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Lyocell

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The EMPEROR‘s new CLOTHES? – No!

A *QUIET* BUT *REAL EVOLUTION* IN THE *TEXTILE INDUSTRY*

Our one-stop shop is ready to go

“We realized quite quickly that cellulose would play a key role in the fiber industry of the future. Initially, the challenge was to turn innovative ideas from the laboratory into reality in industry. We succeeded in creating an open, scalable technology platform. And we can now provide for many types of solvent (including NMMO, ionic liquid, caustic soda, phosphoric acid and others) and for every cellulose pulp, whether from wood, recycled textiles or plants like hemp independently of the water content (from “never-dried pulp” (i.e. from a cellulose pulp taken directly ex-works without intermediate drying) to pulp from cellulose sheets and ground, dry cellulose) an industrial process. This process solution includes the suitable pretreatment of the cellulose (using chemicals, enzymes, etc.) and the dissolving and spinning for all uses, whether for staple fibers, textile filaments, technical filaments or customer-specific processes.

Our ultimate goal has always been to develop a solution for industry use. Our one-stop shop is now open!”

Karsten Güdemann
CEO of LIST Technology AG

The fashion industry currently produces 10% of global CO_2 emissions and this trend is being accelerated by the rapid growth of the middle classes. With agricultural land for global cotton farming reaching its limits and more people than ever before understanding the importance of sustainability, there is a great opportunity for the cellulose-based fiber industry to make up for the shortage of cellulose with a sustainable processing technology.

It is in this context that Lyocell fibers offer a number of advantages. They are renewable, biodegradable and do not involve the use of microplastics. In addition, unlike viscose fibers or cotton, producing Lyocell fibers does not require the use of toxic chemicals, herbicides or pesticides. Thanks to their higher fiber strength, it is hoped that Lyocell fibers could also replace oil-based polyester fibers, which are increasingly coming under pressure from consumers and politicians because they are neither renewable nor biodegradable. In addition, oil-based polyester fibers also produce 170 times more CO_2 emissions than Lyocell fibers. Another trend which aims to meet the rising global demand for sustainable textiles is the emergence of all kinds of innovative solutions for pretreating and dissolving cellulose pulps made from wood, plants like hemp and recycled textiles.

By raising capacity limits and enabling new qualities In order to achieve economies of scale in production, manufacturers of commodity Lyocell fibers can implement the highest possible production capacity per production line. However, the current capacities are still lower than in the production of viscose fibers. LIST Technology now plays a crucial role in developing and implementing a new generation of Lyocell technology to enable higher plant capacities.

The new requirements for textile fibers

- Biodegradable
- Renewable raw materials
- No use of microplastics
- Reduced carbon footprint

In the race for companies to establish themselves in the new world of the textile fiber industry, various cellulose raw materials are being examined with regard to their suitability for cellulose fibers. This means that the spinning solution quality requirements for spinning filaments are also becoming increasingly strict.

This is where LIST's new generation of Lyocell technology plays a vital role, not only in developing spinning solution methods for higher quality products and products made from alternative raw materials, but also in increasing plant capacities.

NEXT-GENERATION fibers

The challenge

We currently face a wide range of challenges, reflecting our wide variety of customers. For instance, while in one project we are focusing on the purpose of a new cellulose, in others we are aiming to apply an innovative, new solvent or to ensure greater homogeneity in the spinning solution.

Other challenges include treating cellulose with too high a degree of polymerization and dealing with a spinning solution that does not spin even though the cellulose pulp seems to have completely dissolved. Ultimately, we want and need to put all our findings into practice on an industrial scale.

With its next-generation Lyocell project, LIST is running a state-of-the-art, Technological Center of Expertise covering pilot machines, analytics and personnel for developing every type of dissolving method for all cellulose pulps.

LIST Technological Center of Expertise

Center of Expertise for *CELLULOSE SPINNING SOLUTION METHODS*

Wet-spinning method

For cellulose pulps with a surplus of water, LIST uses its own special approach called the *LIST Combo* - Process. This is a two-stage process, comprising an efficient evaporation stage followed by a dissolving and homogenization stage focused on quality. This separation of stages allows higher industry capacities to be reached than is the case with the current industry standard. The standard method brings both process stages together in a single apparatus and results in not only a limited production capacity but also a trade-off between efficiency on the one hand, and quality and safety on the other. What is so elegant about the *LIST Combo* - Process is that it is easy to scale the results in a pilot or laboratory scale. Generally speaking, methods used for large scales are not suitable for pilot and laboratory scales. It goes without saying that these limitations in scalability also apply to the *LIST Combo* - Process. Since the evaporation stage (stage 1) is not relevant for the product quality, development can be limited to the process stage (stage 2). This means that you can start with the Laboratory KneaderReactor at a scale of 100 grams and simply apply the results to larger capacities.

Additional cold dissolving Process

As part of the “NeoCel“ research project funded by HORIZON 2020, LIST successfully implemented a new LIST KneaderReactor type. For the project, the processing task was to dissolve a cellulose pulp with a NaOH-based solvent while cooling it. This technology is now available to all of our customers for every type of cold dissolving processes, whether for acid or alkali-based processes.

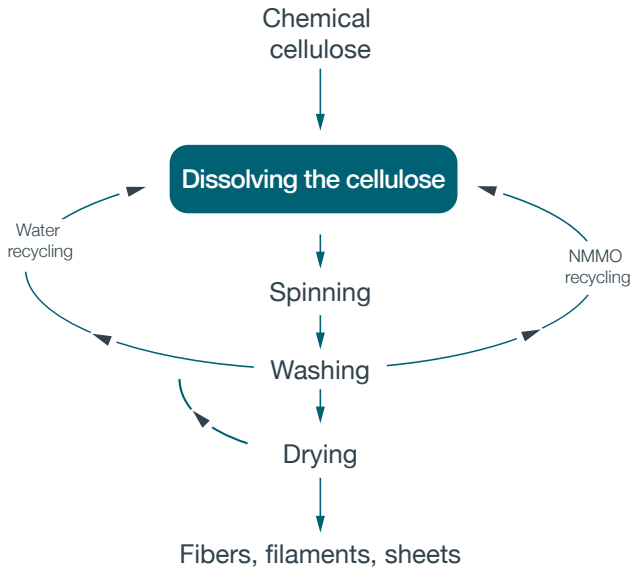
LIST Combo - Process

- Easy
- Robust (stand-by mode)
- Increased capacities
- Better quality
- Flexibility
- Simple application from the pilot scale
- No compromise between quality, efficiency and safety

Your success is our success!

Only if you can properly implement your entrepreneurial ideas and aims we can both be successful. We know the hurdles that can arise between having an idea and arriving at the finished product. Our task is to work together with you in order to successfully overcome these hurdles.

In everything we do, we are results-oriented and focused on implementation in industry.

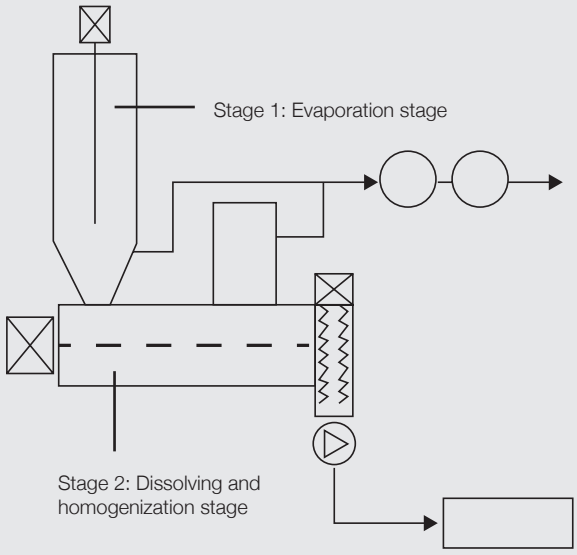


The LIST Competence & Test Center

We collaborate with our customers at the LIST Competence & Test Center in Arisdorf, Switzerland, to come up with customized solutions. In addition to the technical equipment at the Test Center and our expertise in technical processes, LIST offers a wide range of services for addressing special, complicated and customer-specific challenges in the field of rheology.

Our customers have access to LIST's specialists and over 50 years of experience in dealing with highly viscous media, innovative spinning solutions to ensure high homogeneity at large capacities, and our network of complementary technology providers and institutions.

The *LIST Combo* - Process



Advantages

- Higher Safety
- Higher Capacity
- Lower Power Consumption
- Flexibility
- Higher Quality

LIST Technology AG

LIST KneaderReactor Technology is a key technology for optimizing processes in high viscosity processing technology. We focus on industrial processes that work without the use of solvents and that run-in the concentrated phase. This allows us to reduce the energy and material costs, thereby also lowering production costs. LIST KneaderReactor Technology brings significant advantages when carrying out processes such as bulk polymerization, crystallization, process intensification, polycondensation, drying, main evaporation, devolatilization, chemical reactions, dissolving, mixing and reactive compounding, sublimation and torrefaction. These advantages include high process reliability, low energy consumption, pioneering sustainability, high product consistency, maximum plant availability and the largest production scales in the world.

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LIST
Kneading - Mixing - Drying