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Research area: Product aims

Paper, paperboard and board // Technical specialty papers

Key words:

Ceramic, preceramic paper, filtration, support, membrane

TITLE:**Submerged flat filter membranes based on pre-ceramic papers****Background/Problem area**

Membrane filter systems (support & membrane) can be made of ceramic or polymer materials. Ceramic filter systems compared to polymer filter systems have different properties and useful advantages regarding:

- a) Higher bio-inertness
- b) longer life cycles
- c) higher temperature resistance
- d) better regeneration

Since polymer filter systems are cheaper they have the greatest market share of low-cost applications in the area of micro-, ultra- and particle filtration.

Ceramic filter structures are limited mostly to tubes, which are produced by extrusion technologies. Conventional ceramic submerged flat filter systems are also made by extrusion which causes higher costs.

Objectives/Research results

The objective of this project is to develop a technology to using pre-ceramic papers after sintering in submerged flat fluid filtration systems. Pre-ceramic paper derived ceramic (PT-Ceramic®) will work especially as the filter support. A special filter membrane will be applied by water based membrane coating technologies on top of the paper derived PT-Ceramic®. The membrane coated and shaped ceramic structure will be built in adapted module concepts.

The project is splitted in four parts:

1. Paper development and shaping technology (Papiertechnische Stiftung)
2. Thermal conversion (sintering) (Werkstoffzentrum Rheinbach GmbH)
3. Development of Membrane coating technology (atech innovations GmbH)
4. Development and adaption of module concepts (SGS Aqua Technologies GmbH)

Within these four parts quite a lot of development work has been done. PTS developed the paper making process and sorted out some good working paper qualities. The focus was to create a maximum homogenous paper which can be converted into a permeable and solid ceramic filter support structure. PTS improved the densification, corrugating, cutting and gluing process for multi layer systems. WZR supported the corrugating and gluing process. Also WZR adapted and optimized the sintering process. Atech developed the application of a micro filtration membrane and first filtration tests performed successful (milk filtration test!). SGS developed a polymer casting compound to fix the ceramic filter discs within a modular box. Next step is to produce a prototype.

Application/Economic benefits

The use of pre-ceramic papers as flexible green body before sintering combined with paper converting technologies promises new flat and formed filter structures with great filter areas (for example corrugated structures). This new process should deliver a cost reduced way to achieve new market segments in low cost water filtration. The focus herewith is the application of submerged flat membranes in local waste water treatment plants.

The research results will be used by German paper manufacturer and converting plants. Secondly, they will have an impact on the future trend of German SMEs (small or medium-sized enterprises) in the membrane and environmental industries. Low cost applications of pre-ceramic based filter systems could evolve into a totally new market for German enterprises once the current technical problems such as porosity and strength has been solved in research projects.

Project period : 01.10.2009 – 30.09.2011

Remarks

The research project ZIM-KF 2037906WZ9 is being funded by the German Federal Ministry of Economics and Technology BMWi and is being performed together with Werkstoffzentrum Rheinbach GmbH, atech innovations GmbH and SGS Aqua Technology GmbH.