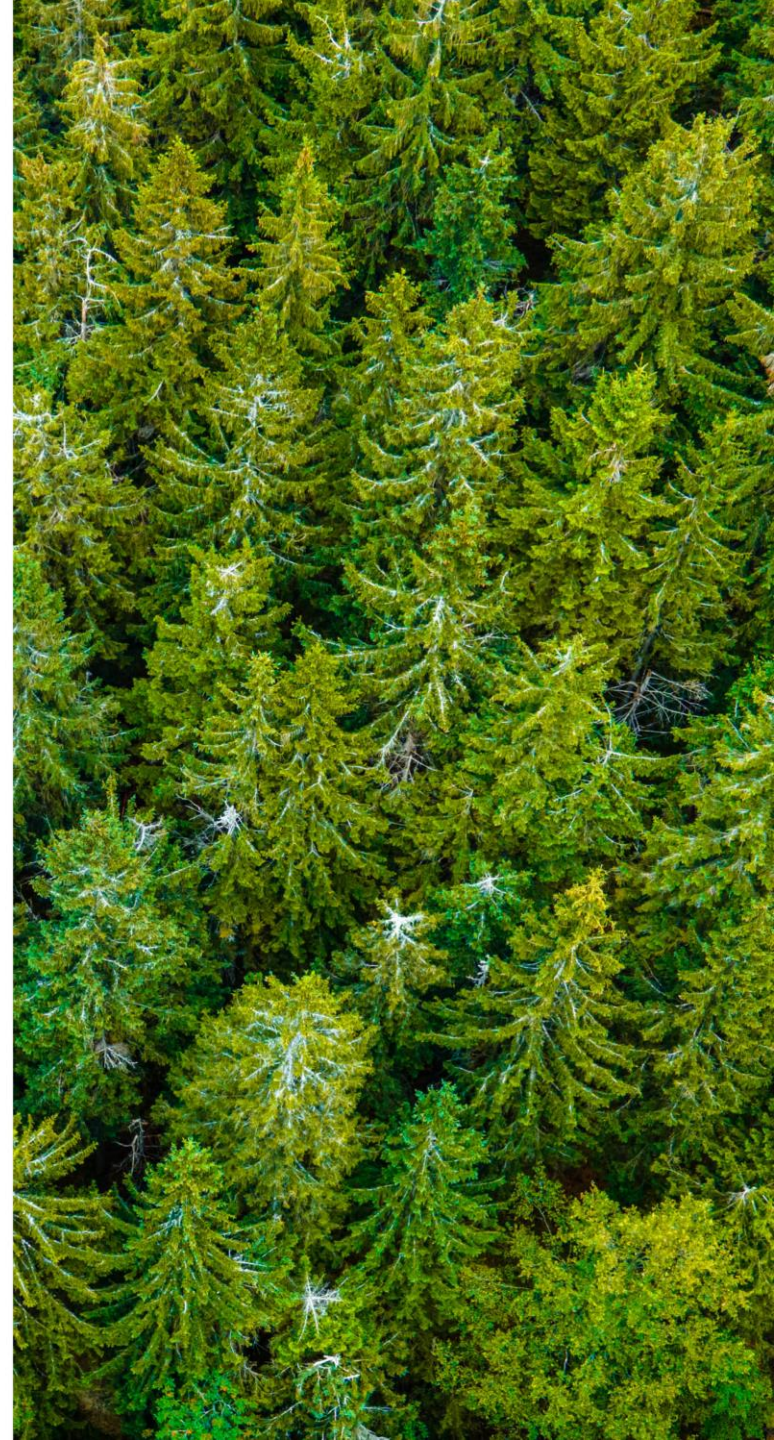




SIE Sustainable Industry Ecosystem



Catalogue of Pilot Lines and Green & Digital Tools

What are Pilot Lines and Green & Digital Tools?

- Pilot Line is a pre-commercial ('test before invest') production or prototyping environment, physical or virtual that enables learning through experimentation in new product, service and business development
- Green & Digital Tools are tools and services that enable, accelerate and promote information-based innovation & sustainability in the energy and manufacturing industries

Background

- Catalogue of Pilot Lines and Green & Digital Tools contains nationally collected and voluntarily reported Pilot Lines and Green & Digital Tools
- Pilot Lines and Green & Digital Tools are available for customers with certain prerequisites
- Current version of the catalogue has been published 8.12.2022
- Project has received funding from the Finnish Academy of Science research and innovation programme under grant agreement No. 337722

How to use the catalogue?

- **Description** describes what the pilot line or green & digital tool is for, and what is possible to accomplish with it
- **Benefits** describes how the customer is able to utilize the pilot line or green & digital tool, and the key benefits generated to the customer
- **Type of the Pilot Line/Green and Digital Tool** describes how the pilot line or green & digital tool is offered to the customer (e.g. as a technology, as a solution or as a service)
- **Prerequisites for use** describes what kinds of specific prerequisites are needed from a customer to utilize the pilot line or green & digital tool
- **Contact information** for the owner and/or person responsible for the pilot line or green & digital tool
- **Links** to the pilot line's or green & digital tools' website for additional information

Laser Micro Machining

Description

Working with small features on different materials can sometimes be very difficult. Short pulse lasers also enable working with materials that are difficult for traditional methods, e.g. glass, silicon.

The laser micro machining pilot line is equipped with femtosecond and nanosecond lasers. For moving the beam, there are both scanners and direct optics with moving devices.

Benefits

Micro laser processing is still a very little used technology in Finland, especially for femtosecond lasers. The pilot line provides an opportunity to test the suitability of the laser for customer applications. It can be used for basic tests. Application experiments reveal the possibilities and factors of laser technology that must be taken into account, for example, in application design or in the transition to commercial operators or in acquiring one's own laser environment.

TRL

Pilot line available for research collaboration and business use

Links

Type of the Pilot Line

- Application
- Demonstrations
- Testing facility

Prerequisites for use

- Access fee
- Case specific

Keywords

Laser micro machining, Femtosecond laser, Laser drilling, Laser engraving

Contact information

Jorma Vihinen
Research Manager
Tampere University
+358405567874
jorma.vihinen@tuni.fi

Directed Energy Deposition Pilot Line

Description

In recent years, additive manufacturing has brought a new option to manufacture and repair metal products. The directed energy deposition (DED) pilot line offers a versatile opportunity to test the possibilities of different methods.

The equipment includes both arc methods and laser-based methods. Directed energy deposition devices are connected to industrial robots or machine tools, so even industrial-scale tests are possible.

Benefits

The equipment are suitable for versatile experiments with different materials and also for making real pieces. Both AM and cladding processes are possible.

The results of the processes can be analyzed in a variety of ways using the university's research equipment. The customer receives validated information about the process and its outcomes, which it can use to develop its own processes.

TRL

Pilot line available for research collaboration and business use

Links

<https://www.tuni.fi/en/research/coating-techniques#switcher-trigger-resources>

Type of the Pilot Line

- Application
- Demonstrations
- Testing facility

Prerequisites for use

- Access fee
- Case specific

Keywords

Directed energy deposition, DED, Laser, Cladding

Contact information

Jari Tuominen
Senior Research Fellow
Tampere University
+3584084990196
jari.tuominen@tuni.fi

Composite Processing Lab

Description

Composite processing lab is the laboratory premises for developing advanced composite materials and demo parts. The premises include a synthesis room for 1-100 g polymer synthesis and fibre surface treatment solutions, lamination and adhesive bonding room with vacuum systems, infusion pumps, and ovens, and thermoplastic compounding and hot press systems hall that works in conjunction with the pilot line of thermoplastics processing. The in-house raw material storage is kept valid for around ten sqm of general-use carbon, glass and flax reinforcements as well as corresponding amount of epoxy and bio-epoxy resins for 20-50 fV% laminate development.

Benefits

Composite processing lab at Tampere University offers customers highly tailored research and development possibilities for trial run processing of composite laminates, fibre sizings and coatings, adjusted resin and compound chemistries, bio-additives, and also numerical (finite element) analysis related to the customer needs and targets. A specialty of the Composite processing lab is the tooling and knowledge of adhesive bonding. The direct connections to laboratories and pilot lines at Tampere University allows fast and efficient use of mechanical and fracture testing, thermal analysis, and fibre-matrix micro-scale testing for new composite materials or repairs and replacement purposes.

TRL

Pilot line available for use

Links

<https://www.tuni.fi/en/research/plastics-and-elastomer-technology>

Type of the Pilot Line

- Demonstrations
- Service
- Software
- Testing facility

Prerequisites for use

- Case specific

Keywords

Composite processing

Contact information

Mikko Kanerva
Associate Professor
Tampere University
+358407188819
mikko.kanerva@tuni.fi

Thermoplastics' Processing Lab

Description

The environment allows processing of thermoplastic polymers (drying, mixing and compounding, injection molding, extruding, thermoforming), analysis of polymers' processability (rheological measurement) and characterization of polymer properties before and after processing (thermal, mechanical, chemical and physical properties). Research projects are done in collaboration with companies to study specific use cases.

Benefits

Companies can benefit from the versatile analysis and characterization techniques to support their own decision making, development or innovation actions. Further, the expertise of the University research group is available in joint projects.

TRL

Pilot line available for use

Links

<https://www.tuni.fi/en/about-us/engineering-materials-science#switcher-trigger--research>

Type of the Pilot Line

- Demonstrations
- Service
- Testing facility

Prerequisites for use

- Staff effort & resource allocation

Keywords

Extrusion, Injection moulding, Rotational moulding, Thermoforming

Contact information

Ilari Jönkkäri
Tampere University
ilari.jonkkari@tuni.fi

Cold Spray

Description

Cold Spray facilities at Tampere University offer several cold spray coating production methods. The latest installation called the high-pressure cold spray system (PCS-100) is an advanced process for coating production and additive manufacturing. The low-pressure cold spray system (Dymet403) as a portable process as well as the medium-pressure cold spray system (Kinetiks300) and coaxially laser-assisted cold spray process (COLA) are also available. In addition to coating production methods, a spray booth includes a robot with a turning table and the diagnostic camera (HiWatch HR2) for particle velocity and particle size measurements. Coating and substrate materials can be metals, metal alloys, ceramics, composites, plastics and mixtures of different materials.

Benefits

Coating production demonstrations, material and coating development, testing and process optimization can be done in the cold spray facilities, which can be useful for researchers, scientists, industrial and academic collaborations. Cold Spray offers coating production facilities with well-equipped cold spray processes and supporting methods for various research projects, research and development. Cold spray coatings or cold spraying as an additive manufacturing can offer new solutions for industrial and academic challenges.

TRL

Pilot line available for use

Links

Type of the Pilot Line

- Demonstrations
- Service
- Solution
- Testing facility

Prerequisites for use

- Case specific
- Staff effort & resource allocation

Keywords

Cold spray, Coating production, Additive manufacturing, Cold spray Research and development

Contact information

Heli Koivuluoto
Senior Research Fellow
Tampere University
+358408490188
heli.koivuluoto@tuni.fi

Description

The RoboLab Tampere has been established to facilitate the learning process of both formal and non-formal education, and academia-industry R&D&I collaboration. The RoboLab Tampere operates with similar principles as e.g., Fab Labs.

The RoboLab Tampere offers a place for students, researchers and industry representatives to work with robotic equipment and experiment without major restrictions. Robots and related technology are for example industrial manipulators, a multitude of sensors (2D/3D ToF cameras, LiDAR, GNSS, IMU, etc.) and different processing platforms (PCs, embedded PCs, Raspberry Pi, Nvidia TX2).

Benefits

The RoboLab Tampere supports both formal and non-formal education and industry-academy collaboration in research. From the education perspective the robotics learning environment was developed to facilitate the learning process and to allow different robotics projects originating from industry to be carried out. From the society's perspective the accessibility and visibility to the environment was made as easy as possible yet ensuring the safety of the users.

TRL

Pilot line available for research collaboration and business use

Links

<https://research.tuni.fi/roboabtampere/>

Type of the Pilot Line

- Application
- Demonstrations
- Physical equipment
- Testing facility

Prerequisites for use

- Access fee
- Case specific
- Free for students
- Staff effort & resource allocation

Keywords

Human-robot collaboration, HRC, Industrial robotics, Collaborative robotics, Robotics safety

Contact information

Minna Lanz
Professor
Tampere University
+358408490278
minna.lanz@tuni.fi

HRC Pilot Line

Description

The HRC Pilot Line is a reconfigurable advanced robotics R&D&I platform for academics and industry to create and test ideas for the future Horizon Europe and national collaboration projects. In addition, this will be place for vocational education for special equipment, robotics programming, virtualization and AI-based methods.

The HRC Pilot environment supports both formal and non-formal education and industry-academy collaboration in research. From the education perspective the robotics learning environment was developed to facilitate the learning process and to allow different robotics projects originating from industry to be carried out.

Benefits

HRC Pilot Line is a reconfigurable advanced robotics and Digital Twins pilot line which enables rapid and cost-effective system configuration changes according to current industry and academy needs. Thus, HRC Pilot Line serves as showroom and testbed for companies from different manufacturing sectors to explore, test and validate possible novel solutions they could transfer to their own production site. This pilot line supports SMEs to adopt try-fast-fail-fast design cycle. Technologies in this environment include human-robot collaboration, AR/VR applications, digital twins, machine vision, and the development of AI methods for object recognition and classification.

TRL

Pilot line available for research collaboration and business use

Links

<https://research.tuni.fi/hrc-pilotline/>

Type of the Pilot Line

- Application
- Demonstrations
- Physical equipment
- Testing facility

Prerequisites for use

- Access fee
- Case specific
- Free for students
- Staff effort & resource allocation

Keywords

Human-robot collaboration, HRC, Industrial robotics, Collaborative robotics, Robotics safety

Contact information

Minna Lanz
Professor
Tampere University
+358408490278
minna.lanz@tuni.fi

Virtual FMS

Description

The challenge of education related to large technical systems is to provide enough hands-on experience. Virtual models and visualizations make it easier to explain the behavior of those systems. For that we have developed a Virtual FMS, that is a digital twin of the physical education environment, FMS Training Center located in the Fastems Factory floor. Virtual FMS is a digital twin developed for educational purposes.

Benefits

The goal of the VirtualFMS is to make the engineering education interesting and efficient. The efficiency in learning can be improved by utilizing a mixed reality environments.

The education environment is an example of a typical FMS existing in several Finnish companies. The actual setups in companies varies in terms of needed resources, but the principles of the environments are similar. The environment has been scaled larger compared to actual physical environment to allow the introduction of a more complex manufacturing system and how the management software has been implemented to control the environment.

TRL

Pilot line available for education use

Links

<https://research.tuni.fi/virtualfms/>

Type of the Pilot Line

- Application
- Demonstrations
- Testing Facility

Prerequisites for use

- Case specific
- Free for students
- Staff effort & resource allocation

Keywords

Digital twin, Virtual FMS,
Manufacturing, Training center

Contact information

Minna Lanz
Professor
Tampere University
+358408490278
minna.lanz@tuni.fi

Smart Manufacturing



Description

Platform supports human-robot interaction, human factors and user experience studies, and fosters co-creation. The platform provides solutions for robotics, remote operation, mixed reality solutions, industrial work and human factors. The platform is supporting SIX Smart Manufacturing Cluster development and services.

Benefits

Services offered via this environment: Holistic development of agile manufacturing, advanced robotics and automation: Intelligent robotics solutions for production, Agile production development, Human-robot cooperation, Remote operation of machines, Factory logistics and Physical, cognitive and social support for people.

TRL

Pilot line available for research collaboration and business use

Links

<https://www.vttresearch.com/en/vtt-world/>

Type of the Pilot Line

- Demonstrations
- Service
- Software
- Solution
- Testing facility

Prerequisites for use

- Case specific
- Expertise, skills & capabilities
- Facilities
- Staff effort & resource allocation
- Tools, instruments & equipment

Keywords

Robots, Human-robot interaction, Human factors, Industrial metaverse, Remote operation

Contact information

Antti Vääänen
Technology Manager
VTT Technical Research Centre of Finland
+358405706959
antti.vaatanen@vtt.fi

Optical Measurements



Description

Optical measurements infrastructure is an entity for developing optical solutions to complex measurement phenomena in demanding industrial applications. Answering to demanding industrial needs, VTT develops the next generation of machine vision by combining AI, novel imaging methods and optical innovations. VTT develops customized spectroscopic devices and measurement solutions for online industrial measurements, diagnostics and handheld customer applications. Our clients include the paper, mining, steel, food, agriculture and forest industries as well as other process and manufacturing industries.

Benefits

We have unique facilities for the agile development and construction of prototypes enabling us to swiftly deliver complete optical instrumentation solutions from the laboratory phase to real environment. We have decades of experience and the expertise to combine diverse spectroscopic and machine vision measurement technologies to solve customers' needs in various fields, including the steel, mining, paper, defense and process and other process and manufacturing industries.

TRL

Pilot line available for research collaboration and business use

Links

<https://www.vttresearch.com/en/ourservices/industrial-sensing-solutions>

Type of the Pilot Line

- Application
- Demonstrations
- Service
- Solution
- Testing facility

Prerequisites for use

- Case specific
- Facilities
- Software & applications
- Staff effort & resource allocation
- Tools, instruments & equipment

Keywords

Spectrometers, Machine vision, Optical measurements, Characterization, Sensor integration

Contact information

Katariina Rahkamaa-Tolonen
Research Team Leader
VTT Technical Research Centre of Finland
+358407598890
katariina.rahkamaa-tolonen@vtt.fi

Materials Performance



Description

Platform is for gaining knowledge to understand failure and ageing mechanisms, quantify material performance, and predict component and structural behavior in operation targeting to develop sustainable material solutions for extended lifespan and improved operational efficiency. Key technology and research equipment include powder piloting, metallography and microscopy, additive manufacturing, cementitious materials, corrosion and water chemistry, tribology, destructive and non-destructive testing and capabilities for advanced materials modelling. The infra is located in Espoo and Tampere.

Benefits

Materials Performance (VTT) covers the whole lifecycle from material development to manufacturing, and from operation and maintenance to ageing and lifetime extension. The target is to develop sustainable material solutions for extended lifespan and improved operational efficiency. The platform covers materials from metals and ceramics to cementitious materials and provides solutions for a wide range of industrial demands, from nuclear operation & waste, process & energy, marine & offshore industry, aerospace to civil engineering.

TRL

Pilot line available for research collaboration and business use

Links

<https://www.vttresearch.com/en/ourservices/industrial-3d-printing>

Type of the Pilot Line

- Demonstrations
- Service
- Software
- Solution
- Testing facility

Prerequisites for use

- Access fee
- Case specific
- Expertise, skills & capabilities
- Facilities
- Staff effort & resource allocation

Keywords

Materials modelling, Materials testing, Failure analysis, Additive manufacturing, Powder piloting

Contact information

Ari Koskinen
Technology Manager
VTT Technical Research Centre of Finland
+358400162630
ari.koskinen@vtt.fi

Metrology



Description

Reliable and accurate measurements are vital for global industry, commerce and safety. New measurement solutions and technologies benefit digitalization and the circular economy. VTT MIKES, the National Metrology Institute of Finland, realizes the SI units, performs high-level metrological research, develops measuring solutions in partnership with industry, and provides expert services and calibrations of customer equipment. The infrastructure includes high-accuracy measurement systems located in high performance laboratory rooms and large flow facilities. The infrastructure provides most accurate measurements in Finland. The platform is part of the European and global metrology networks EURAMET and CIPM. Located at the Espoo and Kajaani, Finland.

Benefits

VTT MIKES can help in validating measuring equipment, or when, for example, developing a measurement system or process for quality control. VTT MIKES provides the most sophisticated metrology laboratory environment for measurement related R&D and metrology. It provides high-end measurement innovations, capabilities and tools for demonstrating quality of measurements, and worldwide recognized measurements and calibrations.

TRL

Pilot line available for research collaboration and business use

Links

<https://www.vttresearch.com/en/ourservices/vtt-mikes>

Type of the Pilot Line

- Service
- Solution
- Technology licensing
- Testing facility

Prerequisites for use

- Case specific
- Expertise, skills & capabilities
- Facilities
- Staff effort & resource allocation
- Tools, instruments & equipment

Keywords

Metrology, Calibration, SI unit, Characterization, Quality, Measurement accuracy

Contact information

Martti Heinonen
Vice President MIKES
VTT Technical Research Centre of Finland
+358400686553
martti.heinonen@vtt.fi

Secured Connectivity



Description

The platform provides enablers for future 5G-A/6G and cybersecurity research and testing. It includes carrier-grade mobile network and separate War-Room enabling performance and cybersecurity testing. The environment enables end-to-end communication network testing, core network and service performance and energy efficiency testing, quality of service measurement and testing, and cybersecurity testing of devices, services and connectivity. Infrastructure provides enablers to build proof-of-concept implementations and technology demonstrations of pre-commercial solutions and testing of commercial products. The application areas for infrastructure include, e.g., critical infrastructures, defense and security, automotive, industrial systems, energy, smart cities, public safety, and health & wellbeing. The main site location are in Espoo and Oulu.

Benefits

Increasing digitalization has made connectivity and cyber security the fundamental requirement for societies and organizations. We assist our clients in utilizing efficiently new telecommunication solutions and preparing for cyber threats and develop efficient solutions for dealing with cyber risks. We have a solid background in solving cyber security and connectivity challenges, especially in the energy, industry and mobile telecommunications sectors.

VTT's Cyber Range and 5G test network environments enable cyber security testing of networks, devices and software. These environments expedite tangible experiments and provide new information about the performance and security of innovations.

TRL

Pilot line available for research collaboration and business use

Links

<https://www.vttresearch.com/en/ourservices/cybersecurity>

Type of the Pilot Line

- Demonstration
- Service
- Solution
- Testing facility

Prerequisites for use

- Case specific
- Expertise, skills & capabilities
- Facilities
- Staff effort & resource allocation
- Tools, instruments & equipment

Keywords

5G/6G, Cybersecurity, Connectivity, Mobile network, Radio access networks

Contact information

Jyrki Huusko
Research Team Leader
VTT Technical Research Centre of Finland
+358405254698
jyrki.huusko@vtt.fi

Maturity Self-Assessment Tools



Description

Triplet of free maturity web tools for assessing position in digitalization, applying artificial intelligence (AI) or reaching Industry 4.0 or even beyond (VTT). A maturity tool is useful when an organization is willing to progress towards a goal but does not know how to proceed. An effective tool will give a common understanding of the necessary viewpoints, the current status and comparison to others. The tool will also help to find the potential development areas and initiate the discussion in the organization. The triplet of self-assessment tools is available for non-commercial use in both Finnish and English. The AI maturity tool dedicated for EIT AI action, <https://eit.aimaturity.vtt.fi/> is available in seven language EN, ES, FI, FR, DE, IT, PL.

Benefits

Free of cost service, customers self-assessment of current state, comparison to other similar responses, future development planning. These web tools are available for self-assessment. After registration, the user will answer questions simply by selecting from the prewritten response options. The immediate result illustrates both the present state, the potential development needs and variation between other respondents. From the result diagram it is easy to pick potential development issues to proceed with. After the self-assessment, it is possible to have a results discussion or, workshop with VTT and even consider for further development projects.

TRL

Green & Digital Tool available for research collaboration and business use

Links

<https://digimaturity.vtt.fi>,
<https://ai.digimaturity.vtt.fi>
<https://manumaturity.vtt.fi>

Type of the Green & Digital Tool

- Application
- Service

Prerequisites for use

- Free use
- Expertise, skills & capabilities
- Software & applications

Keywords

Digitalization, AI, Industry 4.0, Maturity tool, Self-assessment

Contact information

Leila Saari
Senior Scientist
VTT Technical Research Centre of Finland
+358408208929
leila.saari@vtt.fi

Bioruukki: Pressurised extraction and down stream processing

Description

Pressure reactor: 300-litre reactor, batch and flow-through extractions, working pressure 1-20 bar, temperature range 10-200 °C for pressurized hot water extraction (PHWE)
Supercritical fluid extraction (SFE) and supercritical fluid precipitation: Chematur Engineering Supercritical Fluid Pilot Plant, capacity 0,5 – 3 kg, CO₂ or CO₂ combined with Ethanol, Ethanol-water
Membrane filtration: 2 x B1 tubular modules, one module: length 2.44 m, area 1.75 m², modified PES membrane: pH 1.5–12, max pressure 30 bar, max temperature 80 °C

Benefits

Bioruukki offers an easy and quick way to pilot new production processes and increase the refining and utilization rate of biomass. In Bioruukki, companies can do piloting resource- and cost effectively without having to build their own piloting equipment. Testing done in the pilot scale reduces the risks associated with the transition to actual production. Anticipating the production issues speeds up the process scaling up.

TRL

Pilot line available for research collaboration and business use

Links

<https://www.luke.fi/en/expert-services/bioruukki-piloting-center/>

Type of the Pilot Line

- Piloting
- Service
- Technology licensing

Prerequisites for use

- Co-operation

Keywords

Pressurized Hot Water Extraction (PHWE), Supercritical Fluid Extraction (SFE), Membrane filtration, Cascade use

Contact information

Kalle Kaipanen
Laboratory engineer
Natural Resources Institute Finland
kalle.kaipanen@luke.fi

Biopaja: Solutions for the circular bioeconomy

Description

Biopaja is Luke's experimental facility in Jokioinen. In Biopaja, various solutions can be tested to study and demonstrate the nutrient and organic matter recycling of different biomasses. Luke works with and serves companies in developing and adopting recycled fertilizers, renewable energy and other value-added products. Biopaja services are customized according to the specific needs of each customer. Examples of our services are e.g., biogas production research, manufacturing and utilization experiments for bio-based fertilizers, pyrolysis experiments and research of pyrolysis products. Biopaja conducts research and development projects in cooperation with universities, research institutions and companies.

Benefits

In Biopaja, the processing of biomasses into new valuable products by means of biogas, pyrolysis and nutrient recovery technologies, can be demonstrated in laboratory and pilot scale. Furthermore, Biopaja enables the assessment of varying processing chains and the production of multiple products from various biomasses and side streams. By cascading use of processing technologies, we can enhance the use of biomasses to get the most value out of them. Experiments on a laboratory and pilot scale ensure the effectiveness of processes and reduce investment risks.

TRL

Pilot line available for research collaboration and business use

Links

<https://www.luke.fi/en/services/biopaja-solutions-for-the-circular-bioeconomy>

Type of the Pilot Line

- Demonstrations
- Service
- Testing facility

Prerequisites for use

- Co-operation

Keywords

Circular bioeconomy, Nutrients, Biogas, Pyrolysis, Biomass processing

Contact information

Elina Tampio
Senior Scientist
Natural Resources Institute Finland
elina.tampio@luke.fi

FeedPilot - Animal feed processing

Description

Feed ingredients tested can be processed prior mixing and pelleting of the feed. Pre-processing steps can be grinding, heat treatments, extrusion, coating or encapsulation. After mixing the ingredients, feed can be further processed by pelleting, coating and cooling before packing and transportation.

Benefits

Luke's FeedPilot enables testing of different animal feed processing conditions on the quality of feed, specifically on the inactivation of antinutritional factors, digestibility of feed, lipid oxidation, protein denaturation, flavor and appearance and stability of feed supplements (e.g. enzymes, probiotics, vitamins). FeedPilot helps customers to test different feed processing approaches and conditions in pilot scale before proceeding to industrial scale production. The close proximity to Luke's animal research facilities and laboratories enables further feed quality assessment by animal feeding trials and laboratory analyses.

TRL

Pilot line available for research collaboration and business use

Links

<https://www.luke.fi/en/services/expertise-areas/livestock-and-feed>

Type of the Pilot Line

- Service
- Testing facility

Prerequisites for use

- Co-operation

Keywords

Feed, Processing, Pelleting, Quality, Stability

Contact information

Heidi Leskinen
Group Manager
Natural Resources Institute Finland
heidi.leskinen@luke.fi

FoodPilot - Solution for processing healthy and safe food

Description

Luke's FoodPilot services include testing and optimization of food processes (for example extrusion, drying, heating, microbial and enzymatic processing), product development, recovery and batch production of bioactive compounds, scale-up of separation processes from product development laboratory to pilot production, scale-down analysis of industrial production processes, as well as process and equipment consulting. Also, services include laboratory analysis of samples: microbiological and chemical analyzes, bioactive and functional properties, sensory evaluation.

Benefits

FoodPilot test facility in Jokioinen provides customers with access to equipment and services for food research and side stream up-grading. Process development and testing on a pilot scale enables new innovations and reduces risks associated with the transfer to actual production. Identifying possible bottlenecks in production beforehand speeds up the transfer of processes to industrial production. New processing technologies can be tested before making any investments. The material generated during test production enables comprehensive further studies.

TRL

Pilot line available for research collaboration and business use

Links

<https://www.luke.fi/en/services/jokioinen-foodpilot-new-food-technologies-to-support-research-and-development>

Type of the Pilot Line

- Service
- Testing facility

Prerequisites for use

- Co-operation

Keywords

Food processing, Fermentation, Drying, Heating, Enzymatic processing, Filtration, Product development

Contact information

Sari Mäkinen
Group Manager
Natural Resources Institute Finland
sari.makinen@luke.fi

Extrusion Center - Solution for extrusion processing

Description

Luke's Extrusion Center was established in 2021. There are 2 twin-screw extruders and a new generation extruder, a multi-screw extruder (Planetary Roller Extruder = PRE). Capacity of extruders: PRE 0.3-10 kg/h, the twin-screw for food applications 10 kg/h and for feed applications 70 kg/h. Through multi-screw extrusion, we improve our research and service facilities to cover cereals, feed, specialty crops, legumes, berries, straw, wood, sawdust, peat and other biomass and their by-products such as chaff, bark fractions and mill by products. The most important features of PRE are continuous operation, efficient material and heat transfer, precise optimization of temperature and pressure, and stability under reaction conditions. Also, services include laboratory analysis of samples: microbiological and chemical analyzes, bioactive and functional properties, sensory evaluation.

Benefits

Extruder Center test facility in Jokioinen provides customers with access to equipment and services for food, feed and circular economy products research and side stream up-grading. Process development and testing on a pilot scale enables new innovations and reduces risks associated with the transfer to actual production. New processing technologies can be tested before making any investments and extrusion methods can be transferred to larger production classes linearly. The material generated during test production enables comprehensive further studies.

TRL

Pilot line available for research collaboration and business use

Links

Type of the Pilot Line

- Service
- Testing facility

Prerequisites for use

- Co-operation

Keywords

Extrusion, Extruder, Planetary roller extruder, Twin-screw extruder

Contact information

Sari Mäkinen
Group Manager
Natural Resources Institute Finland
sari.makinen@luke.fi

Description

FieldLab is practical industrial testbed environment where businesses and knowledge institutions develop, test and implement Smart Industry solutions in a targeted way. In addition, it allows people to learn how to apply these solutions. FieldLab also strengthens the links between research, education and policy in relation to a specific Smart Industry theme and transfers knowledge to other businesses. Dataflow and connectivity are the essential enablers for Industry 4.0. FieldLab is equipped with state-of-the-art data collection capabilities, enabling pilots and deep dives also with data-intensive industrial cases and examples. Target audience: FieldLab offers a testing and learning environment for companies, supporting them on applying the best Industry 4.0 practices in a feasible and cost-effective way. FieldLab also supports TAMK's educational goals by acting as a learning environment for skilled future workforce.

Benefits

FieldLab offers a testing and learning environment for companies, supporting them on applying the best Industry 4.0 practices in a feasible and cost-effective way. FieldLab also supports TAMK's educational goals by acting as a learning environment for skilled future workforce.

TRL

Pilot line available for research collaboration and business use

Links

<https://sites.tuni.fi/fieldlab/>

Type of the Pilot Line

- Demonstrations
- Testing facility

Prerequisites for use

- Access fee
- Case specific
- Staff effort & resource allocation

Keywords

Industry 4.0

Contact information

Jere Siivonen
Tampere University of Applied Sciences
jere.siivonen@tuni.fi

Description

TAMK has years of experience in 3D printing of large structures. We have 3D-printed various structure using biocomposite material, for example, a footbridge. Latest development steps have taken our large-scale additive manufacturing (LSAM) environment to a new level:

- The new extruder printhead enables efficient 3D printing with high variety on output per hour.
- Ability to 3D-print large structures with an industrial robot mounted on linear track (5m)
- The system is connected to an IoT server according to Industry 4.0 for data collection and AI solution development.

Benefits

FieldLab LSAM environment is servicing all companies and other parties that are interested in Deep Dives and POCs related to large scale 3D-printing. As process is also very versatile from the data generation point of view, it gives also great test bed for machine learning and AI-enabled product and service development for different stakeholders.

TRL

Pilot line available for research collaboration and business use

Links

<https://sites.tuni.fi/fieldlab/>

Type of the Pilot Line

- Demonstrations
- Service
- Testing facility

Prerequisites for use

- Access fee
- Case specific

Keywords

Additive manufacturing, 3D-Printing

Contact information

Jere Siivonen
Tampere University of Applied Sciences
jere.siivonen@tuni.fi

Design for Additive Manufacturing

Description

Concept design can be started with topology optimization. In topology optimization algorithm finds the optimum distribution of material inside design space. Objective for the optimization can be for example minimum mass design. Manufacturing method of the part can be considered by manufacturability constraints. For example, overhang angles can be controlled to reduce the need for support structures in parts, which are going to be manufactured by 3D printing. Additional weight reduction can be achieved by using lattice structures, which are impossible to manufacture, except if 3D printing is used. Printing process can be simulated and e.g., support structures and print orientation can be optimized to reduce distortion. It's also possible to compensate the distortions by modifying the digital model based on the simulation results. Simulation can therefore reduce the amount of wasted material and time.

Benefits

Digital Design and Simulation reduces the amount of wasted material and time.

TRL

Green & Digital Tool available for research collaboration and business use

Links

Type of the Green & Digital Tool

- Demonstrations
- Service
- Testing facility

Prerequisites for use

- Access fee
- Case specific

Keywords

Topology optimization

Contact information

Mikko Ukonaho
Tampere University of Applied Sciences
mikko.ukonaho@tuni.fi

J. Hyneman Center

Description

J. Hyneman Center is a proto lab at the LUT Lappeenranta campus for all LUT group students. The goal is to create new ideas and give recourses for both building and testing prototypes. The lab brings together students, LUT research and companies with a common goal to solve problems with creating. JHC is equipped with a wide variety of tools and the 330 square meters JHC premises include metal, paint, wood and electronics workshops. The workforce of JHC are students, and work done at JHC is connected to their studies.

Benefits

Low-cost channel to prototype building and testing. JHC brings together students from different disciplines and working on different courses. Besides the wide selection of existing courses, the company assignment can also be formulated into a building challenge where many student teams are focusing on the same challenge. LUT group students also represent customers of the future, meaning the feedback given has strategic significance.

TRL

Pilot line available for use

Links

<https://jhynemancenter.com/>

Type of the Pilot Line

- Service
- Solution
- Testing facility

Prerequisites for use

- Case specific
- Free for students

Keywords

Multidisciplinary, Problem solving, Prototype building

Contact information

Markku Ikävalko
Associate professor
LBM / J. Hyneman Center
+358401496204
markku.ikavalko@lut.fi

Metal 3D Printing Lab

Description

The University of Vaasa's 3D metal printing laboratory conducts high-quality research. The laboratory is also used for teaching. In addition, the laboratory makes it possible to design and print parts for companies in various industries, such as the automotive and other manufacturing industries, as well as SMEs. The equipment purchased for the laboratory in Technobothnia is one of the best in the industry. The laboratory guarantees that the parts printed on the equipment are of high quality and safe. The laboratory uses a Prima Additive Print Sharp 250 -3D metal printer, which works by the powder bed method (selective laser melting SLM). The powder bed method is the most common 3D printing method for metals, in which the metal is melted in layers with a laser beam.

Benefits

3D printing revolutionizes industrial manufacturing and offers new opportunities for research and development. In the new 3D metal printing laboratory of the University of Vaasa, the Metal Additive Manufacturing Lab, digital 3D models are printed layer by layer directly into finished metal parts. The range of printing possibilities is wide: from simple spare parts to very complex and geometrically demanding components. 3D printing is also known as additive manufacturing (AM).

TRL

Pilot line available for research collaboration and business use

Links

<https://www.uvasa.fi/fi/tutkimus/tutkimusymparistot/metal-additive-manufacturing-lab>

Type of the Pilot Line

- Demonstration
- Physical equipment
- Service
- Solution
- Testing facility

Prerequisites for use

- Staff effort & resource allocation

Keywords

3D printing, Additive manufacturing, Metal 3D printing

Contact information

Rayko Toshev
Project Manager
University of Vaasa
+358408485994
rayko.toshev@uva.fi