

# The Roles of Potassium in Kraft Recovery Operations

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## ABSTRACT

K (potassium), along Cl (chloride), has long been considered as an undesirable non-process element (NPE) in the kraft recovery process, due mainly to its role in accelerated superheater corrosion, fouling of tube surfaces and in plugging of gas passages in recovery boilers. These effects of K, however, are insignificant if the Cl content is low. In evaporator, causticizing plant and lime kiln operations, K has literally no effect.

Due to its enrichment in precipitator ash, K is controlled by either purging and/or partially treating ash. Purging precipitator ash effectively removes not only Cl and K, but also Na and S, resulting in substantial chemical losses. Several ash treatment systems are presently available, but most cannot remove K as effectively as Cl.

Based on material and charge balances of individual components in green and white liquors, the following relationship can be established:

$$\left[ \frac{\frac{\text{CO}_3}{60} + \frac{\text{S}}{32} + \frac{\text{SO}_4}{96} + \frac{\text{OH}}{34}}{\frac{\text{Na}}{46} + \frac{\text{K}}{78}} \right] + \left[ \frac{\frac{\text{Cl}}{71}}{\frac{\text{Na}}{46} + \frac{\text{K}}{78}} \right] = 1$$

Process Element

Non-Process Element

Of all anions ( $\text{CO}_3^{2-}$ ,  $\text{S}^{2-}$ ,  $\text{SO}_4^{2-}$ ,  $\text{OH}^-$ , and  $\text{Cl}^-$ ) in the liquor, only  $\text{Cl}^-$  does not take part in the pulping process. As such, only  $\text{K}^+$  associated with  $\text{Cl}^-$  should be considered non-process element; the rest be process element.

Since the Cl content in the green/white liquor is typically  $< 2$  mole%  $\text{Cl}/(\text{Na}+\text{K})$ , the vast majority ( $>98\%$ ) of K exists as PROCESS element. This means that removing K from the recovery cycle will inevitably require additional Na makeup to maintain the ionic balance of the liquor.