GREBE

Generating Renewable Energy Business Enterprise

Northern Periphery and Arctic Programme

Knowledge sharing expert sessions with SME´s

Knowledge and Technology Transfer Cases

March 2018

www.grebeproject.eu

Knowledge sharing expert sessions with SME´s – Enniskillen, Northern Ireland

Saija Rasi & Veikko Möttönen
Natural Resources Institute Finland (Luke)

Background

The GREBE project arranged the possibility for the transfer of knowledge within the Northern Periphery & Arctic area by hosting expert sessions with SME´s, associations and land owner representatives in the sector of renewable energy supply and demand. The sessions were part of the GREBE project meeting events hosted by the Fermanagh and Omagh District Council from 6th – 10th November 2017. Two experts, Saija Rasi and Veikko Möttönen from the GREBE partner organization Natural Resources Institute Finland (Luke) were available to the participants for one-to-one meetings on Wednesday 8th November. The experts were also available during a networking event for businesses from Northern Ireland and the Republic of Ireland giving the opportunity to engage with one another or opening up the possibility of joint working opportunities in the future.

The participants in these sessions were:

Andrew Kidney	Balcas
Brian Murphy	Balcas
Charles Doherty	Donegal Woodland Owners Society Ltd
Denzil Cluff	Ecoerne Ltd
Diane Moffitt	Moffitt and Robinson
Ger Devlin	Irish BioEnergy Association
Gerry McMorrow	McMorrow Haulage
John Gormley	Gormley Associates
John Jackson	Donegal Woodland Owners Society Ltd
Michael Horan	Sean Horan Ltd
Michael McElroy	Intertrade Ireland
Neil Elliott	Future Renewables
Noel Gavigan	Irish BioEnergy Association
Pat Collins	Irish Farmers Association
Pat Lavin	Ecosmart External Insulation Ltd
Paul Cairns	South West College
Ruth Daly	Sort-It
Shane McBrien	South West College
Teresa McMorrow	McMorrow Haulage
Thomas Scott	Donegal FRS Group
Tom Martin	Tom Martin Consultancy
Tracey McNally	Ecohog Ltd
Trevor Kerr	Invest NI
Willie Moffitt	Moffitt and Robinson

Business areas and expertise

Topics discussed with Saija Rasi:

Biogas production and utilization possibilities in rural areas:

- The possibilities to produce energy from rural raw material
  - Different kinds of manure
  - Grass / grass silage
- The fertilizer potential of the digestate
  - Separation of liquid and solid parts
  - Production of fertilizer products (similar to chemical fertilizers)
  - Spreading the digestate or separated fractions of digestate
  - The environmental effect of using the digestate and the effect of spreading tehcique
- The utilization of gas to energy
  - CHP –the use of heat in farms
  - Gas network / upgrading to network quality
- Small / farm scale biogas production and differences compared to large scale
  - Possible companies providing small scale solutions in Finland
- There is an interest to visit Finnish biogas plants and companies to get more information about the field
- The possibilities of Luke to provide R&D experience

Topics discussed with Veikko Möttönen:

Further processing of sawn wood and side streams:

- The utilisation of side streams (mainly saw dust and bark) from sawn timber production. An example of the survey made in Kuhmo industrial park, Eastern Finland in 2016-17 by Luke was given.
    - Energy use: new products (e.g. bioethanol).
    - Composite products, saw dust as raw material for wood plastic composites.
    - Bioactive compounds for nutritional, medicinal and cosmetic products
- New commercial, environmental friendly modification methods of sawn timber:
    - Chemical modifications (Accoya, Kebony),
    - Thermal modification (ThermoWood®, https://www.thermowood.fi/)
- New nascent techniques for improving the long term durability of fencing material using more ecological impregnation chemicals:
    - Tall oil (pine oil). One example of the technique is introduced by a Finnish company Ekopine Oy (http://www.ekopine.fi/Ekopine-EN.htm)
- Forested land areas, which are not possible to return to the agriculture, need fertilization
    - Using of ash for peatland fertilizers. Granulating of ash wastes to forest fertilizer (E.g. http://ecolan.fi/en/)
- Use of wood material for bedding in animal sheds. There are entrepreneurs in Northern-Ireland and in Finland making shavings from small diameter timber of forest thinning.
- Possibility to manufacture logs for log house construction from sitka spruce. The settling of logs may be a problem with low density wood of sitka spruce. However, there are techniques available to make non-settling constructions of log houses, e.g. Honka FusionTM (https://honka.com/en/our-log-homes/honka-fusion/)
- Start-up of a small saw mill: need to analyse the labour requirement, demand of sawn goods, specialization in production
- Chipping of timber and use of energy wood from thinning
- Using of wood material for construction and insulation

Additional information related to the topics of the expert sessions

Biogas technology

Saija Rasi, Natural Resources Institute Finland (Luke)

There are 44 biogas reactors in Finland (2016) and landfill gas is collected from 40 landfills. 13 of the plants are agricultural based biogas plants, meaning that biogas production in Finland is mainly based on wastes, sewage and biowaste. In 2016, the total recovered energy production from biogas was 623 GWh. It has been estimated that theoretically up to 4–6 TWh/year biogas could be produced from waste and manure, but there are no official targets for biogas production. The potential biogas yield from grass silage is about the same amount, meaning that total biogas potential is about 10 TWh/a in Finland. Present use of silage is negligible. Biogas is mainly used for heat and electricity production in CHP plants located at the biogas production sites, or transported by pipelines for use in industrial processes.

Figure 1. Biogas plant in Maaninka, Finland. (Source: Ville Pyykkönen, Luke)

There are 11 biogas upgrading units, and upgraded biogas is used as vehicle fuel or injected into the natural gas grid. In the past years, vehicle fuel use has increased outside the natural gas grid as more off-grid fuelling stations have been established. The share of biomethane in the methane/CNG mix sold for transportation was approximately 50 % in 2016. In total about 1,900 gas vehicles were in operation in August 2015. The interest in small scale biogas production has increased recently and there are companies in Finland producing small scale reactors and biogas upgrading units.

Modification of sawn wood for the improved durability - New methods and processes from Finland

Veikko Möttönen, Natural Resources Institute Finland (Luke)

Thermal modification (heat treatment) of wood

Thermally modified wood is wood that has been modified by a controlled process with the wood being heat treated at high temperature (>180 °C) in absence of oxygen. The process induces some changes to the chemical structures of cell wall components (hemicellulose, cellulose and lignin) of wood. The aim of heat treatment is to increase durability, thermal insulance and dimensional stability of wood. Low oxygen content prevents the wood from burning at these high temperatures. Several different technologies are introduced using different media including steam, nitrogen gas and hot oil.

ThermoWood® process is a heat treatment process developed in Finland which uses a steam environment at atmospheric pressure to treat the wood. This process can also be used on "green" wood and is the most widely used commercial wood modification process. ThermoWood® is a registered trademark owned by International ThermoWood Association (ITWA, https://www.thermowood.fi/). Only the members of the International ThermoWood Association have legal right to use the word ThermoWood with thermally modified timber. ITWA logotype is an official quality control stamp of the association. The International ThermoWood Association was founded in 2000. Today, there are sixteen members from eight countries. The utilization of ThermoWood is constantly increasing and the aim of the association is to enhance ThermoWood® products.

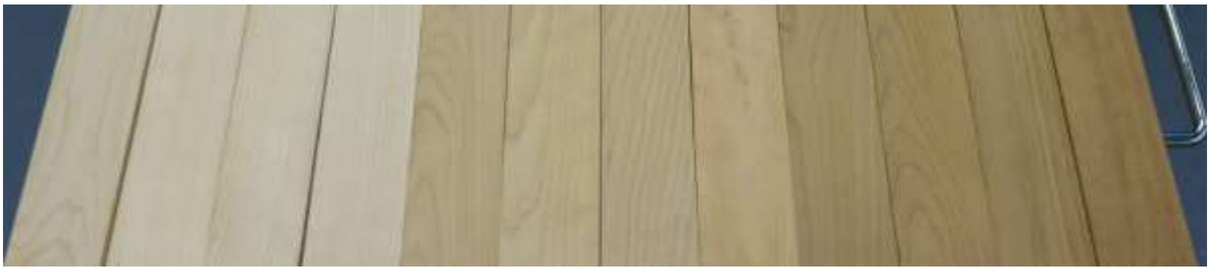

Figure 2. Sawn birch wood material, thermally modified at 170 °C (left), 185 °C (middle), and 200 °C (right).

ThermoWood is a wood material produced by using only natural elements, heat and steam. Chemicals are not added in the process. Thermal modification improves the wood's technical properties and ThermoWood is non-toxic, dimensionally stable, resistant to decay and resin free. It can be used inside or outdoors, in any climate. In addition, thermal modification for visual improvement of wood surface of light-coloured wood species is becoming more and more a general method that is used in furniture, paneling and parquet industries for reproducing the aesthetic of tropical woods.

ThermoWood properties:

- Improved dimensional stability
- Reduced equilibrium moisture content
- Improved durability against decay
- Reduced thermal conductivity
- Resin removed
- Consistent colour through the wood
- Non-toxic material
- Reduced splitting strength
- Slightly reduced bending strength

The energy consumption of the heat treatment process is 25% higher compared to the energy consumption of drying process alone. Typically the heat treatment process takes around five days when the wood temperature is gradually raised at 190–220°C and then dropped gradually back to normal temperature. The time at the actual heat treatment temperature (190–220°C) is 1–3 hours. The process changes the structure of wood by degrading mainly the hemicellulose component of the wood. The changes in hemicellulose content and composition are also the main reason for the changes of the properties of wood.

Chemical impregnation of wood with pine oil

Pine oil (or "crude tall oil") impregnation, either alone or combined with some other modification such as heat treatment, has been considered as an alternative for pressure impregnation. Impregnating small diameter timber with pine oil is expected to reduce the wood technological problems such as dimensional stability and poor durability related to, e.g., juvenile wood. Pine oil impregnation not only reduces the capillary water uptake of wood but also increases the hydrophobicity of wood surface. Pine oil impregnation could be well suited for example such as garden and environmental construction products (fencing, decking etc.), which utilize knotty, relatively low density wood and wood material with low heartwood proportion.

There are challenges limiting the possibility to use pine oil as a wood preservative on an industrial scale. The first one is the large quantity of oil needed to preserve wood. The high retention level increase the material costs on the one hand, and make the products quite heavy, on the other hand. Being a by-product of kraft pulping process, however, crude tall oil is available in large quantities wherever kraft pulp industries exist. Wood preservation is only one of the potential end uses for pine oil that can be further refined into biofuels, for example. The second challenge is the occasional leaching of oil from the wood. This is due to the high retention levels of oil especially in the surface layers of wood. Deeper inside wood, the lack of oxygen prevents polymerisation of the oil, causing leaching and uneven surface quality for the treated products. However, leaching can be reduced markedly by heat treatment and prolonged storage before the implementation the products in the field.

Ekopine Ltd. (www.ekopine.fi) is a Finnish company developing the process and manufacturing pine oil treated products.

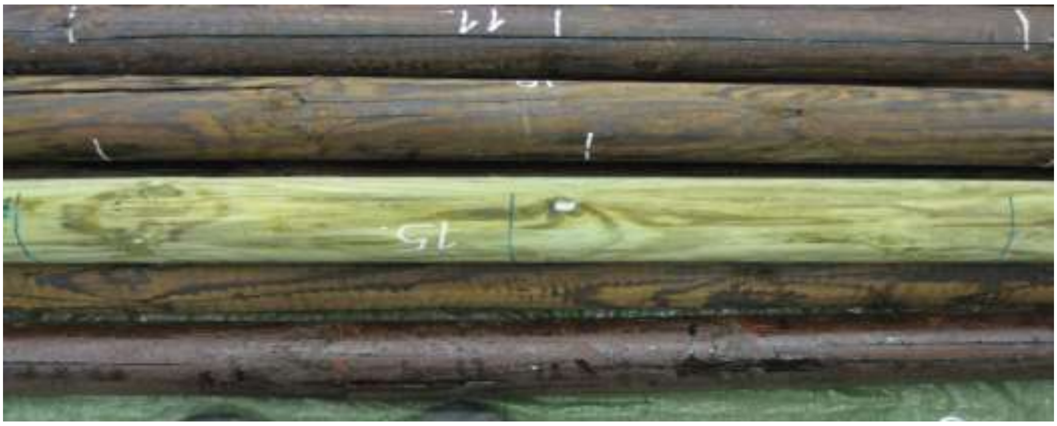

Figure 3. Brown-coloured, pine oil impregnated fencing posts. The green reference is impregnated with copper-based preservative.

Northern Periphery and Arctic Programme 2014–2020

EUROPEAN UNION
Investing in your future
European Regional Development Fund

GREBE

Generating Renewable Energy Business Enterprise

@ GREBE_NPA

GREBEProject

Visit
www.grebeproject.eu

Contact

Western Development Commission,
Dillon House, Ballaghaderreen,
Co. Roscommon, F45 WY26, Ireland.

Tel: +353 (0)94 986 1441
Email: paulineleonard@wdc.ie

Project Partners

GREBE will be operated by eight partner organisations across six regions:

- WDC
- Action Renewables – the future of energy, today
- Luke – Natural Resources Institute Finland
- Forskningsparken i Narvik
- eri
- Fermanagh & Omagh District Council – Comhairle Ceantair Fhear Manach agus na hÓmaí
- Innovation Center Iceland
- Karelia

About GREBE

GREBE is a €1.77m, 3-year (2015-2018) transnational project to support the renewable energy sector. It is co-funded by the EU's Northern Periphery & Arctic (NPA) Programme. It will focus on the challenges of peripheral and arctic regions as places for doing business, and help develop renewable energy business opportunities provided by extreme conditions.