

National Research Projects

3rd General Assembly Stakeholder Meeting

JOINING SUB-PLATFORM TO *MANUFUTURE*

Wednesday, 3rd December 2014

Bruxelles

Joining Technology for Wind Energy

Solutions: Research and Development (1)

- **Decisive bottleneck during production → Welding!**

- **Optimising of joining technologies**
  - → Cost-efficient
  - → Time-efficient

- **Develop adequate production capacities**
  - → For towers
  - → For moving components in the gondola

Raising the Competitiveness of European companies

High-tech solutions → **limit production relocation** → countries with lower wage levels

Joining Technology for Wind Energy

Solutions: Research and Development (2)

- **Easy-to-mechanise high-productivity processes**
  → Better economic viability (e. g. beam welding processes)
- Mechanised process sequences in a **reliable process** / boundary conditions
- **Reliable process parameters** / mechanical-technological joint properties
- **Testing** procedures → **Mechanical-technological properties**
- Utilisation properties → manufacturing quality / monitoring / service life
- **Realistic toughness requirements** → Avoiding brittle fracture
- **Qualification of high-strength and ultrahigh-strength steel grades / combination**
  → Prevented by the lack of → relevant **standardisation**
  → non-existent **qualification**
- **Health and Safety aspects for welding technologies**

Joining Technology for Wind Energy

Solutions: Research and Development (3)

Requirements

→ Approved, certified welding procedures for use on the construction site

→ No size restriction for parts produced in the factory

→ Shell segments, welded on site → Much larger tower diameter possible

Definition of notch cases (depending on the welding process)

→ design of welded structures → reduction of the welding effort

Automation already started from batch size 1 (for small series and large assemblies)

→ integration of sensors → seam tracking / gap and seam profile measurement, adaptive process control in "real time"

→ Flexible Production

→ Cladding (use of titanium → plating, welding of cladded plates)

„Research goes Europe“

Link national and European research demands and aktivities

Common Advances:

- Multinational piloting
- Upscaling
- Certification
- Accreditation
- Broad industry acceptance
- Shorten innovation-to-industry time
- …

Goal: Promoting applied research and development to benefit SMEs

DVS Research Association – Overview

Membership Topology and Budget (Figures in 2013)



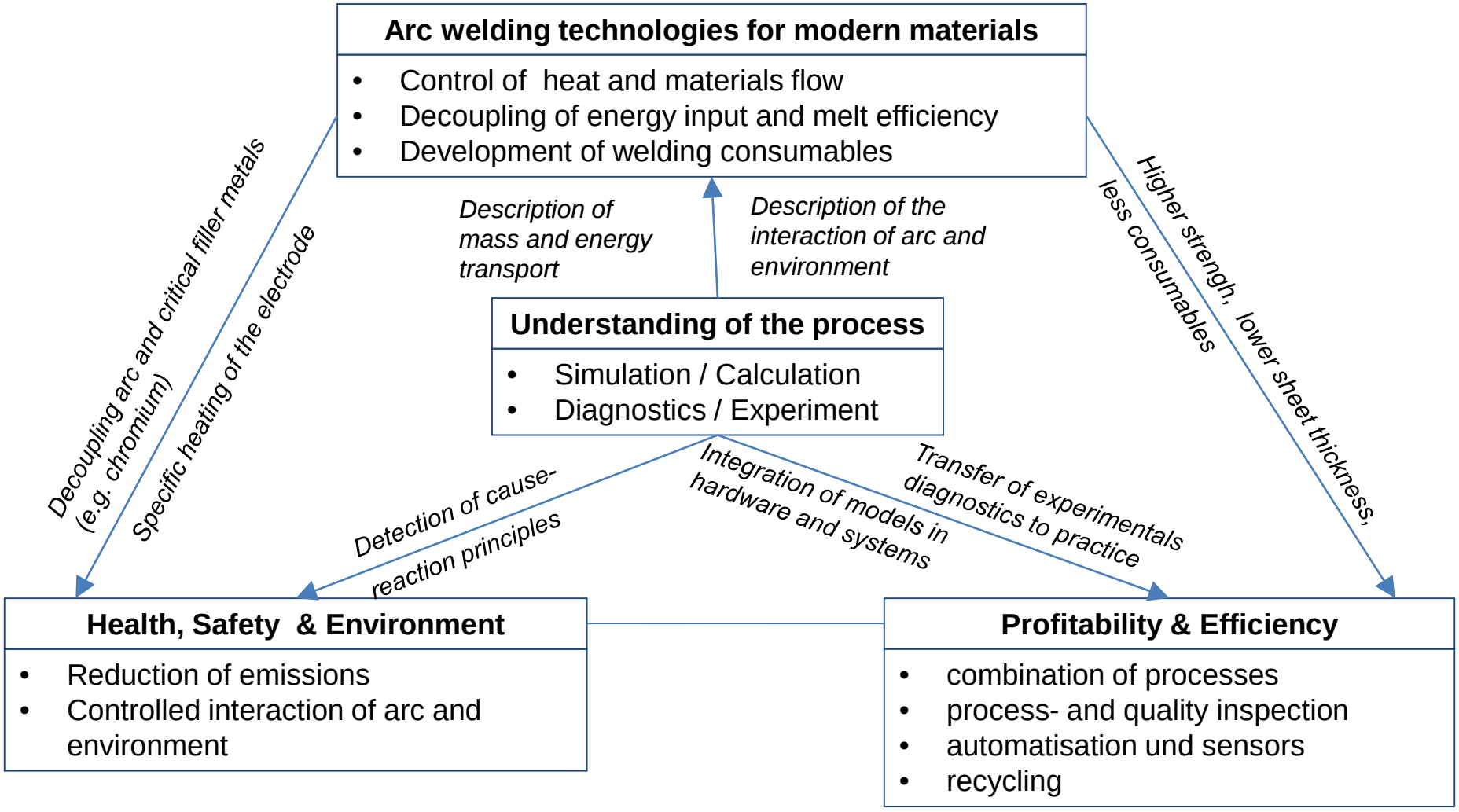
361 Industrial Members (companies, SMEs)
65 Research Institutes
127 Federations (state administration, private sector)
15 Expert Groups with 600 Experts from Industry
553 Members totally

7,6 Mio. EUR Public Funding
107 Research Projects

Basics of Commission FA 3 „Arc Welding“

Vision	**Arc welding processes need to be planable, simulated, emission free, monitorable, qualitatively dedicated, economically, robust and safe for production.**
Mission	• Steigerung der Bedeutung der Lichtbogenschweißtechnik durch innovative, produktive und robuste Technologien • **Communication platform for Science and industry even on an interantional level** • **Networking with national and international research provider** • Identifikation und Konsolidierung von Leitthemen • Entwicklung strategischer Roadmaps und Ableitung des Forschungsbedarf • Initiierung und inhaltliche Begleitung von Forschungsprojekten • Transfer von Forschungsergebnissen in die Industrie • Technologische Förderung des Mittelstandes in Deutschland

Arc Welding: Up-to-date research requirements



1. Example:
Sensor-aided GMA narrow gap welding of high strength steels with modified process guidance in thick plate area (1)

Project aims:

- **Automated GMA narrow gap welding for small series**
- Lateral and vertical control by means of process-oriented and optical sensors
- Development and comparison of appropriate new regulator approaches
- **Control of edge penetration and weld filling** at varying groove width due to flame cut in production and distortion in welding
- **Applying of control strategies** for welding positions PA, PF and PC

Benefits for SMEs:

- GMA narrow gap technique **reduces time and required additional material** when welding thick-walled components
- **Automation** allows application of the method to **small series** and improves competitiveness
- Out-of-position welding extended range of applications for GMA narrow gap welding
- **Stable process control** reduces requirements for joint preparation and finishing



Quelle: EWI.org

1. Example:

Sensor-aided GMA narrow gap welding of high strength steels with modified process guidance in thick plate area (2)

Project: 2014-01-01 - 2015-12-31

Comments:

- System Components are commercially avialable
- Real-time capable control system
- Many interfaces → easy to integrate in existing systems
- Synchronicity also with high frequencies

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2. Example:

Submerged arc pulse welding to reduce the hydrogen entry when welding high strength fine-grain steels (1)

Project aims:

- **Reduction of hydrogen entry** during welding through the use of submerged-pulse technology
- Engineered way **to increase the process safety** in welding of high strength fine-grain steels
- **Applicability** of the submerged-pulse technology for steel with a yield point of more than 690 MPa
- Extension of the **cold crack-free process window**



Pic. 1: Cavern

Benefits for SMEs:

- **Target groups are SMEs**, truck, crane or heavy machinery industry
- The availability of **reliable and economical welding processes** for cold crack sensitive steels are essential qualification for processing this materials
- **Increase in the achievable strength and lightweight potential**



Pic. 2: Pressure Measurement

2. Example:
Submerged arc pulse welding to reduce the hydrogen entry when welding high strength fine-grain steels (2)

Project: 2011-12-01 – 2014-05-31

Comments:

- Easy to market
- Switch power source
- Further research demands:
  → from hardfacing to joining

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Sub Platform „JOINING“

Link national and European research demands and activities

→ Excellent benefit for common demands!

Thank you very much
for your attention.