

# List: improved lyocell dissolving system

The lyocell fiber process is developed to transform cellulose to a man-made cotton-like fiber [1]. The lyocell process includes a number of processing steps. The dissolving step is the most important one. It represents the heart of the lyocell technology. Kneaders developed by List AG, Arisdorf/Switzerland, are successfully applied for the continuous dissolving step whereby raw materials of different origin can be processed and transferred into a spinable dope.

The List Lyocell Dissolving System (LLDS) is a part of the solvent-spun fiber technology for natural raw materials. The 5<sup>th</sup> generation is now developed providing 2 process alternatives.

### Twin-step process

The twin-step continuous process is for plants with large capacities (Fig. 1). It

comprises the premixing and dissolving steps. The premixing step mixes and homogenizes the cellulose with the solvent and swells the pulp. The dissolving step transfers the pulp into a wet spinable dope.

### One-step process

The One-Step process fulfils the require-

ments for small amounts of spinable specialty dope for filament yarns, film and dopes for special technical applications. In one unit cellulose is mixed, homogenized and dissolved. Parallel to this, additives can be added to the process to produce modified dope with specialized properties (Fig. 2).

To date, the twin-step technology is built for production capacities of up to 15,000 tons/year per line. The one-step LLDS is designed for capacities up to 2,500 tons/year cellulose based materials (Fig. 3).

### Fifth generation of LLDS

Five generations of development have

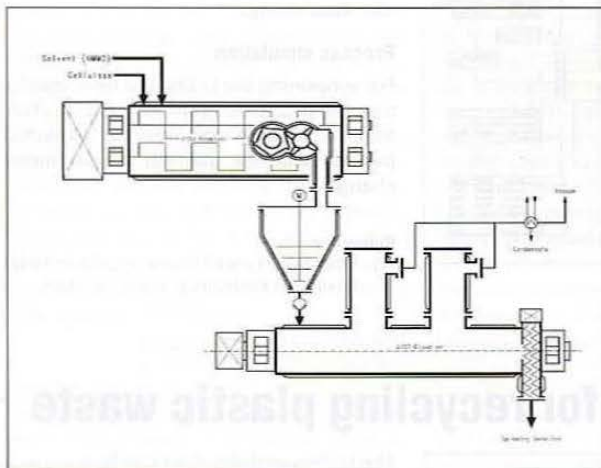


Fig. 1 Twin-step continuous process

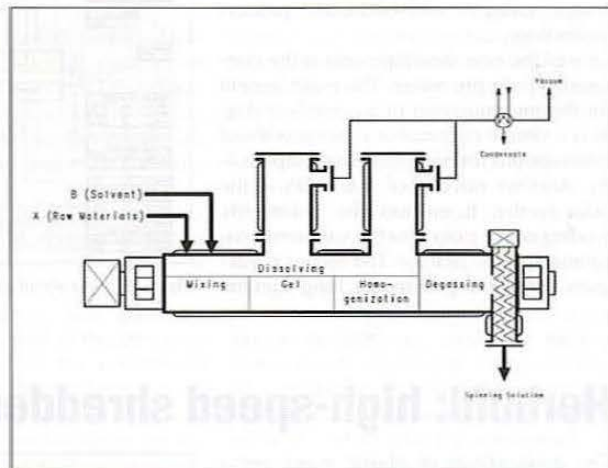


Fig. 2 One-step continuous process

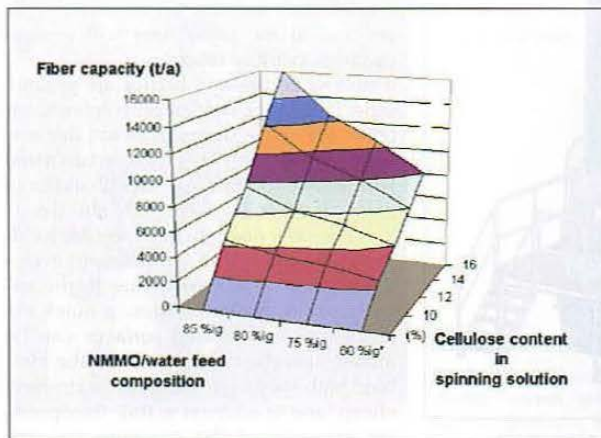


Fig. 3 Lyocell dissolving system capacity



Fig. 4 Continuous pulp pre-mixer

## Raw Materials



Fig. 5 Volumetric pulp feeder into vacuum

created technology improvements, process know-how and expertise. They represent today's state-of-the-art process technology.

One of the new developments is the continuous pulp pre-mixer. The main benefit for the incorporation of a pre-mixer (Fig. 4) is a simple continuous process without interruptions for homogeneous pulp quality. Another novelty of the LLDS is the pulp feeder. It ensures the volumetric feeding of the pulp into the vacuum environment of the reactor. The feeder is vacuum tight and guarantees long lifetime

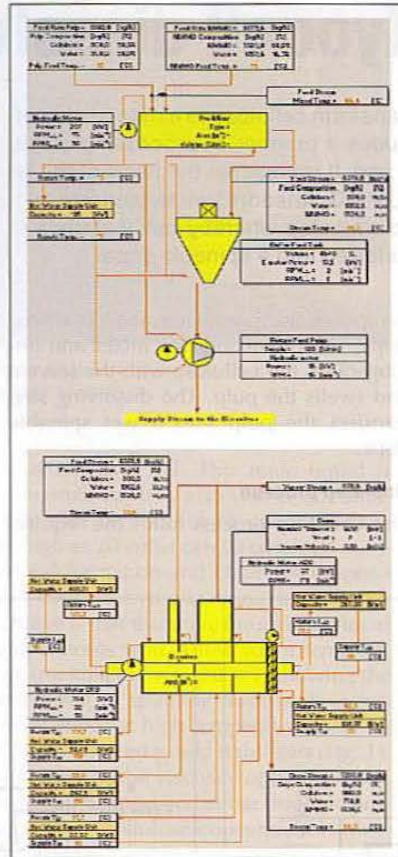


Fig. 6 Process simulation

(Fig. 5). Its design is List proprietary. For a reliable discharge of the dope from the reactor a discharge system was developed. It transports the dope at low shear through a pressurized pipe and degasses it for bubble free spinning.

### Benefits of the process

The LLDS produces with different raw materials an excellent quality of dope for man-made staple fibers, foils and filament yarns and films. Is characterized for the high solvent recycling rate. It is adjustable in shear rate and swelling/dissolving time according to the source of the raw materials. This opens the possibility to transfer low cost raw materials to high quality staple fibers, which are like cotton.

The outstanding feature of the LLDS is manifested in its process safety. LLDS operating at process temperature below 100 °C switches automatically in a safe mode, through efficient product temperature monitoring.

### Process simulation

For supporting the LLDS, List developed a process and scale-up model (Fig. 6). This tool is suitable to illustrate expected process data for start-up or parameter changes.

### Reference

- [1] Fiber Table Lyocell Fibers, 1<sup>st</sup> edition 1997, Deutscher Fachverlag, Frankfurt/Main