Rethinking the Base Material Side

New Sustainable Plastics Substitute Made from Paper

Plafco Fibertech, founded in 2017, was created as a spin-off from an EU-research project coordinated by Jukka Valkama, a professor at the Cooperative State University of Baden Wurttemberg in Karlsruhe, Germany. For three years the company has been dedicated to the industrialization of the process for producing the plasticized fiber composite (Plafco) material for paper. The new material is made by physico-chemical-transformation of paper into an all-cellulose-composite in a continuous process. Plafco can upgrade a paper, without changing its chemical composition, into new products e.g. for substitution of plastics in packaging products. The straight-forward continuous processing enables low operating costs, thus giving Plafco excellent price-value properties. Furthermore, the material delivers a smooth and tight surface for additional functionalization or barrier-coating, which reduces the need of surface chemicals in the end products.

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Jukka Valkama, Plafco Fibertech

Personal Profile

Jukka Valkama, CEO, founder and shareholder of Plafco Fibertech, studied forest product chemistry/paper technology at Helsinki University of Technology and received a Ph.D. in paper engineering from Technical University Darmstadt, Germany, in 2007. He is head of the department for paper and packaging technology at the Duale Hochschule Baden-Württemberg (DHBW, Baden Wuerttemberg Cooperative State University) in Karlsruhe, Germany. He has several patents and innovations and has long background in entrepreneurship and is also a member of several industry associations and serves as an expert for topics around new materials and sustainability in advisory boards.

CHEManager: Professor Valkama, you founded the company in 2017, but the idea was born earlier. How did it all start?

Jukka Valkama: In 2013 we had the initial idea to examine if with state-of-the-art knowledge about dissolution of cellulose it would be possible to upgrade paper into a vulcanized fiber type of products by using paper processing technology. After the successful application in the WoodWisdom EraNet program we spend three years researching different solvent systems and fiber raw materials. Initially we found the Plafco system and proved that it can be produced by modifying the existing technology available. We patented the technology at the university and transferred the IP rights to Plafco Fibertech in 2017 in order to convert the results into industry applications.

What makes the technology so unique?

J. Valkama: Plafco is made from paper, which is developed by the company itself, and large rolls are made by paper factories following directions that they are given. Chemical pulp fibers are available globally in large amounts at competitive price levels. This secures high availability and affordable production costs for Plafco. The transformation into a plastic substitute product includes introducing the paper into a bath in which chemicals first dissolve part of the cellulose from the natural fibers. The chemicals are based on sodium hydroxide and urea, which are very common chemicals used in different industries. The dissolution chemicals are then removed by washing in the following step. The dissolved cellulose acts as a glue, automatically filling all accessible gaps in the paper. After drying, the new material is ready for use in paper-converting units. The Plafco material is much stiffer, stronger, denser and more uniform, giving the material airtight and also oil-proof properties. Food stuff suitability is also one important property of Plafco.

Which obstacles have you had to master so far?

J. Valkama: Plafco has been topping lots of material tests and the product has generated very high interest in industries. Pulp producers, paper manufactures, machine suppliers, packaging producers and end customers have given very positive resonance that one might think it should be easy to get the "baby" running. The biggest obstacle so far, however, has been to get the first funding for the piloting unit. We are talking here about an investment-intensive start-up. We have been ready for more than a year to start the build-up of the piloting plant for production. Actually, we are looking for a funding of €3 million and running several negotiations regarding the funding, but still no deal has been signed. So, we are having a chicken-egg problem in the death valley of a start-up company. I believe that we are going to get the first pilot unit, with a capacity of about 5.000 t/a, cleared this year.

What has been your most exciting project so far?

J. Valkama: Our most exciting project was to develop a packaging for tissue handkerchiefs made of the handkerchief itself. The Plafco packaging fully replaces the traditional PE plastic packaging and makes the product much more sustainable. Being able to make the Plafco process work in very low grammages of less than 20 g/m² was very exciting. Also, this product was our first demo product made all the way from raw material to the end product including the printing. We showed that the idea works and that the process in the future can be a real game changer in the industry.

What will be the next steps to develop the technology and the company?

J. Valkama: Our R&D and product development is running every day, we have done the pre-engineering ready and are focusing on finding a partner, who is ready to invest on our company to get the pilot plant running. The whole technology and process development can be made with the pilot unit only. We have finished all development projects on the laboratory scale and focus on product development for potential end customers. We are still almost booked out in the laboratory and are working with very interesting partners from the food stuff, medical, paper, energy and auto motive sectors.

Business Idea

Plasticized Fiber Composite

The aim of Plafco Fibertech is to commercialize the use of a new type of wood based cellulosic fiber composite for applications in, amongst others, the paper, packaging and construction industries. Plafco, i.e. plasticized fiber composite, is a new material whose manufacturing process is protected by an EU patent in several EU countries. Plafco is an affordable and fully bio-based, biodegradable, marine degradable, compostable, and recyclable material. In comparison to most paper or plastic materials, Plafco has higher strength, stiffness and density, which allows the use of less material in end products, but also to save in additional coatings.

The unique material is fully bio-based combined with the strength characteristics corresponding to many plastics and market leading corrugated boards. Although Plafco has unique properties like high surface homogeneity and moisture resistance, its manufacturing process is similar to that of paper industry processes and, therefore, known technology, excluding the novel Plafco process phase add-on developed by the start-up.

Production is possible with existing paper machine technology. The production principles and scale of properties enhancement of the material have been verified by a proof-of-concept pilot during the research phase and consequent hand-made pilot demo product trials.

The core business idea of the company will be to become a licensor of the technology required to manufacture the Plafco material and support the customers by technical and product-specific consulting as well as being a supplier for special Plafco products. Licensing may apply to the sale and manufacture of machines, raw materials, end-user products and other manufacturing equipment.

A chosen machine manufacturing partner is expected to join forces with the company in a joint endeavor where the machine company is allowed to manufacture Plafco machine units under a license for fixed yearly license fee and fee per units sold under the license. Special Plafco products include high-profit, small-amount products e.g. for medical and electrical applications.

- Plafco Fibertech Oy
  Helsinki, Finland

Elevator Pitch

Milstones and Roadmap

Plafco Fibertech was established in 2017 in Helsinki, Finland, and in the meantime has opened an operative arm in Germany. The eponymous plasticized fiber composite (Plafco) material can be a game-changing innovation for a more sustainable future. The start-up company was founded to industrialize the production technology for the material, a patented process to transform raw paper into the composite material.

Milestones

2014 – 2017
- WoodWisdom EraNet project COMPAC (plasticized lignocellulose composites for packaging materials)
- Plafco production process technology patented

2017
- Establishment of Plafco Fibertech
- Blue Sky young researcher award for co-inventor Tero Tervahartiala

2018
- Business Finland funding for pre-engineering study

2019
- Cleantech Scandinavia Top 25 finalist
- Sustainability award Top 25 finalist
- First demo products launched and published

2020
- Pilot plant proof-of-concept finished
- Winner of NEO2020 award

Roadmap

2021
- Funding for pilot plant and build-up of the pilot unit

2022
- Demo production, technology development

2023
- Pre engineering for industrial unit

2024
- Build up and start of first industrial production unit

2025
- Licensing

Jukka Valkama, CEO, founder and shareholder of Plafco Fibertech, in the company's laboratory-scale pilot plant. The start-up is looking for a funding of €3 million to start the build-up of the piloting plant for production.

The plasticized fiber composite material can be used to substitute plastics in products such as single-use drinking straws as well as to replace multilayer paper packaging by a more stiff and wet resistant one-layer product.