Improvement of productivity and quality of welding on special steels in arctic conditions

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Needs?

- Special requirements for the usage of novel steels (wear resistant and constructional steels) in arctic conditions do exist.

- Increase of usage of ultra high strength steels, that require controlled heat input, in the arctic conditions.

- Support companies RDI, in order to develop new business opportunities.

- Tightening regulations of steel constructions also increase demands for operations in the arctic.

- Increase the safety and competitive edge of Finnish engineering industry
Arctic business areas

Business opportunities in the arctic regions
Approach?

- Reliable guide for preheating and repair welds in field conditions
- Possibility to weld in harsh conditions indoors at Cold Laboratory. (Temperature, wind chill, moisture)
- Promoting usage of new high and ultra high strength steels in energy efficient manner
- Improvement of ecoefficiency through proper material selection
- Overall increase of knowledge on arctic operations
Case studies

• Research and reporting focused on case studies from companies

• Documenting of field testing in real conditions on real subjects

• Comparison of procedure in Cold Laboratory vs. in reality / field conditions

• Where applicable, test of design with prototype before full scale implementation

• Enhancement of information exchange between end users due to networking
Confirmed industrial partners

- SSAB Europe Oy, Raahe
- Outokumpu Chrome Oy (Kemi Mine)
- Miilux Oy, Raahe
- Ilin Konepaja Oy, Ii
- Telatek Service Oy, Raahe
- Metso Minerals Oy, Tampere
- Tornion Sähköpojat Oy, Tornio
- Akkoy Service Oy, Kemi
- Norrhydro Oy, Rovaniemi
- Kemppi Oy, Lahti
- Retco Oy, Pori
Material selection plays a vital role in designs for Arctic conditions.
Applications
Possible benefits

• Added reliability for welding instructions for novel steels

• Increase of knowledge about arctic welding and real-time controlling of harsh conditions on laboratory scale.

• Increase the work safety

• Enhancing of national and international competitiveness of enterprises by creating new solutions

• Enhancing the export of welding technologies

• Increase in ecoeffeciency of machines and constructions
Cold laboratory as a welding environment?

- Increase of knowledge about arctic welding and real-time controlling of harsh conditions comprises of:
  - Dividable 2 chamber test space
    - Big chamber -40°C - +30°C (12,5m x 5,5m x 2,5m)
    - Small chamber -50°C -+80°C (4,5m x 2m x 2,3m)
  - Wind conditions simultaneously 33 m/s
  - Spraying of supercooled water as an option
  - Equipped with exhaust removal equipment
  - Other tools may also be tested, such as:
    - Angle grinders, cutters, welding tractors, etc.
Cold laboratory as a welding environment?
Monitoring of welding conditions
Welding equipments

Welding table

FastMig X 450


Retco welding tractor (kuljetin)

+Retco preheating unit
Savonia UAS: welding, testing and quality

- Hybrid welding (laser+MIG/MAG)
- Dynamic testing of welds
- Business for welding industry in arctic conditions
- Increase knowledge and know-how on welding standards, regulations and approval procedures
- Knowledge on requirements of welding automation for novel steels
Czech Technical University in Prague, CTU

- International collaboration
- Research and development of welding
- Prof. Jakub Dolejš
- Ph.D. student Kateřina Šefčíková
  - Research on welding parameters of hybrid beams
- Mechanical properties of welded joints
  - Tensile test, impact tests, hardness, FESEM
- Co-operation with SSAB in Finland, Sweden and Czech
Competition and rival possibilities

Steels in arctic conditions

Welding metallurgy in arctic conditions vs. Cold laboratory

Laser hybrid-welding

Jig technology robotizing mechanization

Properties welding fillers WPS’s

Dynamic testing production simulation Mass-tailoring

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Savonia UAS

Cold Laboratory

Lapland UAS

SSAB Raahe

SME’s in Lapland

Savonia UAS
Accepted budjet in project proposal

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