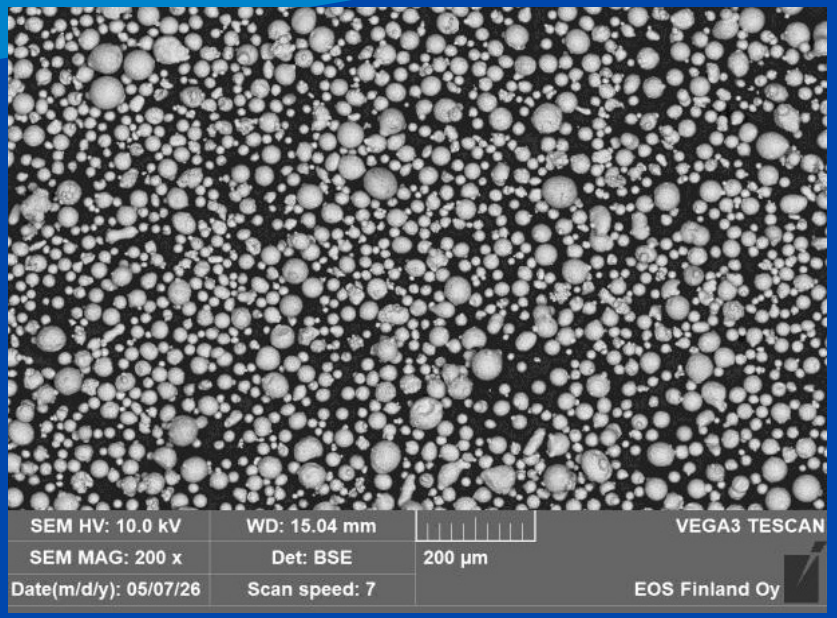
FAME Campus

Condition analysis of PBF-LB/M powder EOS MaragingSteel MS1 (18Ni300) after 50 build jobs and 1600 exposure hours



FAME

Finnish Additive Manufacturing Ecosystem

PUBLICATIONS 2

Condition analysis of PBF-LB/M powder EOS MaragingSteel MS1 (18Ni300) after 50 build jobs and 1600 exposure hours

FAME white paper
9.11.2026

Authors:

Antti Seppälä, Development Manager,
EOS Electro Optical Systems Finland Oy

Henri Ervasti, FAME Campus Facilitator,
Etteplan Oyj

Finnish Additive Manufacturing Ecosystem (FAME) is a professionally facilitated, business-driven and co-creative Additive Manufacturing ecosystem, established in 2020. FAME increases the role of additive manufacturing and brings together Finnish players in the field. FAME Ecosystem partners cover the entire value chain of additive manufacturing and has the Finnish top-know-how companies involved.

FOREWORD

Reliable industrial adoption of PBF-LB/M requires practical knowledge of how materials and processes behave over time. Powder reuse is an important part of this understanding as it affects material efficiency, production costs, and confidence in part quality.

At the Finnish Additive Manufacturing Ecosystem (FAME), we bring companies together and turn shared questions into useful knowledge. This white paper is a concrete example of that collaboration, combining operational experience from FAME Campus with the material expertise of EOS.

The study examines EOS MaragingSteel MS1 powder after 50 build jobs and approximately 1,600 hours of exposure, with fresh powder added during its service history. The results provide an encouraging picture of overall condition of the powder under the documented handling and storage practices.

For me, the value of this work lies in making practical experience available to the wider AM community. Sharing documented findings helps companies make better-informed decisions about powder management and identify where further verification is needed for their own applications.

I would like to thank Antti Seppälä and Henri Ervasti for their contribution to this publication, and everyone involved in the FAME Campus collaboration. I hope this white paper encourages further exchange of experience and supports the continued development of reliable, resource-efficient PBF-LB/M.

Markus Korpela
Senior Expert, DIMECC
Finnish Additive Manufacturing Ecosystem

CONTENTS

1. Scope and powder history

2. Results

3. Conclusions

SCOPE AND POWDER HISTORY

Purpose of the study is to evaluate the condition of used powder.

EOS MaragingSteel MS1 powder with following history was analyzed:

- Original batch: 200 kg
- 100 kg of more powder was added to the original batch gradually
- 50 build jobs in total, approximately 1600 h exposure time
- 50 sievings
- 90 kg of powder left after the builds (210 kg used)

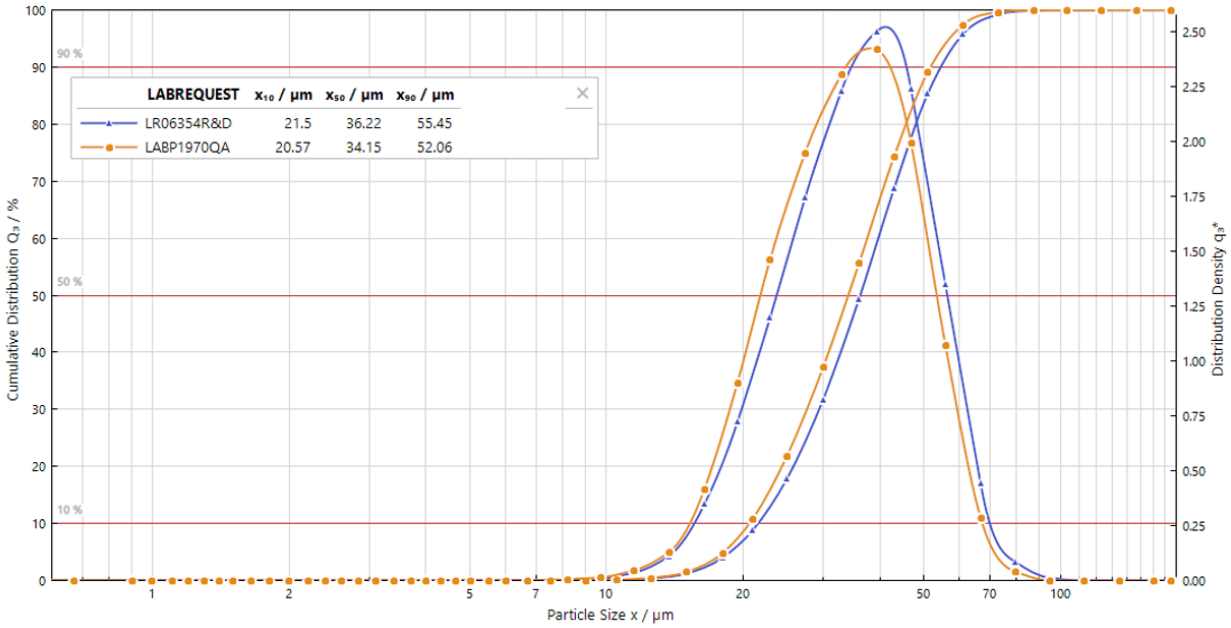
Test methods

• PSD, Laser diffraction	ISO 13320
• PSD, Dynamic image analysis	ISO 13322-2
• Apparent density	ASTM B212
• Powder Flow measurement	ASTM B213
• Moisture content	Coulometric KF titration
• Particle cross-cut analysis	Optical microscopy
• SEM overview	SEM

RESULTS

Laser Diffraction, Helos Rodos, ISO 13320

- Small shift to coarser from virgin sample, i.e. loss of fine particles
- Change insignificant to performance
- Used powder within new powder acceptance limits
- Orange line represents typical virgin powder, blue used

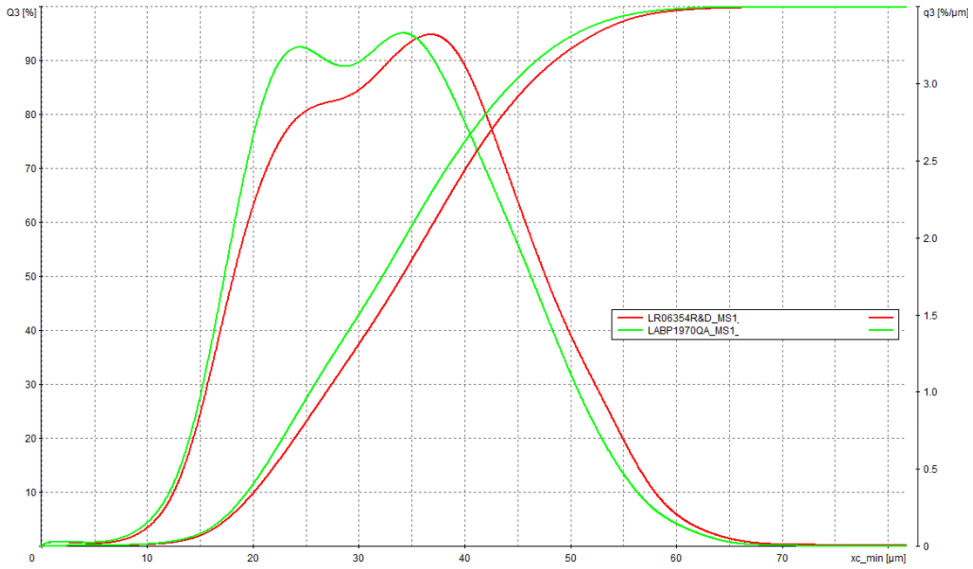


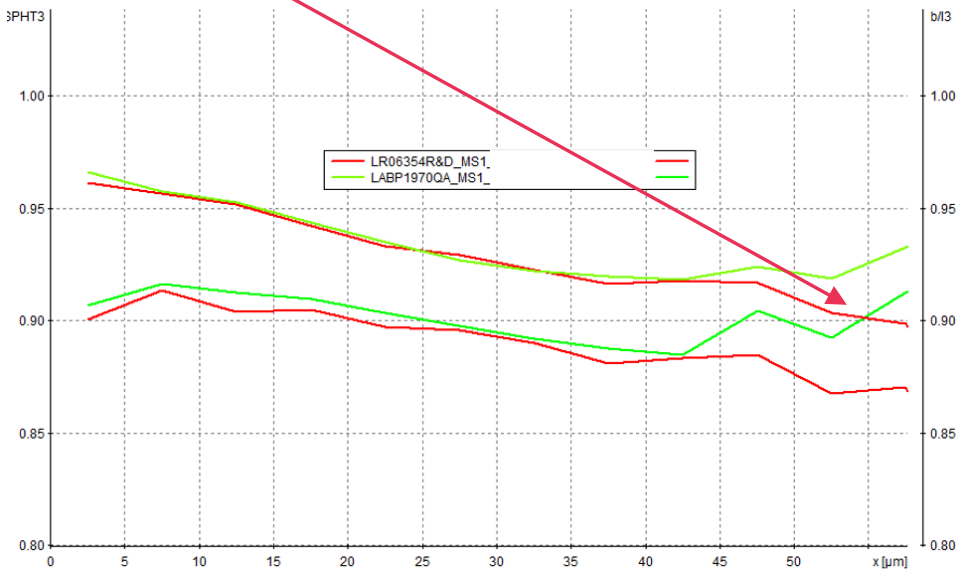
Dynamic Image analysis, Camsizer XT, ISO 13322-2

Small shift to coarser from virgin sample, i.e. loss of fine particles

- Green typical new powder, red used
- Change insignificant to performance
- Coarse particles less round in used powder
- SPHT3 = sphericity, B/l3 = aspect ratio

DIA	XCmin 10 [µm]	XCmin 50 [µm]	XCmin 90 [µm]
Used	20	34	48,5
New	19	34	52





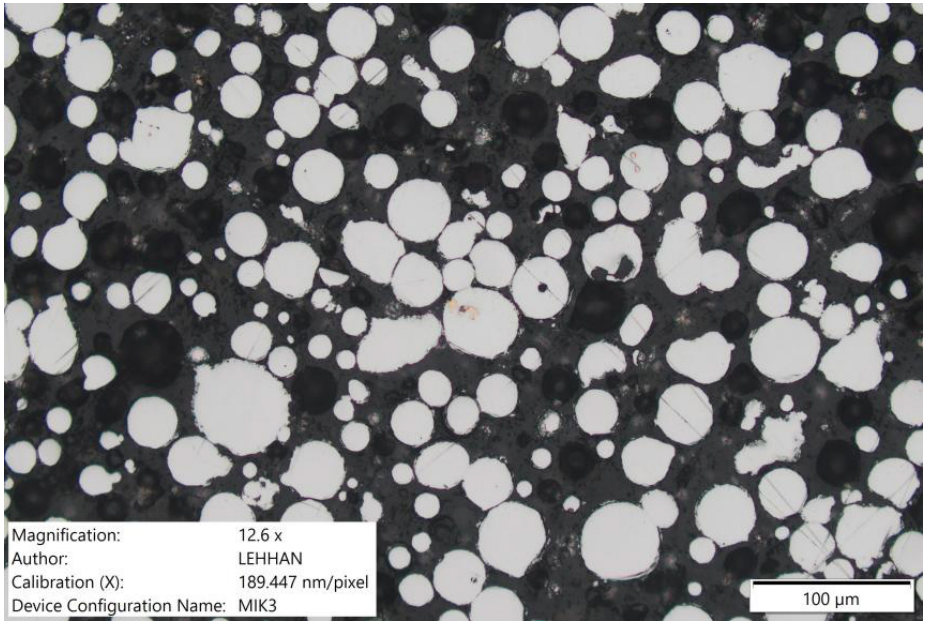
Measurement results

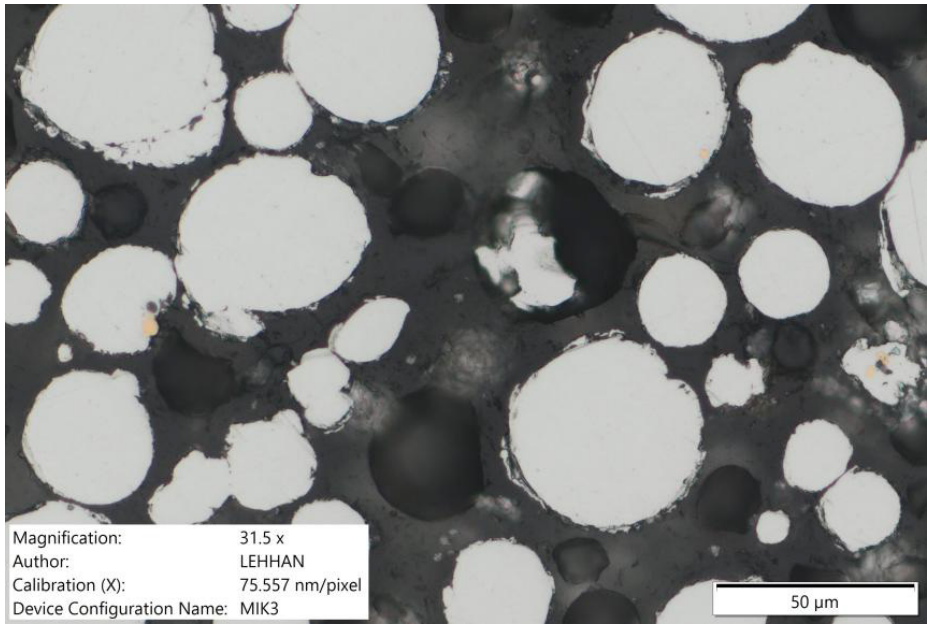
- No major changes in properties
- All within limits

	Method	Unit	Result Used	Result New typical	Limits
Apparent density	ASTM B212	[g/cc]	4.37	4.23	≥ 3.50
Hall Flow	ASTM B213	s/50g	14	14	n/a
Water content	Coulometric KF titration	[ppm]	14	19	≤ 41

Particle crosscut analysis

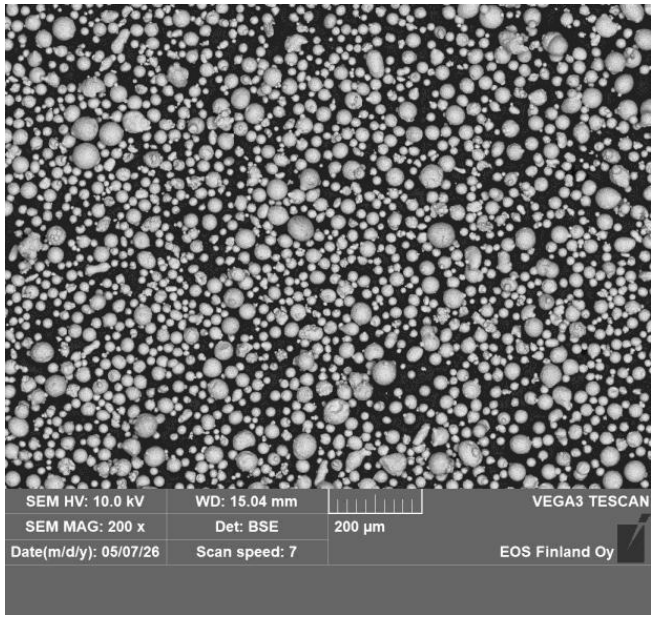
- Some Titanium-based (oxides and nitrides) inclusions found, amount higher than in virgin powder
- Form in melting under nitrogen environment with 0.1 % oxygen
- Cause slight deterioration of high cycle fatigue
- EOS ToolSteel 1.2709 uses argon process gas and 0,05 % oxygen to reduce inclusions in parts

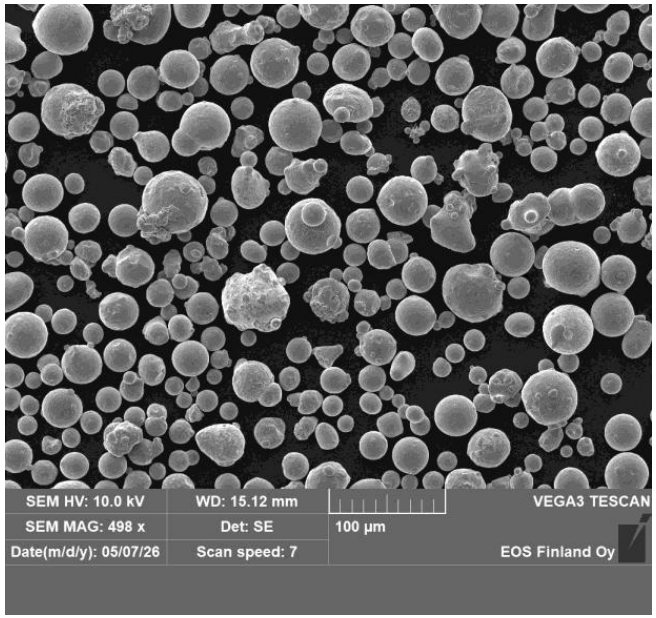


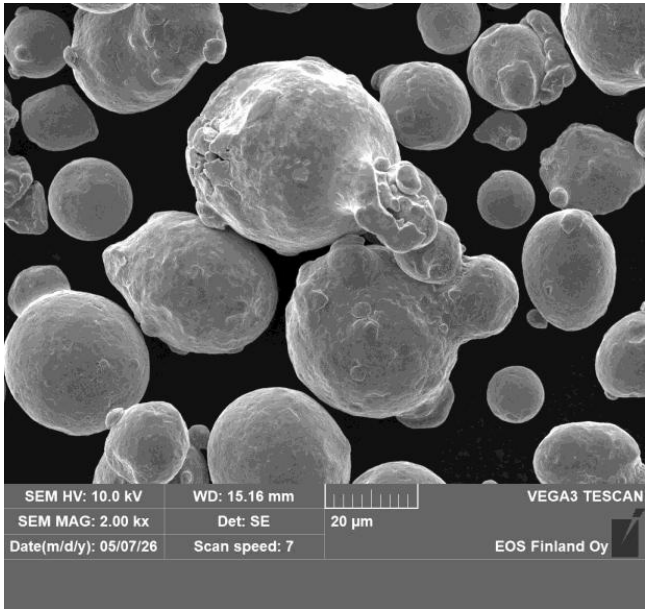


SEM overview

- No abnormal amount of agglomeration or oversized particles
- No foreign particles found
- --> Sieving process works

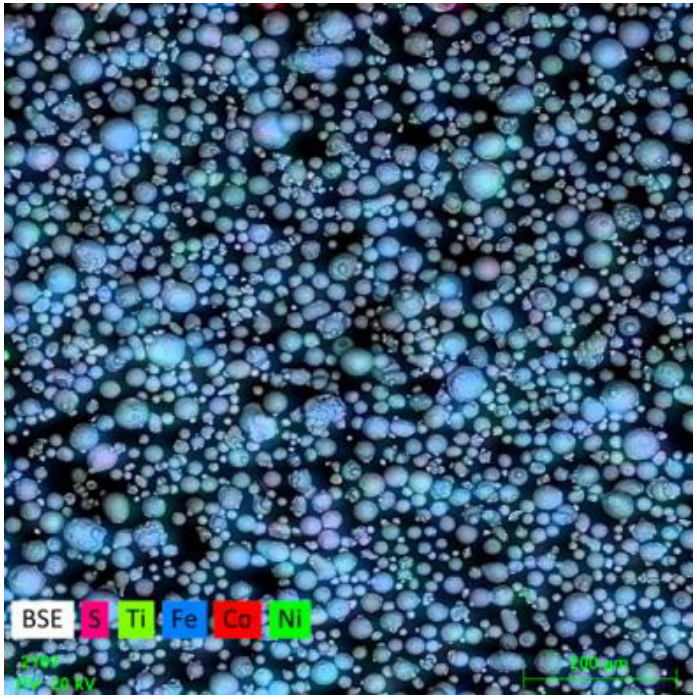


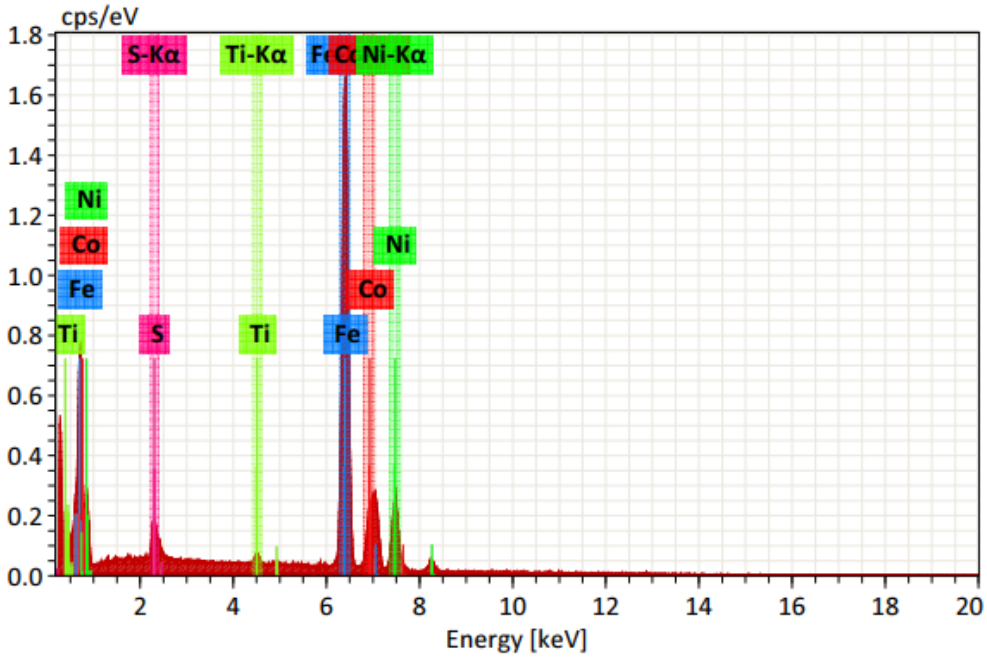




SEM EDS

- No clear contaminants found





CONCLUSIONS

- Powder condition is excellent
- Small shift to coarser distribution, as expected
- Flow in processing picks up small particles and they end up in filters and overflow bin, some can agglomerate to bigger particles when in contact with laser
- No abnormal contaminants found
- Some increase in titanium-based inclusion amount
- Sieving process works as expected and storage conditions have not changed powder