Skisser med relevans innenfor

Annen teknologi

Tabell: Oversikt over skisser med relevans for området **Annen teknologi**

Prosjekt-nummer	Prosjekttittel	Søkerinstitusjon	Prosjektleder	Estimert søkt beløp fra NFR
316454	Powder technology: complete production chain from powder production through additive manufacturing to mechanical testing	UiA (Mechatronics Innovation Lab (MIL))	Geir Grasmo	136 900 000
316498	Infrastructure for the Digitalisation of Process Industry	SINTEF AS (USN, NORCE, Nofima, UiA)	Frode Brakstad	147 260 000
316535	Transition to Sustainable Resource Efficiency in Metal Production and Recycling (TEMP)	STIFTELSEN SINTEF (NTNU)	Nina Dahl	67 500 000
316552	Fiber & Steel ropes testing	NORCE (UiA, MIL)	Ellen Marie Nordgård-Hansen	35 000 000
316601	MaTRLaboratory – Material Test and Recycle laboratory	UiT (SINTEF)	Leif-Gunnar Hanssen	46 000 000
316602	Norwegian Manufacturing Research Laboratory Phase 2	NTNU (SINTEF)	Kristian Martinsen	108 000 000
316611	National Battery Development and Test Lab	SINTEF AS (NTNU, SINTEF Energy, FREYR)	Paul Inge Dahl	140 000 000

Project number: 316454
Title: Powder technology: complete production chain from powder production through additive manufacturing to mechanical testing
Applicant (partners): UiA (Mechatronics Innovation Lab (MIL))
Project Manager: Geir Grasmo

Short summary:
The roadmap for research infrastructure mentions need for research centres that can accommodate a complete value chain from basic fabrication of specific materials up to the production of prototypes. (s 34 https://www.forskningsradet.no/siteassets/publikasjoner/1254034464860.pdf) This project aims on developing such a research centre for metallurgical powder technology.

UiA and MIL are partners within the Future Materials Norwegian Catapult Centre, https://www.futurematerials.no/eng/about/. The Catapult Centres are established to accelerate the process from concept to market launch of the product, but they have broader scopes and focus on the implementation and application steps.

In this project we are aiming to upgrade the UiA research facilities in order to establish a national level research infrastructure for R&D and testing of the whole production chain from powder production to component prototypes of metallurgical materials. This will support the creation of a core, university-based research activity independent of the commercial interest involved in Future Materials, thus providing a platform for developing novel solutions and thus supporting the innovation both regionally and nationwide. The research infrastructure will be improved to a high enough level to facilitate seamless cooperation with the most advanced scientific research groups in Norway and abroad. The centre shall complement our existing catapult centre with more laboratory scaled R&D equipment.

Project number: 316498
Title: Infrastructure for the Digitalisation of Process Industry
Applicant (partners): SINTEF AS (USN, NORCE, Nofima, UiA)
Project Manager: Frode Brakstad

Short summary:
The INDIGO infrastructure will unite interdisciplinary competence in digitalisation and industrial processing, to build a national infrastructure that enables advances in land-based process digitalisation, including research in novel robust sensor technology and advanced analytics and modelling. This research will be supported by an advanced e-infrastructure that allows large-scale testing of technology and online process characterisation, including data visualisation, management and security.

Why digitalise? There is undoubtedly an international drive for digitalisation in the process industry, as seen by the number of white papers and reports 1,2,3,4,5. Digitalisation, which includes smart sensors, Artificial Intelligence (AI), Machine Learning (ML), Big Data, the Internet of Things (IoT) and Autonomous Systems, gives the potential for:

- Optimisation of recipe specification and raw materials feedstock into the processes and formulations

- Improvements to process control, resolution of quality issues, and equipment failure prediction
- Increased throughput, boosted yield and reduction of energy use x Improved exploitation of food raw materials and less food waste
- Process insight generation through online data and analytics

The vision of process digitalisation and the potential benefits is more or less adapted by the process industry. It is, however, a vision that is hampered by challenges, and requires a new way of researching and developing. INDIGO will address the challenges several industry sectors face when progressing to digitalised processes. One of the main critical pillars of digitalisation is the online data, often generated by sensors that link the physical data to the process analytics. Chemical and metallurgical processes expose sensors to harsh environments such as high acidity, high temperature, high magnetic fields, and scaling damage. The food industry struggles with natural variation of raw materials, seasonal variation, and hygiene constraints, and the challenge of obtaining reliable quality measures of highly heterogeneous biomaterials. The simple fact is that many of these challenges become evident over time and are not addressed by short term testing and demonstrations. The ability to conduct long-term testing in real online environments, with advanced analytics of large datasets, combined with theoretical models of the process, will open up a new form of research in digitalisation that will enable different sectors to benefit from each other.

Project number: 316535
Title: Transition to Sustainable Resource Efficiency in Metal Production and Recycling (TEMP)
Applicant (partners): STIFTELSEN SINTEF (NTNU)
Project Manager: Nina Dahl

Short summary:
Norway has broad and diverse industrial production of metals. However, to reach the objectives of sustainable future metal production with zero net greenhouse gas emissions, improved energy efficiency and better utilisation of primary and recycled materials, advanced research infrastructure is required. The applied infrastructure intends to supplement existing infrastructure to cover the complete research value chain in the transition to more sustainable metals production and recycling methods. It is expected that the infrastructure will be attractive to both Norwegian as well as international projects. To achieve these goals, the application focuses on three main, interconnected areas important in metal production: 1. Hydrometallurgical processing, covering extraction and separation from primary ores as well as secondary sources including recycling of complex metal compounds and alloys 2. Electrometallurgical processing, both aqueous and molten salt and molten oxide electrolysis and developments within cell and electrode materials 3. Pyrometallurgical processing, including new and more environmentally friendly solutions with less use of fossil-based reduction materials, increased raw material utilisation and use of secondary raw material.

Metal production, based on primary as well as secondary raw materials, often requires combinations of these three areas, supporting the holistic approach of this infrastructure application. The infrastructure will support new developments and improvements in existing metal production as well as facilitate new industrial metal production. The expected contributions from the new infrastructure is: x Replace or reduce the use non-renewable fossil materials as coal and coke with biobased

materials or climate neutral reduction agents such as hydrogen x Significantly increase recycling of complex metal compounds and alloys and metal wastes to reduce exploitation of natural resources x Significantly increase the utilisation of mined ores in metal production (or other applications) x Much higher utilisation of process wastes, including fumes, slags, dilute solutions, etc.

The overall goal of the infrastructure application is to establish generic equipment set-ups covering all key processing stages to enable more efficient research and technology developments up to TRL4 – TRL5.

Project number: 316552
Title: Fiber & Steel ropes testing
Applicant (partners): NORCE (UiA, MIL)
Project Manager: Ellen Marie Nordgård-Hansen

Short summary:
Currently, there is a trend for replacing traditional steel wire ropes with light-weight fiber ropes in several industries important for Norway, such as offshore oil and gas (lifting and mooring), deep sea mining (hoisting), and offshore wind power (mooring). NORCE and UiA have over the last years focused strongly on industrial research for condition monitoring and condition-based maintenance. To establish reliable discard criteria and make good predictions about incipient failures and remaining useful life, measurements are combined with verifiable mathematical models for fault development. For modern materials like synthetic fiber ropes, a large knowledge gap exists, compared to the decades of test results and verified theories available for metal fatigue. The present proposal will focus on closing this gap using a systematic approach for the load cycle testing, combined with modern sensor technology and analytical methods. Establishing science-based discard criteria will benefit both the manufacturers and the end users, improving new designs and saving money while still operating within safe operational limits.

We therefore propose to extend the existing rope testing infrastructure in Agder with the world's most advanced kind of rope test fatigue machine. Most rope testing facilities, in Norway as well as abroad, perform fatigue testing until destruction, and may thereafter perform a repetition of the experiment using a reduced number of cycles and then inspect the rope visually or break the rope in a tension test. This is a slow and uncertain method, since the test must be repeated, each time performed with a different specimen.

Our idea is to establish an integrated rope testing assembly comprising: 1) a large machine for fatigue bending tests, where the rope goes over five sheaves in succession. 2) the machine will be instrumented with a range of technologies to collect different information during the test process related to load cycles, tension, elongation, temperature, and thermal & RGB images. 3) the assembly will be complimented with a High Processing unit for: a) deploying real-time data management tools (i.e. storage, access, categorization) and, b) hosting real-time analytics tools (e.g. analysis models based on physical properties, multivariate analysis of the visual and thermal images1,, computer vision for condition monitoring2, AI models for life-time prediction).

Project number: 316601
Title: MaTRLaboratory – Material Test and Recycle laboratory
Applicant (partners): UiT (SINTEF)
Project Manager: Leif-Gunnar Hanssen

Short summary:
UiT - The Arctic University of Norway Institute for Construction, Energy and Materials has a concrete and material laboratory at campus Narvik. The Laboratory has facilities for research and testing within concrete and materials. The laboratory offers today additional test and certification services for the industry in the North.

The Department of Construction, Energy and Materials (IBEM) has developed an increased portfolio of research projects related to the area where there is close collaboration with Sintef and actors from industry and SME's. This has resulted in the strengthening of the laboratory through the purchase of advanced research equipment that benefits the ongoing research and the student work. Upgrading the existing staff and employed new researcher's.

Due to research, business and government's feedback, UiT plan to further develop the concrete and materials laboratory with facilities and equipment directly against the challenges posed by coastal development, recycling and reuse. Expanding the lab with a long term durability test facility and corresponding material test equipment in a cold climate chamber.

The MaTRLaboratory established in Narvik v. UIT for long-term testing and research on materials in harsh conditions (wind, ice, tide/spring, salt, corrosion, etc.) and with a satellite at UNIS for additional long-term durability testing in relation to cold, ice.

Project number: 316602
Title: Norwegian Manufacturing Research Laboratory Phase 2
Applicant (partners): NTNU (SINTEF)
Project Manager: Kristian Martinsen

Short summary:
Norwegian Manufacturing Research Laboratory (project #269898) MANULAB is a national infrastructure for manufacturing research. MANULAB aims at creating an infrastructure capable of performing cutting edge research with state-of-the art equipment, and to support the Norwegian manufacturing industry to increase its global competitiveness and sustainability. Partners are; Norwegian University of Science and Technology (NTNU), SINTEF Industry and SINTEF Manufacturing AS. NTNU is project coordinator and professor dr.ing. Kristian Martinsen is the project manager. MANULAB is currently funded by 78 MNOK from the Norwegian Research Council. This draft proposal is for the second phase of MANULAB, based on the original MANULAB proposal, although there are updates from the original proposal given changes in the needs and the research state-of-the art. We claim this equipment is necessary to achieve the complete MANULAB concept as described in the original proposal. With three partners and four geographical nodes the current phase 1 might be under critical mass. The phase 2 equipment will complement the phase 1 equipment in the following laboratory nodes; The Wireless sensor systems lab, the Additive Manufacturing (AM) lab, the Industry 4.0 lab, NAPIC one-piece flow aluminium forming line, IDEALAB for product and process development, Laser robotic welding lab, AMT SLM and The Gleeble thermomechanical testing machine. In addition, there will four new laboratory nodes; The polymer lab, the Nano AM lab, the

Nano CT lab and the ceramics AM laboratory. These four new sub-laboratories mean that MANULAB will widen the scope to a fully multimaterial national research infrastructure, where metals, polymers and ceramics are included. Furthermore, MANULAB phase 2 will introduce nanoscale manufacturing with the nano-AM laboratory and the nanoscale Computed Tomography X-ray laboratory (CT).

Project number: 316611
Title: National Battery Development and Test Lab
Applicant (partners): SINTEF AS (NTNU, SINTEF Energy, FREYR)
Project Manager: Paul Inge Dahl

Short summary:
Through the National Battery Development and Test Lab (BATTLAB), SINTEF and NTNU aim to link the proposed Norwegian research infrastructure to emerging industrial initiatives in the field of batteries. The foundation for the infrastructure is based on a battery production concept line to be applied for; i) investigation and optimization of various battery chemistries, ii) validation of battery materials from providers, iii) evaluation of various battery cell concepts, iv) variation of battery production processes, and v) prototyping of batteries produced from the beforementioned points (i-iv) or combination thereof.
The concept line will be implemented directly at an industrial site in Mo Industripark by SINTEF and FREYR, an emerging company with intentions to build up battery production facilities in 3 levels in Mo i Rana; Concept line(s), 2 GWh brownfield factory, 32 GWh greenfield factory. Both SINTEF and FREYR have established premises in Mo i Rana, in close vicinity to Mo Industripark. The concept line will provide access for both industry partners and the R&D community.
The proposed infrastructure links the concept line (Node 1) to more fundamental battery chemistry research on material development, characterization/validation (Node 2), battery electrode design and production process optimizations (Node 3), investigation of battery and durability, including thermal management, degradation mechanisms, lifetime prediction and post-mortem analysis (Node 4), as well as advanced battery cell/pack testing, including battery management systems (BMS) (Node 5). Through this approach the whole "R&D value chain" from academia, via research institutes to industry is covered.