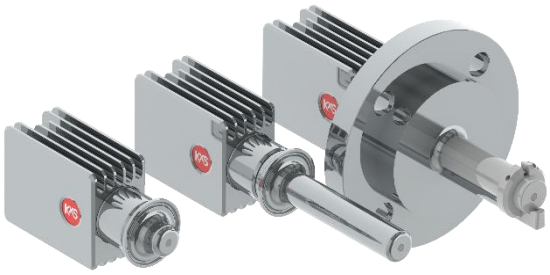
Benefits of R.I. measurement

- Guarantees consistent starch quality for uniform paper sizing
- Improves printability and surface performance of paper
- Reduces raw material waste and process variability
- Enables tight control over dilution and cooking performance
- Minimizes manual sampling and operator workload



Overview

Cooked starch is used in paper sizing to reduce the paper's tendency to absorb liquids after drying. This treatment ensures inks and coatings remain on the paper surface for better print quality and finish. Starch sizing also enhances paper smoothness, printability, and surface bond strength, while reducing porosity and fuzzing.

Achieving optimal starch quality for paper sizing starts with a precisely formulated starch slurry, tailored to meet the specific dry solids content and viscosity required for each paper grade. Maintaining this balance is critical for both product performance and process efficiency.

With refractive index measurement, the starch concentration can be monitored continuously and in real time, enabling tight control over slurry composition.

Refractive index measurement

The liquid is usually cooked in continuous or batch cookers or in-line jet cookers. The starch is cooked by introducing steam directly into the starch slurry. After cooking, the starch is cooled and diluted to the desired concentration by adding water before it enters the storage tank.

In modern paper sizing processes, fully automatic in-line jet cooking offers an efficient and consistent method for preparing cooked starch. In this process, starch slurry is rapidly heated and mixed by direct steam injection, causing the starch granules to swell, hydrate, and dissolve almost instantaneously.

This rapid transformation ensures uniform gelatinization and breakdown of starch chains, forming a stable and homogeneous solution.

The process begins with blending fresh water and dry starch to form a slurry in a mixing tank. This slurry is then circulated through a high-velocity venturi section of a direct steam heater, where it is cooked at 120–130 °C (248–266 °F). The intense heat and turbulence result in effective starch conversion, making it ideal for continuous, high-speed paper production environments.

Instrumentation and installation considerations

The KxS DCM-20 Process Refractometer is used to control the concentration of the cooked starch. The refractometer verifies that the liquid has been properly cooked/prepared and diluted to the correct level.

Accurate inline concentration measurement ensures repeatability in the sizing process and supports optimal paper quality and grade consistency. The typical measurement range is 0–15% starch by weight.

The DCM-20 refractometer is installed inline in the main process line or in a bypass loop after the starch cooker and before the storage tank.

Automatic prism wash, using high-pressure warm water, is recommended to prevent prism fouling and ensure reliable, maintenance-free operation.

Key benefits of in-line refractive index measurement in starch preparation

KxS DCM-20 refractive index measurement offers a selective and direct method for measuring the concentration of dissolved starch in the liquid phase. It is unaffected by entrained slurry solids, or gas bubbles. The refractive index method delivers a direct correlation to starch concentration, enabling precise, real-time monitoring that integrates seamlessly with DCS and automated control systems.

With full-range temperature compensation, the DCM-20 ensures accurate readings from ambient startup to high operating temperatures common in starch cooking. Its robust optical design ensures long-term reliability and minimal maintenance requirements.

In contrast, density-based instruments measure the overall density of the slurry mixture, which includes dissolved starch, suspended solids, and air bubbles. This may make them susceptible to interference from non-dissolved materials, and may lead to indirect and potentially misleading results, especially when solids content varies. These systems also often require frequent calibration and come with higher operational costs over time.

In summary, refractive index measurement provides an accurate, stable, and application-specific solution for monitoring starch concentration in paper sizing processes. It focuses solely on the dissolved phase, offering superior control and reliability, were consistency and product quality matter most.