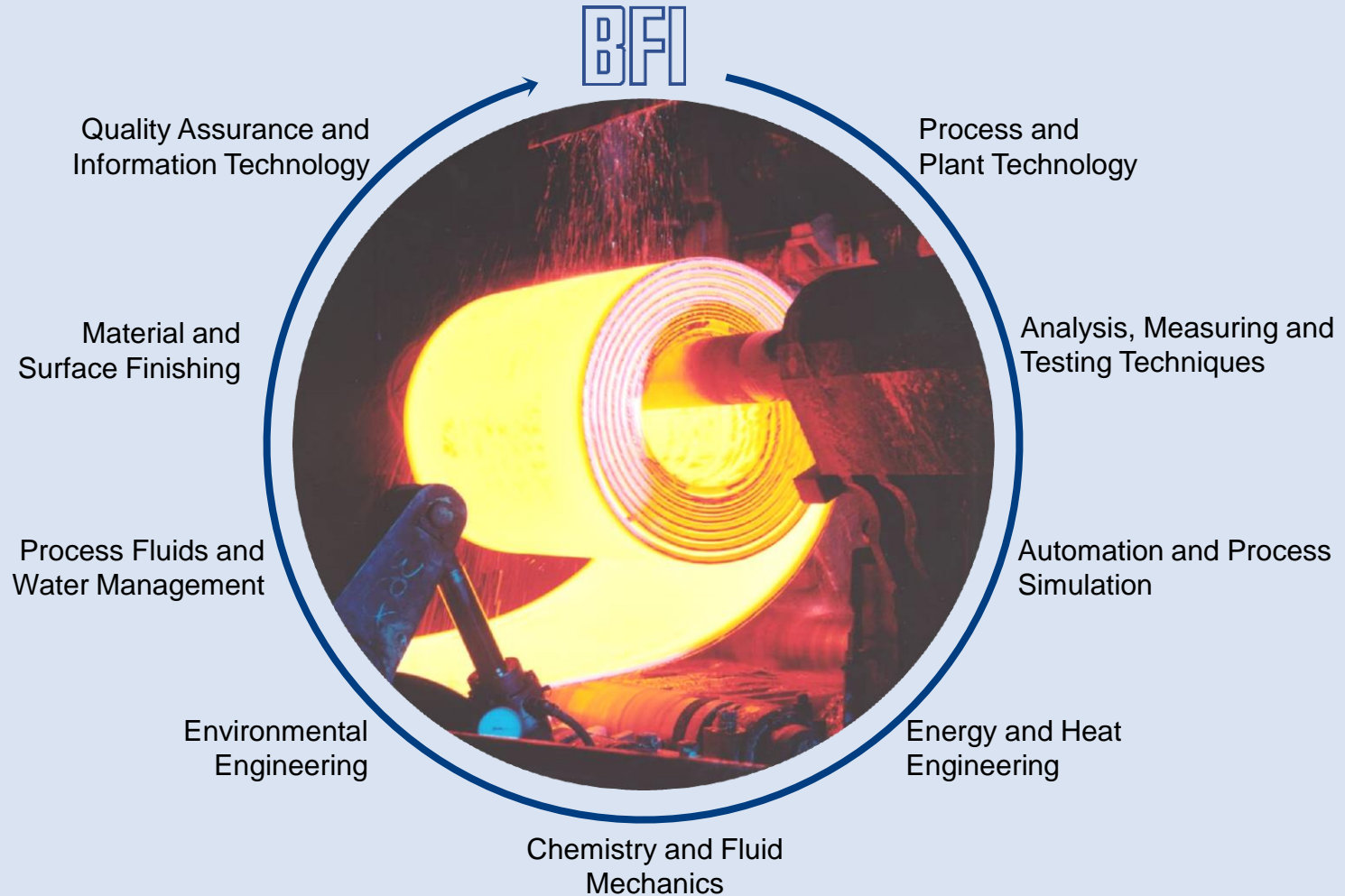




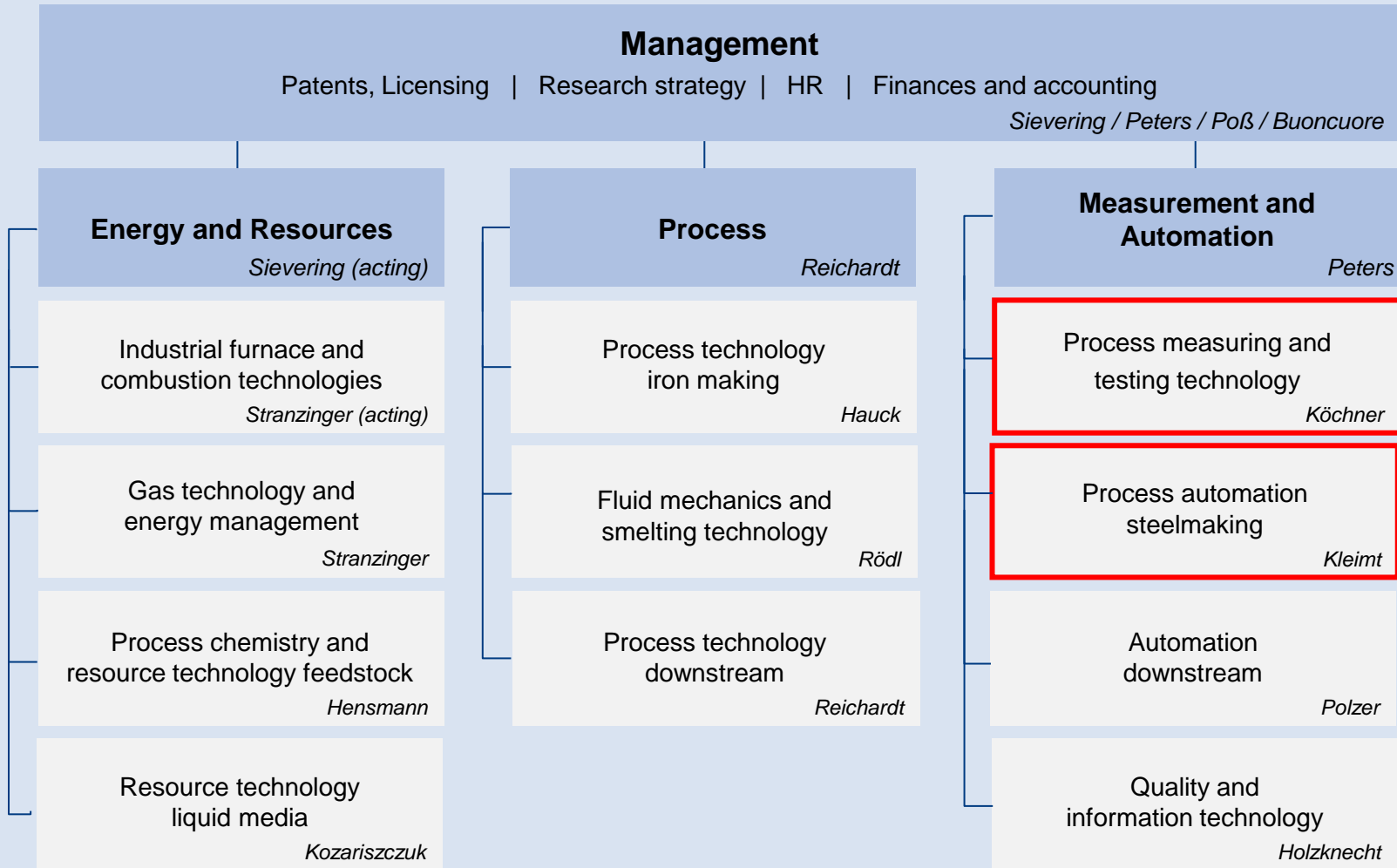




- **Virtual network** of established European steel research institutes
  - Aim : Preserve and develop **competitiveness of European steel industry**
  - Close links to Eurofer, ESTEP and SPIRE
  
  - **Coordination** of research activities
  - Independent **counselling** on steel research in Europe (Roadmaps, Agendas)
  - Coordinated **strategy** towards RFCS, EU
- Expl: R&D topics for SPIRE, Green book H2020, Consultation ERA, RFCS workshops*







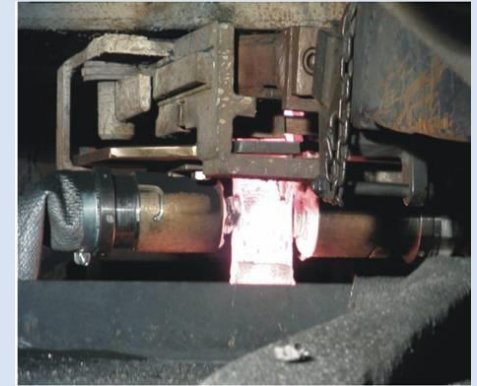
### Blast furnace hearth monitoring



### Temperature monitoring



### Monitoring of liquid steel flow



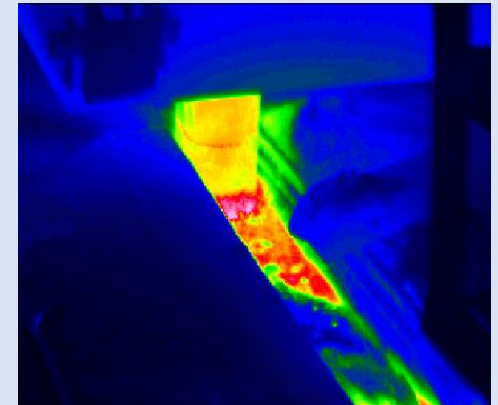
### Melt analysis



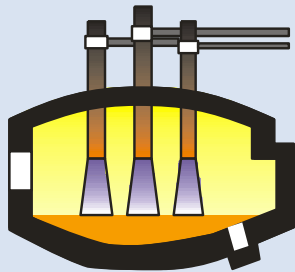
### Image processing for liquid steel



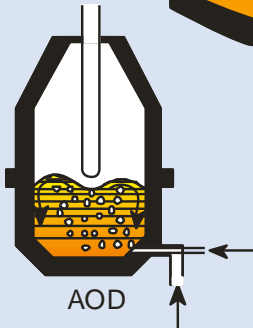
### Monitoring of casting powder feeding



## Electric Steelmaking



EAF



AOD



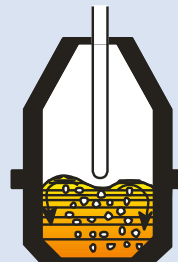
LF



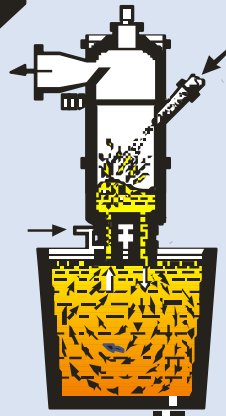
VD / VOD

## Secondary Metallurgy

## Oxygen Steelmaking



BOF



RH (VCP)

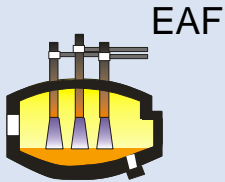
Optimisation of process control through:

- Model based on-line process monitoring
- Dynamic process control
- Off-line process analysis

With the objectives of:

- Reduced consumption of energy, material and media resources
- Increased productivity
- Reliable and reproducible process operation
- Improved transparency of the production process
- Improved quality of liquid steel wrt.
  - Adjustment of aim temperature
  - Achievement of target analysis
  - Steel cleanness

## Electric Steelmaking



- On-line process observation based on dynamic energy and mass balance models and thermodynamic models for monitoring and end point control of
  - steel and slag weight
  - steel temperature
  - decarburisation
  - metal oxidation
  - dephosphorisation
  - slag composition
- Model-based control of electrical and chemical energy input
- Model-based control of oxygen input for decarburisation and dephosphorisation
- Through process modelling, control and optimisation of the complete route of EAF steelmaking
- Regression calculation for determination of composition of the charged scrap types, and optimisation calculation for cost minimal charge mix determination
- Implementation of process models within Level-2 process control systems