Rheinmetall Mobile Smart Factory® and IRIS®print

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RHEINMETALL

Agenda

IRIS print

Mobile Smart Factory

- Rheinmetall AG
  - AM @ Rheinmetall Landsysteme GmbH
    - AM in military logistics
    - Mobile Smart Factory®
    - IRIS®suite and IRIS®print
    - Use Cases
  - Outlook

Rheinmetall – Five divisions under one roof

RHEINMETALL AG

Vehicle Systems

- Tactical vehicles
- Logistic vehicles
- Turrets


Weapon and Ammunition

- Weapon systems and ammunition
- Protection systems
- Propulsion systems


Electronic Solutions

- Integrated electronic systems
- Air defence and radar systems
- Technical documentation
- Cyber Security


Sensors and Actuators

- Pump technology
- Actuators
- Automotive emission systems
- Solenoid valves
- Commercial diesel systems


Materials and Trade

- Trade
- Stock
- Castings (50:50 Joint Venture)


AM @ Rheinmetall Landsysteme GmbH

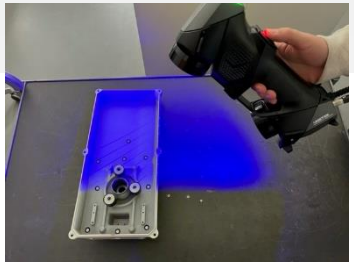
Research & Technology | Education & Training | Engineering & Manufacturing | Obsolescence management | Mobile Smart Factory® | Digital Service (IRIS®)

Fields of activity of Rheinmetall Landsysteme

EXAMPLES

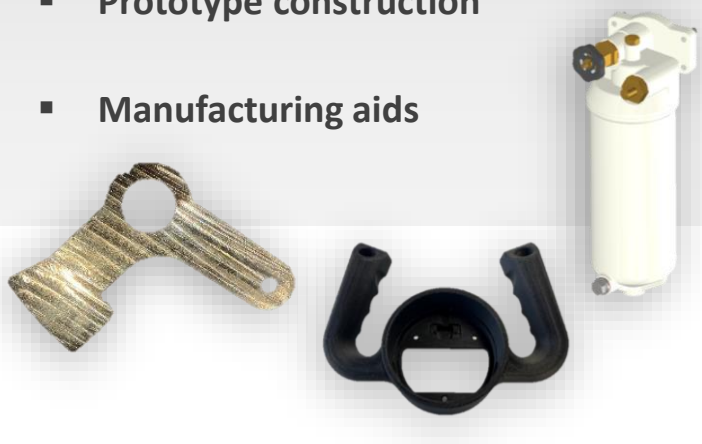
BASICS

- (Basic) research (e.g. with universities and institutes)
- Technology screening and evaluation
- Development of training and further education concepts



APPLICATION

- Obsolescence elimination of old systems
- Spare parts (new & old systems)
- Prototype construction
- Manufacturing aids



PRODUCTS

- Mobile Smart Factory®

- IRIS® Suite

Why should AM be used in military logistics?

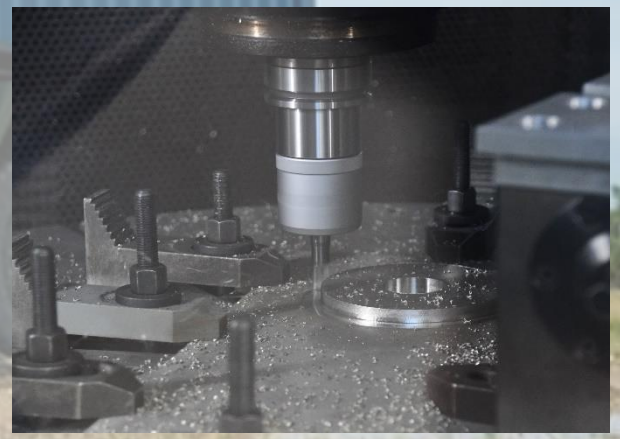
- Providing supplies in the first 24 hours of a mission and over the last 100 metres is a particular challenge
- To avoid long downtimes at all times, troop supply must integrate innovative solutions to support them
- Additive manufacturing technologies - stationary and mobile - can be deployed quickly and flexibly
- Spare parts are manufactured on demand and no longer need to be stored - this saves resources
- Battle damage repair often requires individual solutions, which can be realised through additive manufacturing

Mobile Smart Factory® (MSF) the innovative manufacturing technology

- Rapidly relocatable container factory, consisting of two 20-ft containers
- Covers the entire process chain - including selected pre- and post-processing - for use in battle damage repair
- Includes a 6-axis hybrid machine for additive (WAAM) and subtractive manufacturing
- Additionally equipped with two FDM printers, storage space, tools, IT workstation, hand scanner and much more

Mobile Smart Factory® (MSF) the innovative manufacturing technology

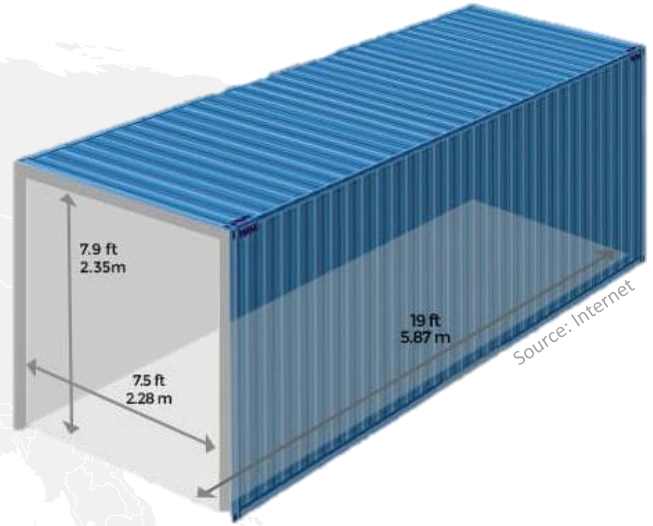
- Components up to a size of:
  - **WAAM:** Ø 500 mm x 450 mm
  - **FDM:** 300 mm x 200 mm x 270 mm
- Materials:
  - **WAAM:** steel & aluminium
  - **FDM:** PLA, PA6, TPU, ABS, PETG, etc.*
- Printing speed:
  - **WAAM:** up to 600 cm^3/h
  - **FDM:** 300 to 800 mm/s
- Connections:
  - **Electricity:** 63 A / 400 V & 32 A / 400 V
  - **Gas:** External inert gas supply (gas cylinders)



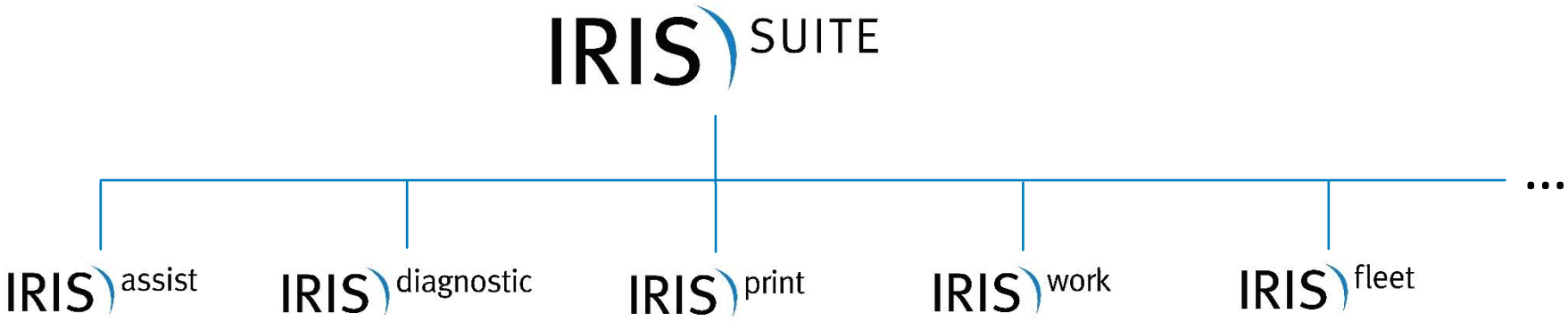
* Partly also with Mirco carbon fibre reinforcement

Challenges in container-based AM production

- Integration of the entire process chain in two 20-ft containers
- Including process preparation (IT workstation, scanner, etc.), work preparation, AM, milling, quality control and storage
- Integration of further peripherals such as switch cabinets, air conditioning, SEA, extraction, cooling, gas supply
- Compliance with occupational safety and CE regulations
- The hardware must meet military standards and function under extreme conditions
- Easy handling and operation by unskilled personnel



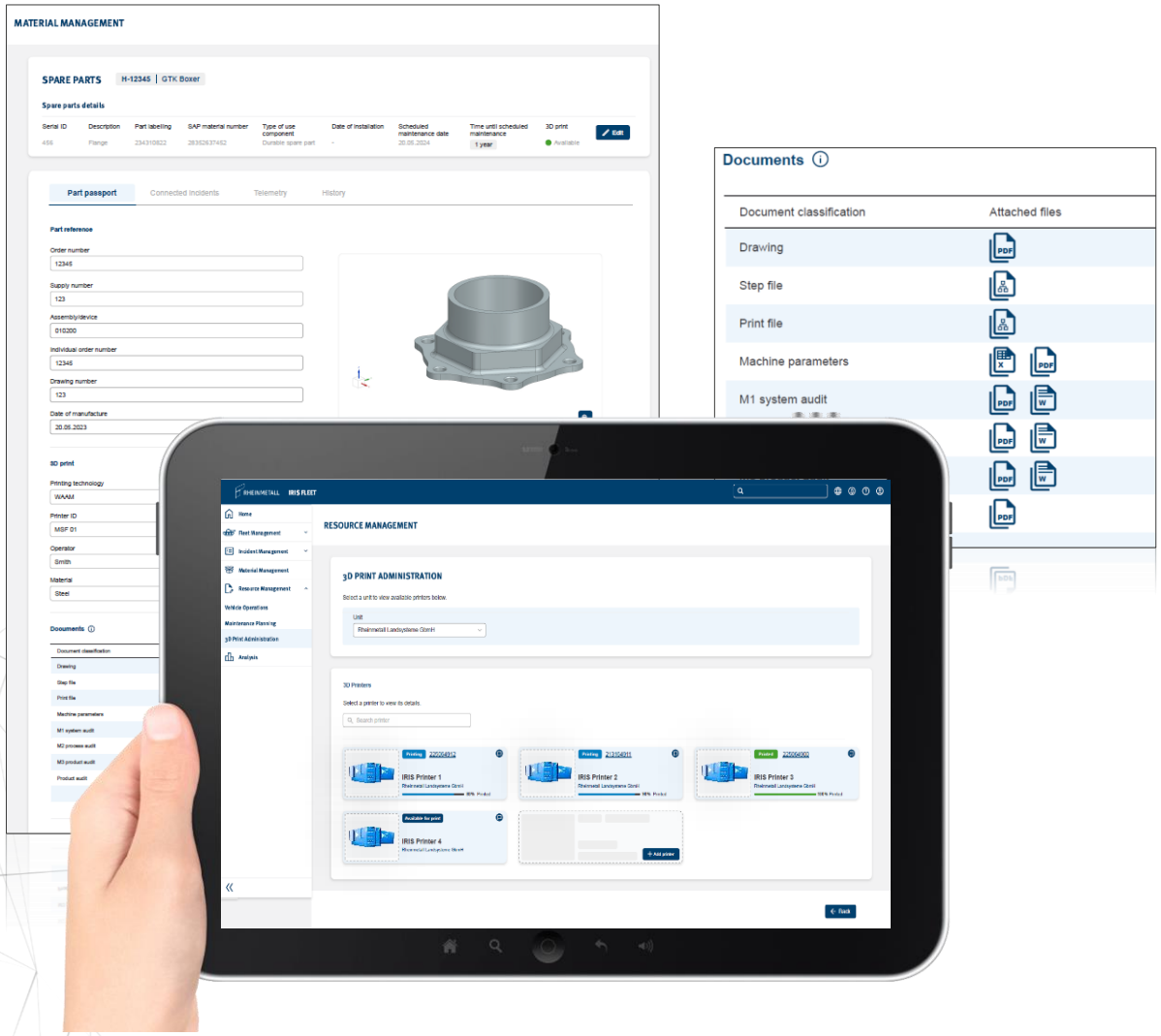
Software integration into the cloud-based IRIS®suite



- The IRIS®suite is a product family in an IT ecosystem to maximise the technical and economic effectiveness of maintenance processes
- The individual product modules enable maintenance and utilisation performance to work together without media discontinuity
- The backbone of the IT ecosystem is the developed IT platform IRIS®platform, which enables data processing up to classification level VS-NfD.

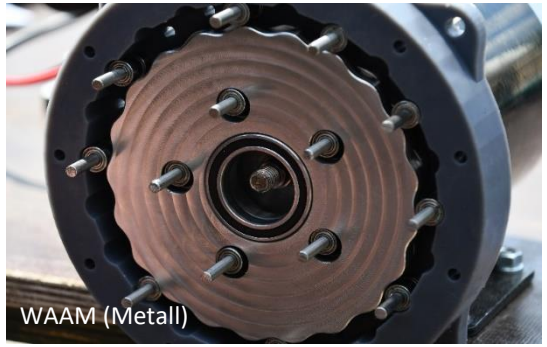
IRIS = Integrated Rheinmetall Information System

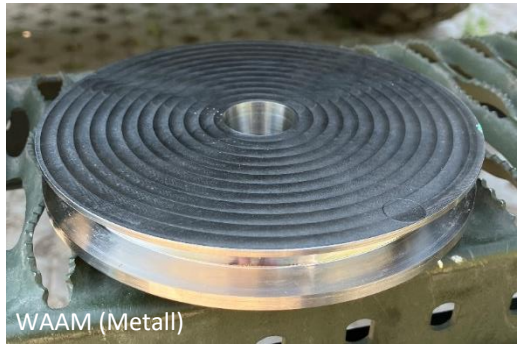
AM Management in the IRIS®print module

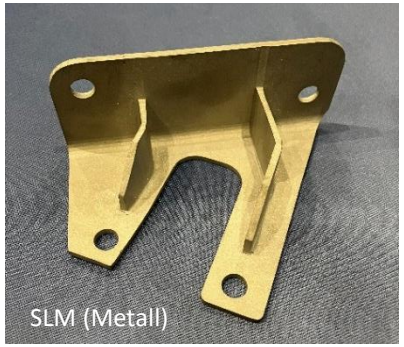


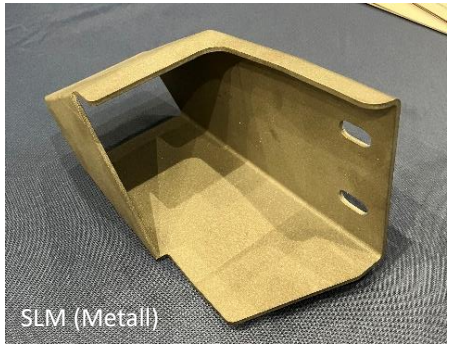
- Printer management and resource planning
- Component profile including all required production files
- Complete process documentation
- AM training content and system maintenance planning
- Can be used online and offline
- Continuous further development and updates

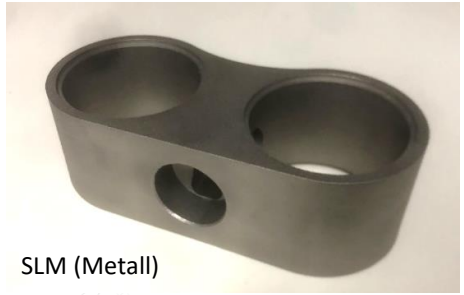
AM Use Cases

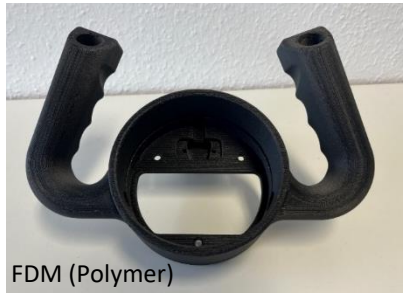


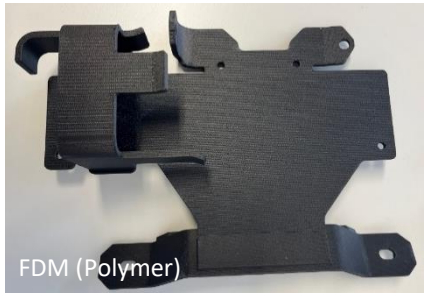


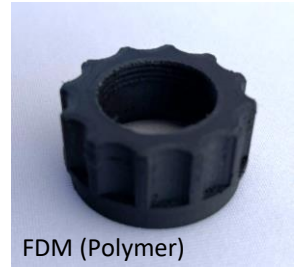


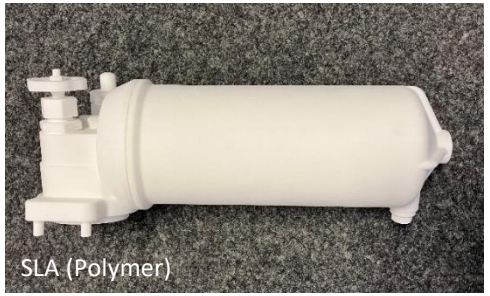


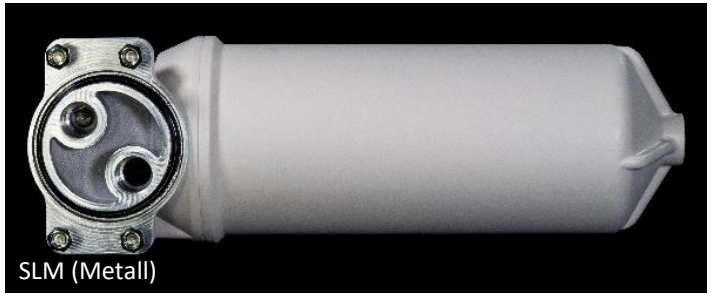












And many more...

Future-orientated development - MSF Next Generation

- MSF Next Generations
  - Further production technologies
  - Customer-specific customisations
- Augmented reality/virtual reality (AR/VR) applications for training, maintenance and support
- Integration of sensors and AI tools for process automation and monitoring
- and much more...

Think outside the box – print inside the box

3D MSF Mobile Smart Factory

Questions?

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TAKING RESPONSIBILITY IN A CHANGING WORLD