PROCESS BULLETIN

# Rosin Emulsions

## Description

Rosin emulsions consist of a resinous phase dispersed in a water phase. They are used as a size in paper manufacture. Sizing is a material used to fill in the pores on the surface of paper. Sizing can "form a solid, continuous surface film, imparting such characteristics as smoothness, stiffness, weight and lustre." (Encyclopædia Britannica®, 2000). When used as internal sizing, the rosin emulsion is added to an aqueous suspension of cellulose fibers at various stages before sheet formation. When used as external or surface sizing, the paper sheeting is formed first, and it is treated subsequently by known methods with the rosin emulsion to provide sized paper. These sizes contribute to the desired mechanical properties of the paper by virtue of the adhesive properties of the resin particles through which cellulose fibers become firmly linked. The rosin originates from certain types of woods (wood rosins) as tree exudates (gum rosins) or from tall oil (tall rosins). Rosins are usually composed of about 90% resin acids and 10% neutral compounds. The principal resin acid is abietic acid. In most cases it has been found desirable to modify rosin properties by reacting it with certain adducts such as maleic anhydride or fumaric acid. Rosins are mostly solid at room temperature, but when the emulsion is made, the rosin would be in a molten/liquid form.

Most rosins can be saponified by suitable reaction with a caustic, in which case they emulsify almost spontaneously when stirred into water. However, this imposes the necessity to precipitate these emulsions further down the process line by use of alum (aluminum sulfate). Consequently, the resulting effluent is rich in sodium sulfate. Because this salt is difficult to remove from purification basins, this process has a serious drawback from the point of wastewater pollution.

## Objective

The objectives are to produce a rosin emulsion of sufficiently fine particle size (0.1-1 micrometer); to avoid the use of alum as a precipitating agent; to obtain a paper size of superior quality that imparts improved drainage of water to the fiber mass during paper manufacture and results in paper products with improved mechanical strength.

## Equipment and Processing

An APV homogenizer fitted with selected wear-resistant parts and a two-stage homogenizing valve assembly is used. The second-stage pressure should be between 10-15% of the total homogenizing pressure (which will be determined by the type of rosin processed). Because the rosin product has a softening/melting point range between 150° and 200°C, the processing conditions call for high temperature provisions, including high pressure premixing vessel; jacketed and insulated feed pump and piping; a double-packed, special-design homogenizer cylinder block and a product cooler. In some cases this direct method of emulsifying molten rosin into a pressurized aqueous phase is replaced by a so-called indirect method. In the latter process, rosin is dissolved in a suitable solvent, such as methylene chloride, rendering this mixture fluid at much lower temperatures (40° to 120°C) than the molten process. The diluted rosin can then be emulsified and homogenized in a more traditional manner; nevertheless, using pressures up to 5000 psi. After this treatment, the solvent is removed by distillation.

## Testing

Routine testing is done using an ordinary light or phase contrast microscope. For more elaborate tests a particle-size analyzer can be used. In most cases, it is also imperative to conduct storage tests as a check on sedimentation of oversized particles that may be present due to a slight but critical deficiency in emulsifier concentration.

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