

Finland is a Forerunner in

Biomass Refining

■ Over the years, Finnish companies have been highly successful in building an industry around the activity of refining biomass into different value-added end-products. In certain segments Finnish companies are, in fact, world leaders.

Niklas von Weymarn

Refining biomass into value-added products has been an industrial activity for centuries all around the world. In Finland, the main sectors active in this field include the food industry as well as the pulp and paper industry (P&P), producing not only fibre-based products, but also significant amounts of energy. In fact, the biomass-derived energy produced by the P&P industry accounts for over 20 percent of the total annual energy consumption in Finland.

With regard to providing know-how, technology and machinery for biomass refining companies, Finland is especially well-known for machinery used in wood harvesting and log handling, in P&P mills and for biomass combustion, as well as for providing various related engineering services.

Biorefinery dynamics

Are the current conventional biomass

PLA-based BioWare cutlery by Huhtamäki is biodegradable and compostable.

refining industries utilising biomass inefficiently? Or are there vast amounts of unused biomass that should be harnessed? Of course not. Biorefineries are not a new invention, so what is all the current fuss about then?

In addition to its main product, a factory processing biomass usually also generates significant amounts of biomass-derived side-streams. Utilising these side-streams as efficiently as possible is important to a successful biorefinery.

Take, for example, the wide variety of products that are made from sugar beet, soy, and wood. A biorefinery must be seen as a dynamic multi-product entity

producing over time those products that are sought by the market.

Today, the world is facing significant new challenges ranging from climate change to high oil prices. These global drivers, in combination with recent technological developments, have



Biorefineries

Subjected to a Strong Tailwind

Who will end up with the biomass this planet is producing? Shall we in the future have to choose between making paper or bio-energy, if the availability of raw materials is indeed limited? And what about the food supply?

Humanity has developed an unprecedented interest in renewable plant-based materials, commonly known as biomass. In fact, it seems that the whole raw materials

situation, including minerals, oil, etc., is currently in flux.

The use of biomass as human food is well known, but with increasing prices, people are suffering, especially in the non-industrialised countries.

The objectives recently published by the European Commission request a substantial increase in production of bioenergy, including separate sub-objectives for biomass-derived transport fuels. The companies refining biomass into products other than food and energy, like chemicals and packaging materials,

are naturally feeling the pressure as well.

With increasing interest in biomass as an industrial feedstock, modelling of the economics and environmental impacts of its use becomes more and more important. Ethical issues are also surfacing.

The challenge for researchers and decision makers is to find a sustainable balance between the various uses of biomass as food, energy and feedstock for other industries, and especially to find a sustainable balance between industrial use of biomass and leaving nature in its native state.

UPM ProFi composite is a unique material which combines the best characteristics of wood fibres and plastics. It can be disposed of by incineration or recycled back into the production process.

spurred an unprecedented interest in biorefineries and biomass as an industrial raw material.

A bright future

The activity among Finnish companies has been and continues to be strong. The best known example of a new biomass-derived product brought to the market by a Finnish company is xylitol, the low-calorie sweetener.

More recent R&D efforts have been directed towards biomass-derived transport fuels and materials. Here the first commercially-operating plant producing a novel plant oil-based biofuel, “renewable diesel”, has been in operation in Finland since 2007 (Neste Oil Plc.). New, larger plants are planned or being built in both Singapore and Rotterdam, the Netherlands.

Lignocellulose-based biofuels are also being piloted in Finland, above all by two of the major P&P companies, UPM-Kymmene Plc. and Stora Enso Plc.

Regarding materials, a recent example is UPM’s novel composite material called ProFi, consisting of a fossil plastic combined with a biomass-derived waste product. End-product applications for ProFi include, amongst others, use as terrace planks.

Finnish know-how can also be found in the polylactic acid (PLA) value chain. Most prominent is the PLA-based BioWare cutlery brought to market by Huhtamäki Plc.

niklas.weymarn@vtt.fi



UPM



Antonin Halas

Dr Niklas von Weymarn is the Biorefinery Programme Manager at VTT Technical Research Centre of Finland.