# Phenomena of hornification and influencing factors

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Delignification, achieved through chemical cooking and bleaching, leads to micro and macro pores and primary fibrils on the fiber's internal and external surfaces, which contribute greatly to the strength of the paper product once formed, pressed and dried. Nevertheless, once the freshly produced never-dried fibers have been initially dried, permanent closure of the pores, collapse of the lumen and reattachment of the fibrils to the fiber surface make it impossible for the pulp to regain its original properties through hydration. This process was first described as "Verhornung", later renamed as hornification, in the early 40s by the German scientist G. Jayme. Due to the nature of chemical cooking and bleaching, chemical fibers suffer from hornification, leaving the market pulp producers condemned to losing 30% of the strength of the pulp processed through their dryers.

Hornification, not a deeply studied subject in the pulp and papermaking field, is more relevant to pulp producers and their customers than first thought, due to the growing importance of market pulp versus integrated paper production. During the research performed in collaboration between EDT and Mercer, hornification was proven to cause a reduction in the water holding capability of the fiber and the strength of the fiber network, which impacts users of market pulp worldwide

This series of studies are pointed towards measuring the micro- and macro effects of hornification in an effort to mitigate the losses from this cause. While other techniques to reduce the hornification penalty in pulp dryers have been proven unsuccessful or not suitable for full-scale operation, the right enzymatic treatments can be efficient in mitigating these losses and producing a stronger pulp for the pulp and paper producers: introducing EDT's patented technology pRefinase®.

The potential of the enzymatic blend pRefinase® has been confirmed through both laboratory- and full-scale experiments, resulting in faster drainage, stronger pulp, enhanced refinability, and reduced hornification as benefits to the pulp producer and the paper manufacturer. During this presentation, the physical and morphological advantages of treating European NBSK from Mercer Stendal and Rosenthal sites are presented for both unrefined and refined samples. An in-depth study of the effects of hornification in paper production and its relation to the drying intensity are also presented.