SFI METAL PRODUCTION

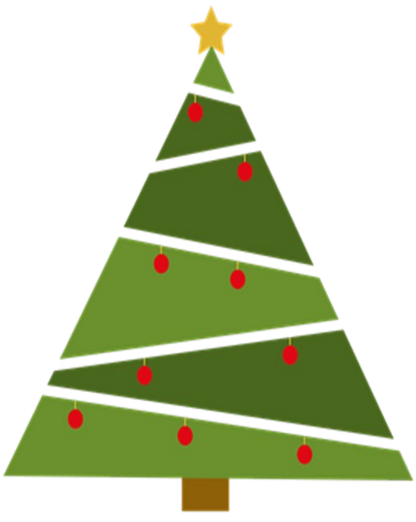
Newsletter No 2/20

2020 is coming to an end, and we would like to share some news with our partners in SFI Metal Production.

The SFI progress report for 2020 to the Research Council shows that the Centre continues to produce important results and progress in the field of metal production. In October RCN invited us to a (digital) site-visit, and we had the opportunity to present highlights and results from the last two years, both from the industry point of view and from academia. You can read more about this on page 2-4.

Some events have been cancelled or postponed this year but I am happy to see that despite the corona virus situation we have organized several courses and seminars this autumn. SFI Autumn meeting was held November 3-4. We would like to thank all speakers and the audience for making this an interesting and successful meeting. Most events this autumn have been online. In 2020 we have speedily broadened our digital competence and we have become very familiar with the webinar formats!

Thank you all SFI members for the collaboration throughout 2020. We are looking forward to continuing working together towards our common goals in 2021.



Merry Christmas &
Happy New Year!

Aud N. Wærnes,

Centre Director

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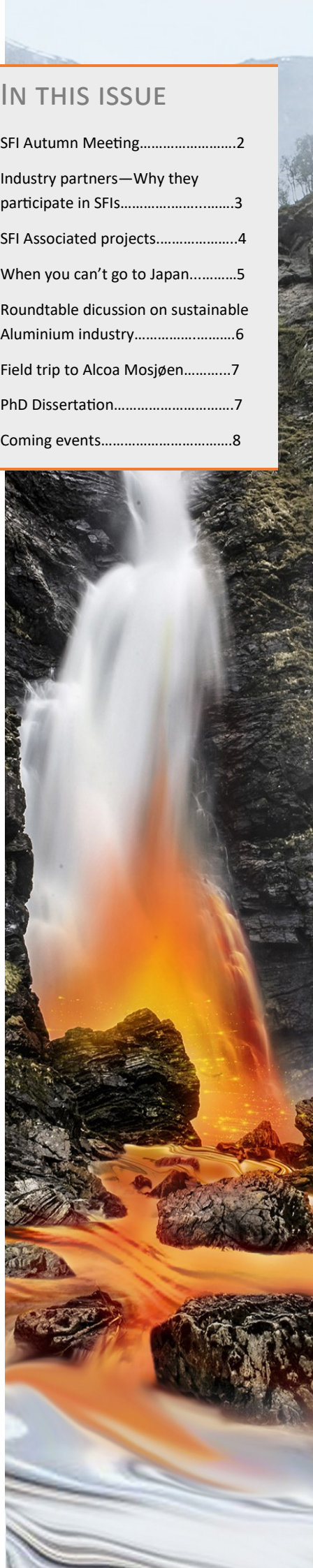


SFI AUTUMN MEETING—WEBINAR

November 3-4

The SFI Metal Production Autumn Meeting was organized as a webinar November 3-4. More than 70 participants from the SFI-partners attended. Participants from industry and academia enjoied interesting lectures and discussions.

A collection of the interesting presentations given during the SFI Autumn Meeting November 3-4.

Main topic on day one were *Process 21: Roadmap to zero emissions*. Process21 was started as a forum in 2018 based on the white paper about Norwegian industry in March 2017 (Meld. St. 27 (2016-2017)). Process21 shall give strategic advice and recommendations to the government and other actors on how to combine sustainable growth and reduced emissions from the process industry. Several experts committees have been working for the last two years to assess key topics related to reduced emissions and increased value creation. Leaders from three of the expert committees were invited to the SFI Autumn Meeting to present their main conclusions.

On day two of the Autumn Meeting scientific highlights from 2020 were presented. Important findings from seven different projects were presented and discussed, with focus on the ability to enable development and improvements in the prosess industry.

Next new technology development projects were presented by industry partners: Elkem's *Battery project,* Eramet's project *NewERA* and Hydro's *Aluminium Chloride Process*.

The Autumn Meeting closed with an interesting presentation about the ElMet project (Electrical conditions in Metal processes). Project leader Svenn Anton Halvorsen presented the main conlusions from the recently finalized project.

We would like to thank all speakers and the audience for making this an interesting and successful meeting.

The Autumn Meeting was followed by a SFI Board meeting and the yearly SFI General Assembly meeting.

Industry partners —

Why should they participate in SFIs?

At the digital site-visit with the Research Council of Norway in October Leader of the SFI Metal Production General Assembly, Benjamin Ravary, was asked to give his thoughts to the topic "Advantages and utility for the industry partners in Centres of Research-based Innovation (SFI)". Here are the main points from his presentation (the presentation was based on input from all industry partners at a strategy seminar in September 2020).

Building competence and knowledge

The size of the centre and the longterm commitment facilitate in-debth projects. Members from industry build competence and establish research groups within the core areas. Also the activities bring people together, from groups who normally would not easily meet or collaborate. The knowledge gained from the centre participation is implemented in the day to day decisions.

Networking

Participants in the SFI expand their network with people from academia, institutes and other industry members. The network is a significant resource for discussions and problem solving. Spring meeting, Autumn Meeting , seminars and webinars are important areas for networking.

Branding

Participation in an SFI gives a comparative advantage. The commitment to the SFI shows that we are innovative and willing to invest in knowledge building. Students that has visited industri partners (summer jobs , experiments etc) become good ambassadors for the industry.

Recruitment

We think SFI participation is a factor that motivates the employees. By choosing to be an SFI partner we recognize the need for new knowledge and give opportunity to be involved in innovation activities. When recruiting new people we present the advantages of participation.

Spin offs/Innovations

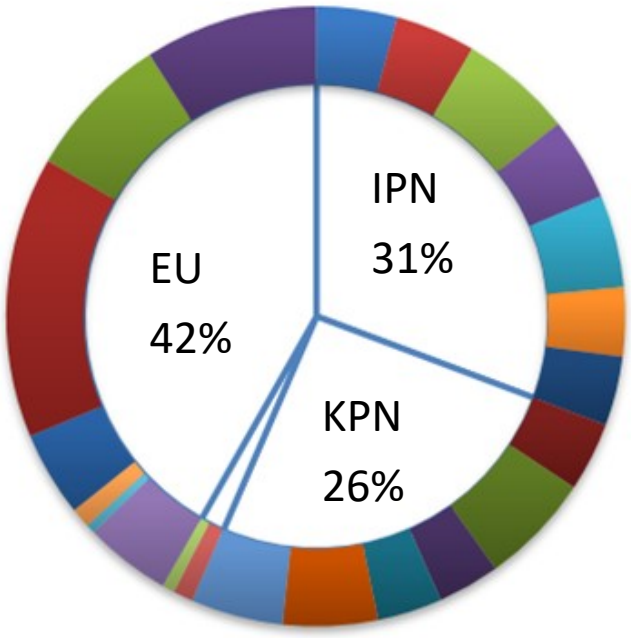
Results from the SFI are implemented in the industry. New ideas, new prosesses and new strategies has appeared as result of scientific findings in the

SFI Metal Production has 8 industry partners.

SFI Metal Production Asociated Projects

In the annual progress report as well as the site-visit to the Research Council of Norway the SFIs are asked to give a report on scientific projects that has appeared as a result of centre activities; associated projects. The list of associated projects from SFI Metal Production has become large during the centre periode. The projects are funded mainly from the Research Council of Norway and EU, and the total budget is 1144 MNOK. 14 large associated projects are listed below.

1. IPN Waste to Value
2. IPN-High-temp Quartz - Characterizing quartz properties predicting high temp. performance in production of ferrosilicon and silicon alloys
3. IPN-BEST - Al cast slab quality by Studying and Implementing Measures to reduce oxide- and carbide inclusions
4. IPN-SiNoCO2 - Silicon production with no CO2 emissions
5. IPN ENSENSE: Real-time Management of Industrial Fugitive Dust Emissions
6. IPN Alpakka - Circular Aluminium Packaging in Norway
7. IPN PAHssion - Industrial efforts towards zero emissions of PAH (polycyclic aromatic hydrocarbons)
8. IPN - BADELand – Recovery of valuable surplus bath components from Aluminium Electrolysis
9. KPN-BioCarbUp – Optimising the biocarbon value chain for sustainable metallurgical industry
10. KPN-CaRMa - Reactivity of Carbon and Refractory Materials used in Metals Production Technology
11. KPN-DeMaskUs- Generation, protection and health effects of nano-sized dust in the ferroalloy ind.
12. KPN ElMet - Electrical Conditions and their Process Interactions in High Temp. Metallurgical Reactors
13. KPN Controlled tapping
14. KPN Reduced CO2 Emissions



The figure shows associated projects with funding from the Research Council of Norway and EU. In total 1144 mill NOK.

When you can't go to Japan—go to Finnsnes!

Every 5-10 years NTNU professors are excused of their teaching duties and have the possibility to visit other universities, or cooperating partners, to gain insight. 2020 was the year that Professor Merete Tangstad planned to go to China and Japan to spend some time at University of Science and Technology Beijing and University of Tokyo. Read about Merete's experience with sabatical 2020, in her own words:

Sunset in FInnsnes. Merete wearing a (not covid related) facemask!

«As a subproject of the SFI Metal production, we are cooperating with University of Science and Technology Beijing and University of Tokyo. This is a part of the Intpart project Thanos, to strengthen the thermodynamic understanding and use in the metal producing processes. As for most people, also I had to reconsider my plans in 2020. According to national restrictions my plan was quickly changed to stay in Norway and I approached Finnfjord Smelteverk in late August. One week later I was travelling to Finnsnes and to Finsnes gård with their boathouses for rent!

The stay at Finnfjord Smelteverk for one month was a good and interesting experience in many levels. First, as a desktop scientist being in the real world with day-to-day issues, it was educational and gave a lot of insight in the operation. It also gave motivation to new research projects and activities.

As an example, we collected samples at the plant that we are now investigating at NTNU. We are also now proposing new projects partly based on the results obtained there.

Secondly, the whole plant was giving me a warm welcome. Operators, furnace managers and staff were all very helpful, and was always interested in discussing aspects of the operation.

In a busy month for the plant, it was good to be included in number of projects and activities of interest for the plant; from wood choppers to slag chemistry. The tappers were also helpful to extract samples from the furnace, even on a busy day.

Finally, Finnsnes, in beautiful Senja municipality, is a treat in September. Living in the boathouse with daily visits of cranes and other sea birds, looking over to the island Senja in sunsets, is like living at my summercabin at Frøya. Sightseeing at the island of Senja was also more interesting than Lofoten (sorry Karin Jusnes).

The stay at Finnfjord gave insight, was interesting and are close to most of the projects we are working on in Trondheim. **I would hence like to thank Finnfjord Smelteverk for their effort during my visit.** Hopefully it will not be 5-10 years until next opportunity.

PS. I was also going to visit Eramet Sauda in November, however at that time the Corona virus situation was getting worse and the trip had to be cancelled.

A Roundtable Discussion: Challenges for a Sustainable Aluminum Industry and Advice for the Next Generation

The discussions where conducted on-line and the technique are sometimes up-side down...

Do you wonder what five well-known specialists both from primary and secondary aluminium industry think are the most critical challenges and how we might face them? Then you should read the report from the discussion initiated by SFI RD leader Anne Kvithyld that is printed in the October issue of The Journal of The Minerals, Metals & Materials Society, JOM.

Five well-known specialists in the aluminum industry were invited to participate in the JOM panel discussion and comment on the most critical challenges for industry and what they would have liked to know when they started their careers. The highlights from the discussions have been summarised in the report. You will notice the more optimistic view from China than USA and Europe. And last but not least you will find out what people late in their carriers would have liked to know when they started.

The panellists were:
- Chris Bayliss, deputy secretary general at the International Aluminium Institute (U.K.)
- Gao Binliang, Professor at Northeastern University (China)
- Don Doutre, senior principal scientist, molten metal processing and recycling at Novelis Inc.(Canada)
- Stephen Lindsay, smelting specialist consultant at HATCH (USA)

The report is available online at the JOM website:
https://link.springer.com/article/10.1007/s11837-020-04354-7

Field trip to Alcoa Mosjøen

As part of the kick-off for our new students working on aluminium, a field trip to Alcoa Mosjøen was arranged in October. As some of the older students for various reasons had not visited a smelter before, the delegation was extended to 2 MSc students, 3 PhD students and 2 Associate Professors.

Nina Helene Omdahl and Martin Grimstad from Alcoa guided the visitors.

Guided by Nina Helene Omdahl and Martin Grimstad, we were given a detailed tour in potrooms, where all of the operations on a pot – including startup of a new pot were seen. Following the potroom, we were given a guided tour of the casthouse, allowing us to see the full production from alumina to metal slab. Results from the last year and plans ahead were presented, followed by good discussions with representatives from Alcoa Mosjøen.

Current activities and new suggestions from industry will be followed up by our students, aiming to gain further knowledge of the aluminum smelting process.

PhD Dissertation – Sethulakshmy Jayakumari

Congratulations to Dr Sethulakshmy Jayakumari who successfully defended her thesis September 10th. Sethulakshmy did an excellent presentation of the trial lecture: “Production of Mn by electrolyses – state of the art and future prospects” followed by the presentation of her PhD thesis “Formation and characterization of β-and α-Silicon Carbide produced during Silicon/Ferrosilicon process”.

Jayakumari has done her PhD work in the SFI Metal Production research domain “Primary Metal Production”.

In her PhD she studied the transformation of carbon to β- SiC and then the transformation α-SiC. The main findings are that the SiC formation transform directly through the solid carbon, but that it also can be produced through a gas/gas reactions and produce a solid SiC on the surface of the carbon materials. She also verified the production of elemental silicon in SiC at temperatures substantially lower than reference temperature of 1800 C.
Professor Merete Tangstad has been the candidate’s supervisor and senior research scientist Eli Ringdalen, SINTEF Industry, has been the candidate’s co-supervisor.

Sethulakshmy is now working as researcher at SINTEF. **Congratulations Sethu!**

Important events next year

December 15-16, 2020 Industrikonferansen i Bodø. Digital conference.

January-June, 2021 SFI Metal Production Webinar series. 45-minutes presentations on the topics Silicon, Manganese and Aluminium. Every second week.

April 20-21, 2021 SFI Metal Procuction Spring Meeting 2021.

April 21, 2021 SFI Metal Production Executive Committee Meeting.

April 22, 2021 Dross seminar 09:00-13:30.

June 6-9, 2021 NFACON XVI Conference, Trondheim/online.

metal production

sfi Senter for forskningsdrevet innovasjon

Norges forskningsråd

Center Director

Aud Nina Wærnes

Senior business developer,
SINTEF Industry

Cell: +47 930 59 428

Mail: Aud.N.Warnes@sintef.no

Executive Committee

Tor Grande, NTNU (Leader)

Nancy J. Holt, Hydro

Ketil Rye, Alcoa

Benjamin Ravary, Eramet

Marit Dolmen, Elkem

Eli Aamot, SINTEF Industri

Svenn Anton Halvorsen, NORCE

Tor Einar Johnsen, NFR

SFI Metal Production

NTNU Gløshaugen

Alfred Getz' vei 2

NO-7491 Trondheim

Norway

www.ntnu.edu/metpro

Twitter: @sfimetprod