# Two Step Study of Flow in an Industrial Pulp Screen, Solved with COMSOL Multiphysics® Mixer Module Frozen Rotor

Ruben Wetind
Wetind Technology AB, Bullås 176, 86592 Alnö, Sweden, ruben@wetind.se

**Introduction**: Diluted pulp is screened in order to separate unwanted solids. The screen barrier, figure 1, consists of long vertical bars separated by narrow gaps. A rotor, figure 2, directs the flow to move orthogonal to the gaps while elements on the rotor cause cleaning pressure pulses

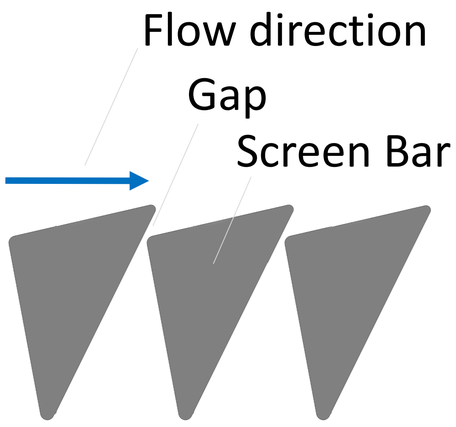


**Figure 1**. Barrier cross section

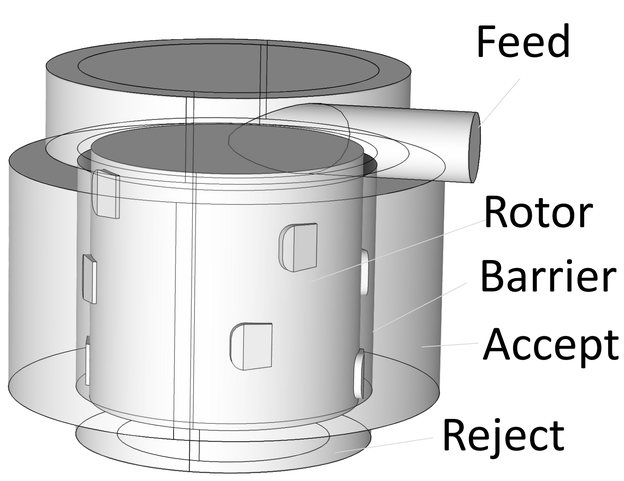


**Figure 2.** The pulp screen

## Computational Methods:

Step 1: A full screen simulation using Rotating Machinery Frozen Rotor k-ω approach is used. The screen bars are not resolved and barrier pressure loss is modeled using volume forces. An initial exercise to establish the relations between feed velocity and pressure over the gap is however necessary, figure 3.

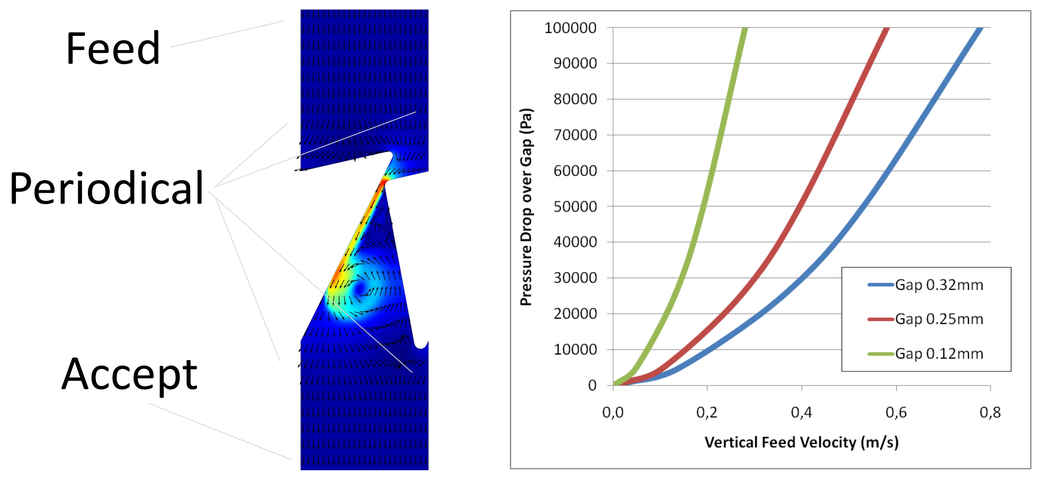


**Figure 3**. Pressure drop through barrier gap

Step 2: Flow close to the screen barrier is resolved using transient k-ω model.
The circumferential pressure variation is extracted from the first step result, figure 4, and used as feed BC.

**Results**: The strongly shear thinning fluid must be fluidized on the rough barrier feed side. It is further essential that rotor elements cause backflow pressure pulses in order to flush the barrier gaps, figure 4.

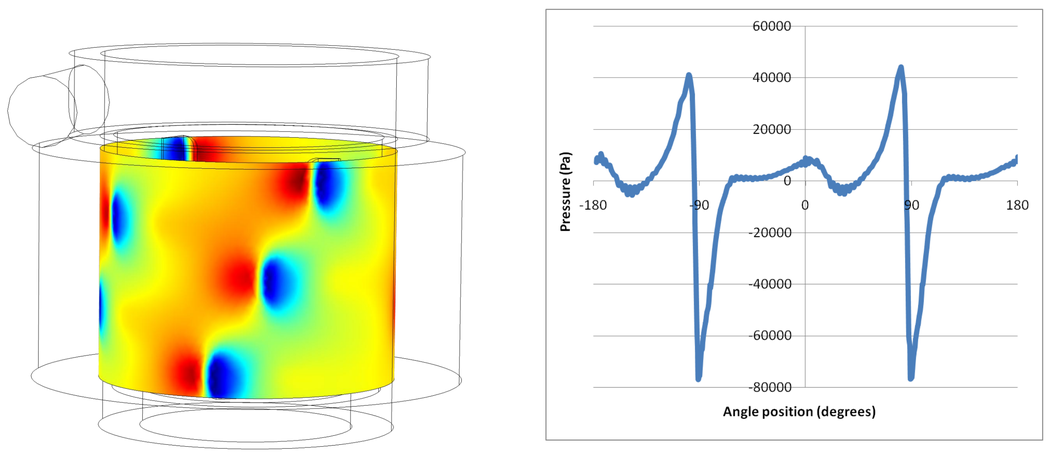


**Figure 4**. Pressure pulses from the rotor elements

Figure 5 displays the strong flow re-direction into the gap where stiff and heavy solids remains on the feed side. The cleaning gap backflow flush is clearly visible in figure 6.

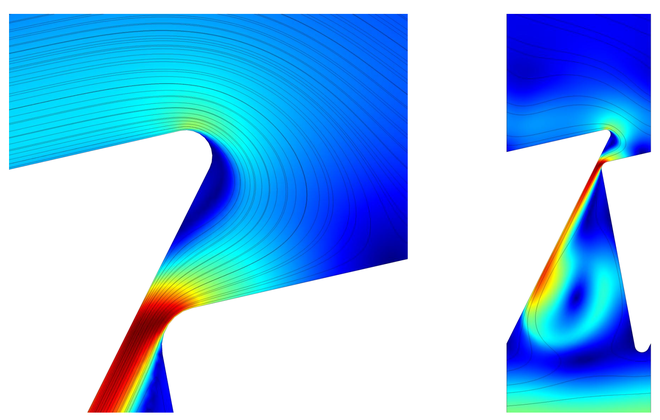

**Figure 5**. Screening gap flow at time 0.568s

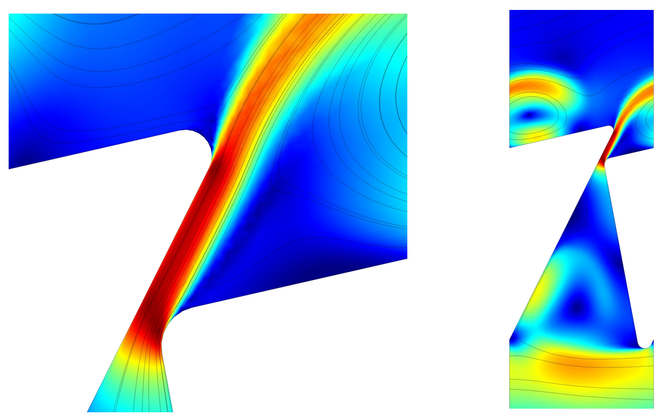

**Figure 6**. Gap backflow flush at time 0.585s.

**Conclusions**: The coupled relation between rotor element and screen bar design is crucial for the performance of the pulp screen. It is here found that present design fulfils basic demands.
Further, COMSOL Multiphysics® has qualified as a strong CFD tool for the demanding pulp and paper industry.