



ANDRITZ SAVONLINNA WORKS OY WAAM INTRODUCTION

2020

ANDRITZ

ENGINEERED SUCCESS

ANDRITZ GROUP

A WORLD MARKET LEADER WITH 4 BUSINESS AREAS



PULP & PAPER



50

% order intake*

PRODUCT OFFERING

- Equipment for production of all types of pulp, paper, tissue, and board
- Energy boilers

METALS



22

% order intake *

PRODUCT OFFERING

- Presses/press lines for metal forming (Schuler)
- Systems for production of stainless steel, carbon steel, and non-ferrous metal strip
- Industrial furnace plants

HYDRO



18

% order intake *

PRODUCT OFFERING

- Electromechanical equipment for hydropower plants (turbines, generators)
- Pumps
- Turbo generators

SEPARATION



10

% order intake *

PRODUCT OFFERING

- Equipment for solid/liquid separation for municipalities and various industries
- Equipment for production of animal feed and biomass pellets

* Share of total Group order intake 2019

ANDRITZ CENTERS OF EXCELLENCE IN FINLAND



Helsinki

- Headquarters, ANDRITZ Oy
- Management
- Recovery and Power
- Service

Lahti

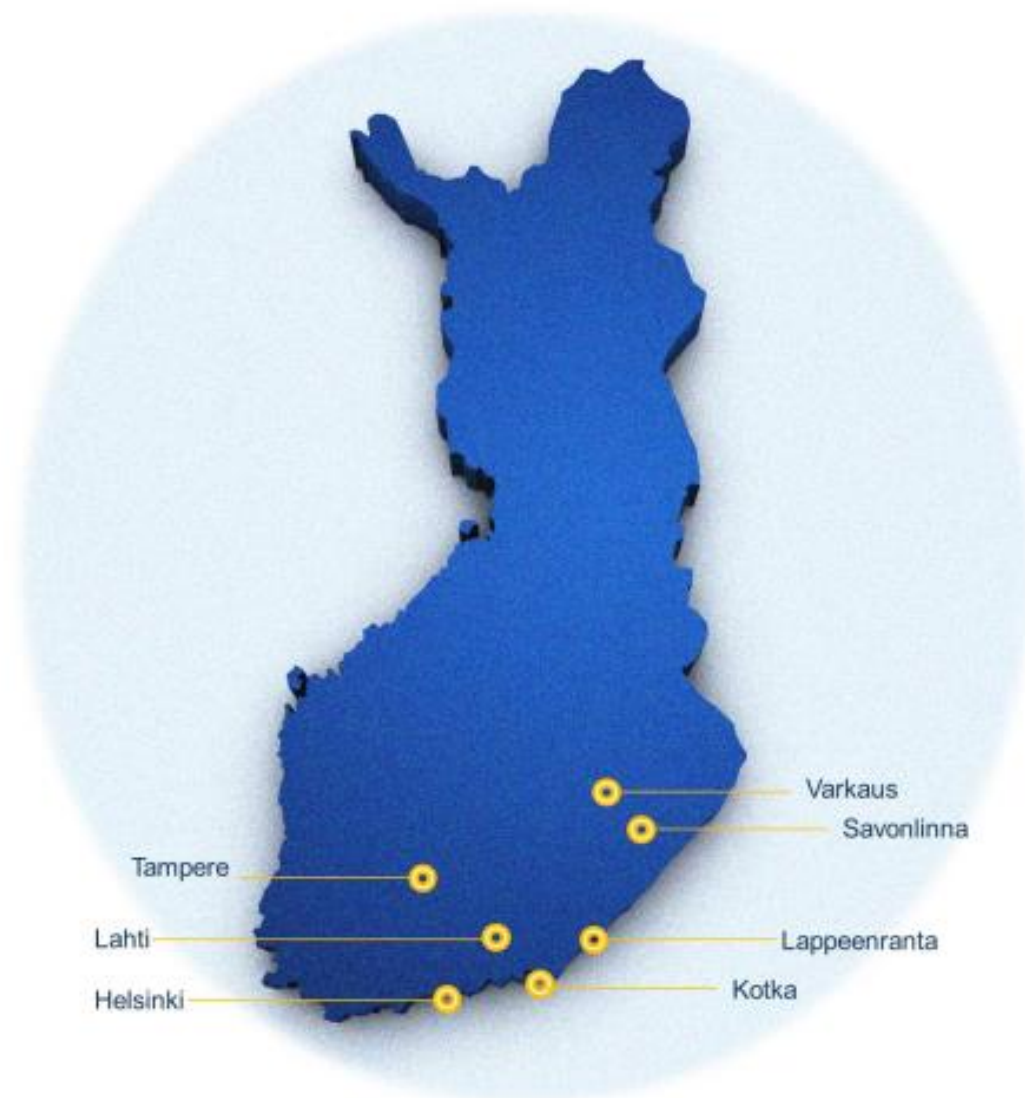
- Wood Processing
- Service

Lappeenranta

- Fiber Technologies
- Service

Tampere

- Automation
- ANDRITZ Hydro Oy



Kotka

- Fiber Technologies
- Recovery and Power
- Pulping & Fiber
- Service

Savonlinna

- Fiber Technologies
- Recovery and Power
- Service
- ANDRITZ Savonlinna Works Oy

Varkaus

- Recovery and Power
- Service
- ANDRITZ Varkaus Works Oy

OVER 100 YEARS OF MANUFACTURING EXPERTISE IN SAVONLINNA



1917

Workshop
was
founded.

1920s

Ab W. Gutzeit & Co
became the principal
shareholder.

Shipbuilding,
manufacturing of
steam engines, steam
boilers and winches.

1930s

Manu-
facture of
evaporators
and
causticizing
plants
began.

1940s

Ammunition and other
equipment for the Finnish
Army were delivered for
World War II.
After the war, goods were
manufactured as war repa-
rations to the Soviet Union.

Fusion with the main
company, Enso-Gutzeit.

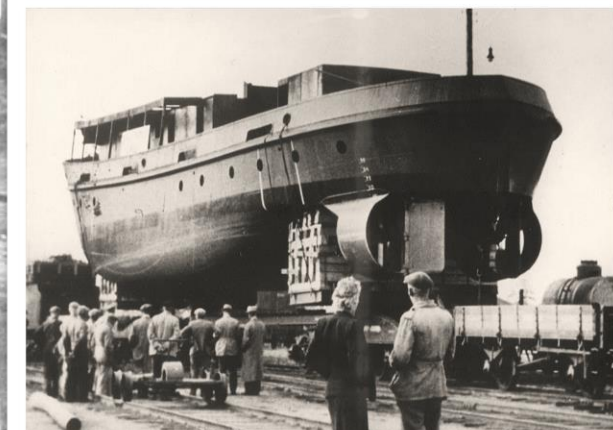
1950s

License agreements with
American companies to
manufacture cleaners,
refiners and pumps for the
wood processing industry.

Export trade in evapora-
tors and causticizing
plants picked up.

1960s

Eimco manufactur-
ing under
license for the mining
and
chemical
industries
began.



OVER 100 YEARS WITH THE FOCUS IN THE FUTURE



1970's

Intense product development.

New products, e.g. Help-silo discharger, Enso-refiner and Ecofilter.

1980's

Manufacturing under license came to an end. Emphasis on development, automation and manufacturing of own products.

The first DD-Washer was delivered in 1983.

1987 Ownership to A. Ahlström Corp.

1990's

The new owner invested in the first welding robots and NC-programmed machining stations.

2000's

2002 Ownership to ANDRITZ.

ANDRITZ became the only company in the world that can supply all the machinery and equipment for a pulp mill.

2004 Savonlinna Works Oy established.

2010's

2015 Virta project: development of order-to-delivery-chain.

2017 Workshop 100 years.

2019 New name: ANDRITZ Savonlinna Works Oy.

2020's

391 DD-Washers sold (Jan. 2020).

The second century of the workshop has begun with continuous improvement of operations, technology, knowhow and skills. We look forward to future challenges in co-operation with our customers.



OUR BEST MANUFACTURING EXPERTISE: EQUIPMENT AND MACHINERY FOR THE PULP INDUSTRY

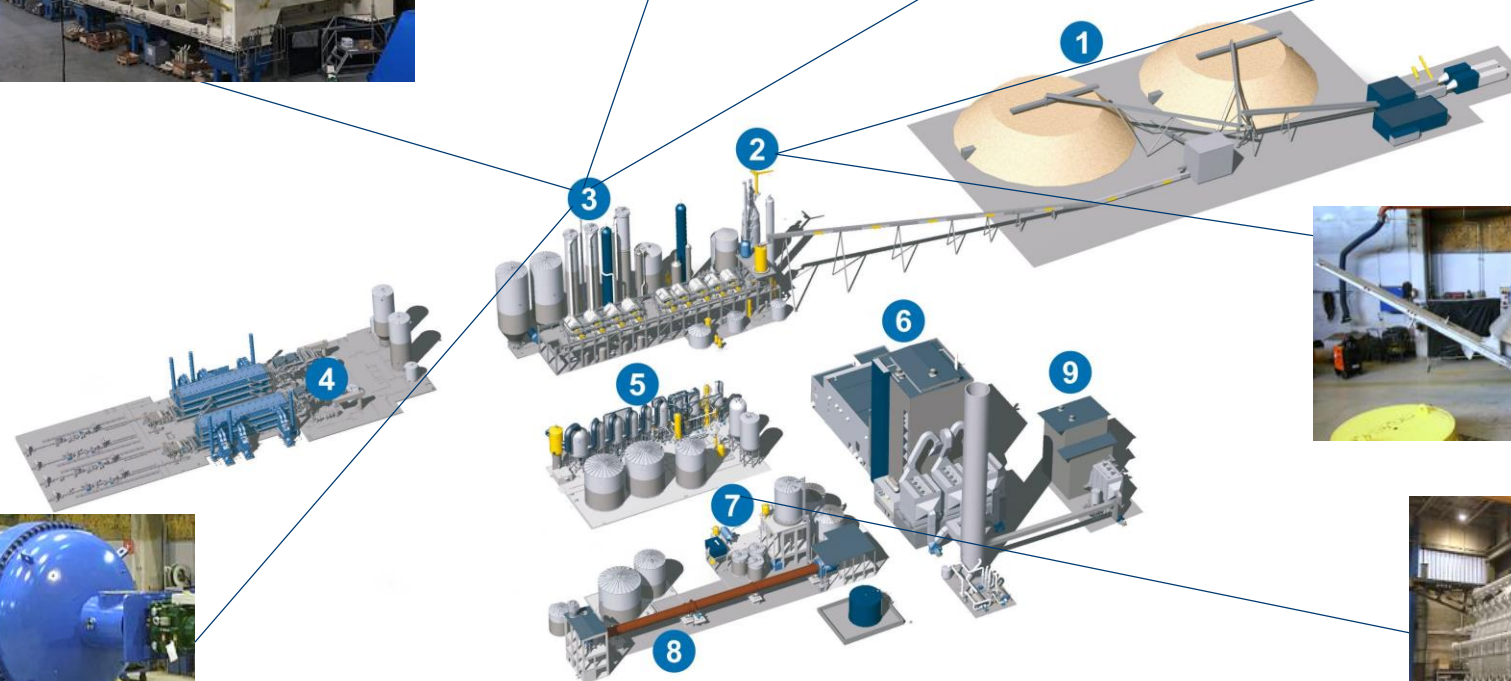


Pulp line

1. Wood processing
2. Cooking
3. Washing, screening and bleaching
4. Drying and bale finishing

Chemical recovery

5. Evaporation
6. Recovery boiler
7. Recausticizing
8. Lime kiln
9. Power boiler



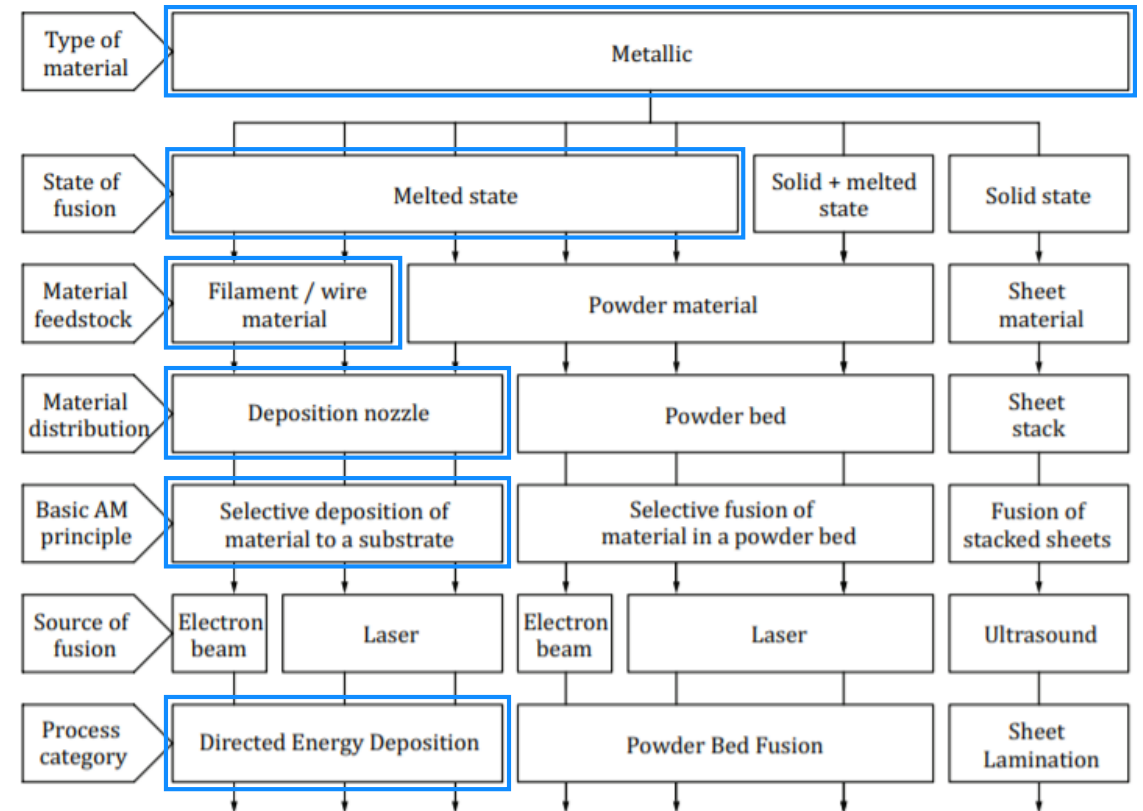
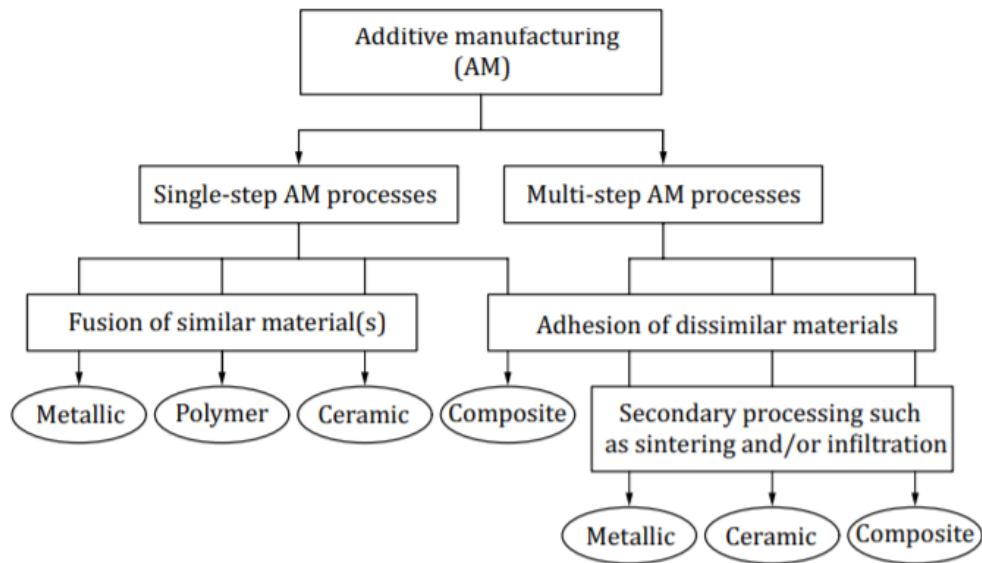
OVERVIEW



OVERVIEW



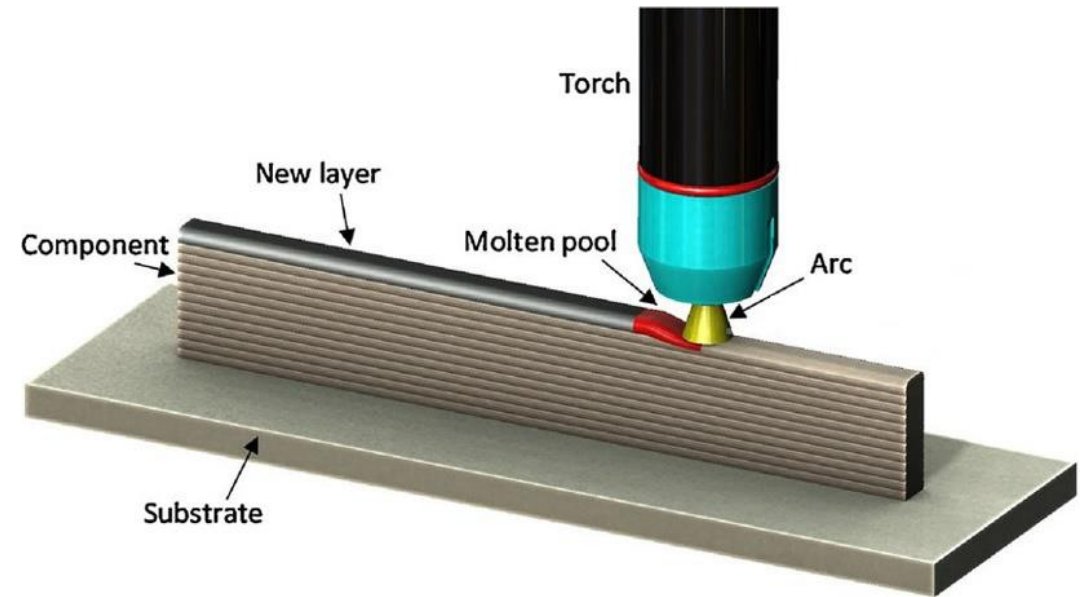
SFS-EN ISO/ASTM 52900 2017



OVERVIEW

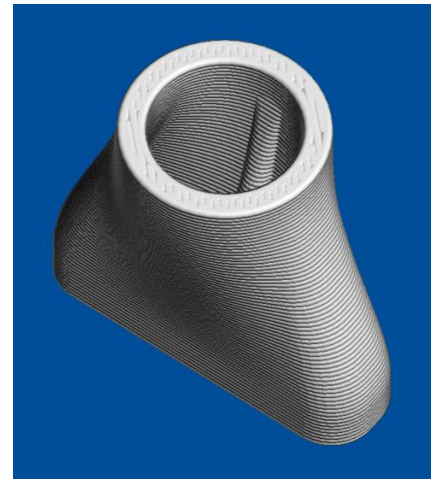
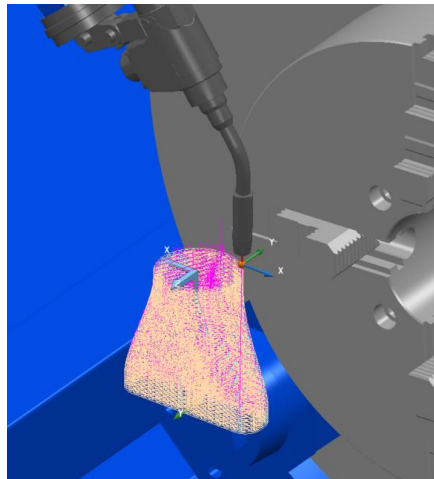
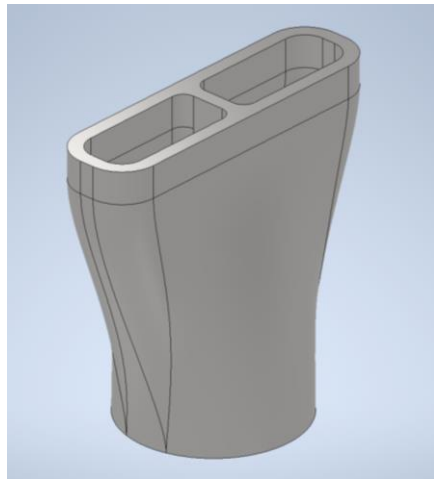
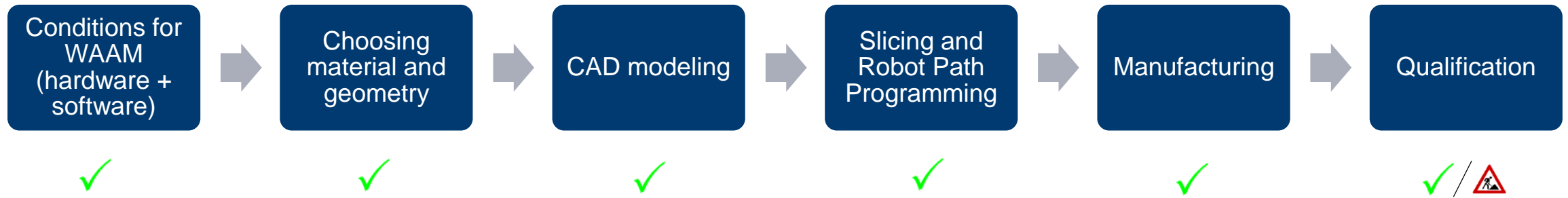


- What?
 - Wire and Arc Additive Manufacturing (WAAM)
 - Additive Manufacturing (3D printing) with robot welding equipment
 - Wire material is deposited layer-by-layer by MIG/MAG welding to build actual part
- Why?
 - To improve manufacturing capabilities
 - To remove manufacturing restrictions (time, price, geometry, location, human errors)
 - To research, what value can be added to customers by parts made by WAAM
 - **Leveraging from new technologies and AM revolution**

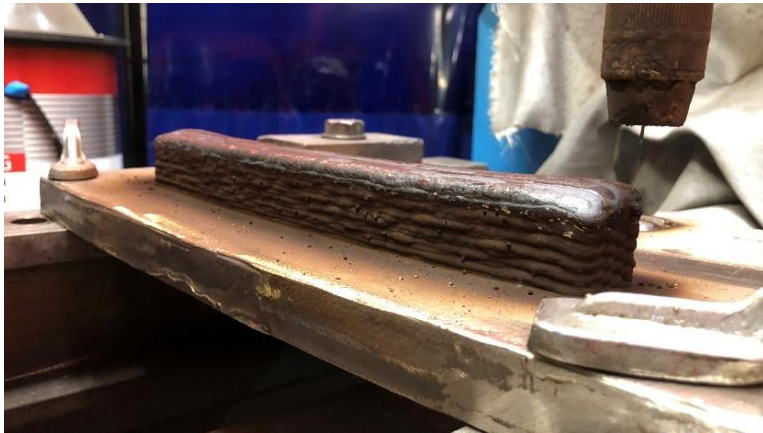


Ramlab WAAM propeller

ROADMAP



FIRST PRINT FOR MATERIAL TESTING



- Motivation: test piece for material testing
- Welded mass: ~17 kg
- Number of layers: 95



WEAR SLEEVE

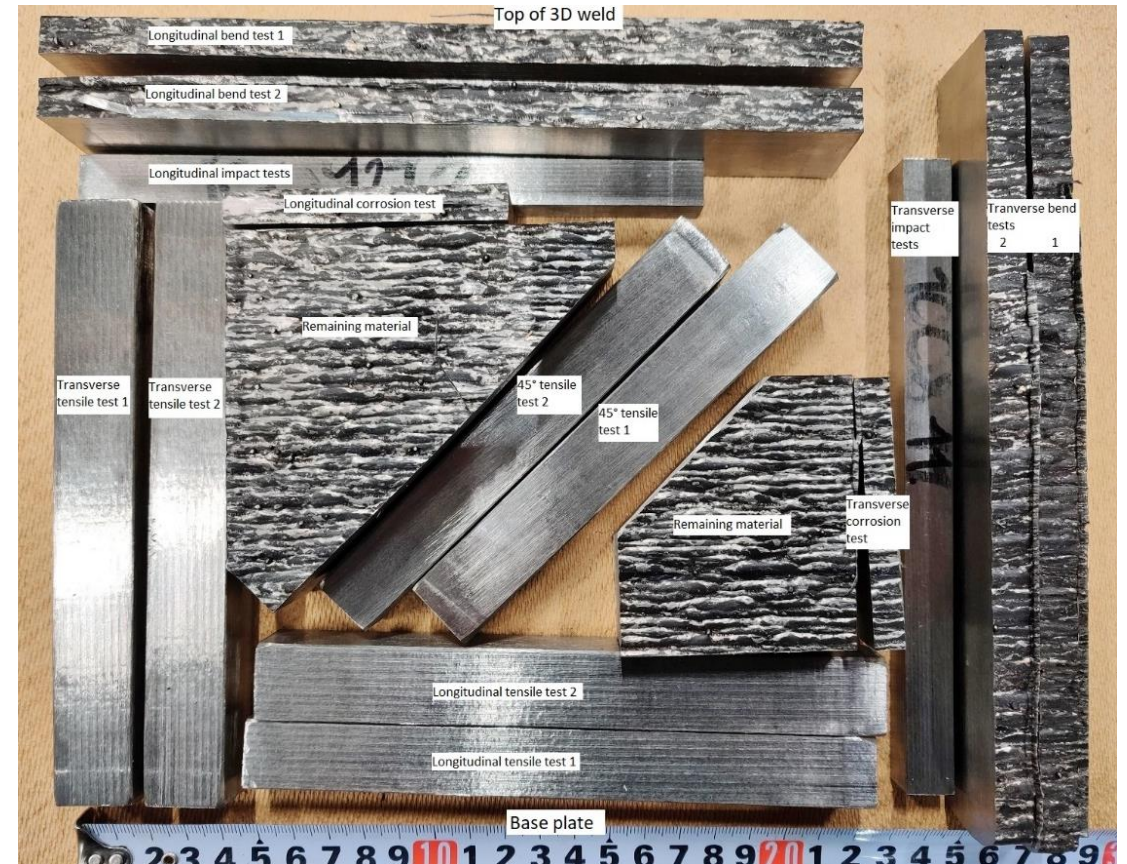


- Motivation: faster lead time for sleeves and testing for geometrical accuracy
- Welded mass: ~15 kg
- Number of layers: ~50

RESULTS - QUALITY



- Material tests for straight wall (NDT by Dekra, DT by Metlab)
 - PT: **passed**
 - RT: **passed**
 - Yield strength: **300-320 Mpa**
 - Ref value: 220
 - Ultimate strength: **590-620 MPa**
 - Ref value: 520-680
 - Impact strength: **80/120 J**
 - Ref value: 60/100
 - Bending tests: **passed**
 - Corrosion tests: **passed**



➤ As a conclusion: Quality and has been surprisingly good so far for 316L material

APPLICATIONS



Deutsche Bahn / Gefertec – Bearing cover



Andritz Hydro – Pelton runner



MX3D – Robot arm
and steel connector

POTENTIAL APPLICATIONS



- Whole parts made with WAAM
 - Need for short lead time
 - Better and optimized design
 - Hybrid materials
 - Challenge in finding suitable parts
- Repairs and claddings
 - More efficient material usage
 - Increasing automation
 - Hybrid materials
 - Combining 3D-scanning and AM



CONTACT INFORMATION



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