Demonstration site at Sandvik in Sandviken, Sweden

Phosphoric acid recovery using Nanofiltration

The demonstration case SANDVIK is carried out at the SANDVIK stainless steel production site in Sandviken, Sweden. Among other products, stainless steel tubes are produced in this production facility. A necessary process step is the pickling of the tubes, which is carried out with a mixture of phosphoric and sulphuric acid. The spent pickling acid is then neutralized and landfilled.

Phosphorus (P) is a limited resource of global importance with natural deposits that are restricted to a few countries. Most countries are heavily dependent on P imports while wasting the resources contained in sewage, industrial by-products or spent acid. Nanofiltration can enable P recovery from waste streams by allowing the phosphorus to permeate through the membrane and retaining multivalent impurities. The figure depicts the descriptive mechanism. During the INSPIREWATER project phosphorus recovery from spent pickling acid using nanofiltration is demonstrated at the Sandvik site in Sweden. By applying nanofiltration **over 50% of phosphorus recovery** can be achieved. The consumption of necessary process agents such as water and energy can also be reduced by 90% and 20% respectively.

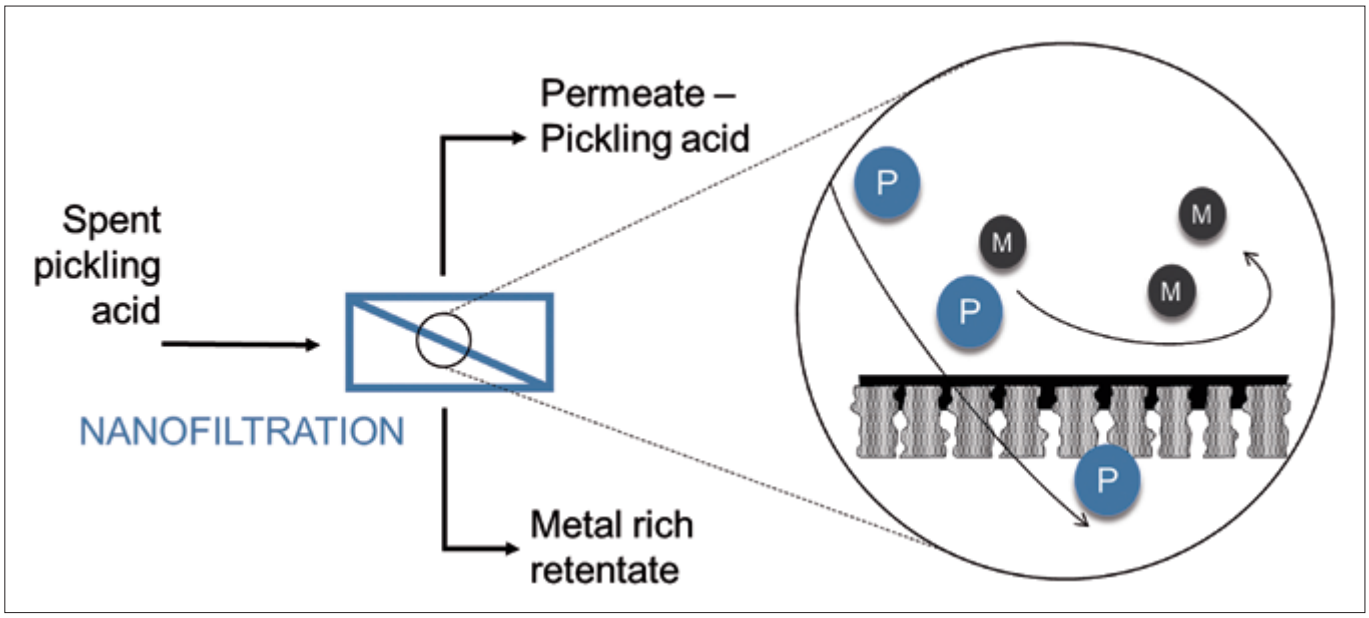

Figure 1: Scheme of P-recovery process at Sandvik

Objective in INSPIREWATER

The demonstration activities at the Sandvik site aim at a closed loop resource and water recycling. This includes the following specific objectives:

- Nanofiltration for phosphorus recovery from spent pickling acid at Sandvik site in Sweden is demonstrated
- Reverse osmosis for water and resource recovery from rinsing bath, towards zero liquid discharge is demonstrated
- The interplay of existing and new treatment units towards minimized energy and water consumption is optimized
- The waste to landfill is minimized
- Innovative membrane technologies such as layer-by-layer modification are screened

Technologies used for the treatment in the INSPIREWATER case study:

- Membrane technology (MF, NF, RO)
- Evaporation

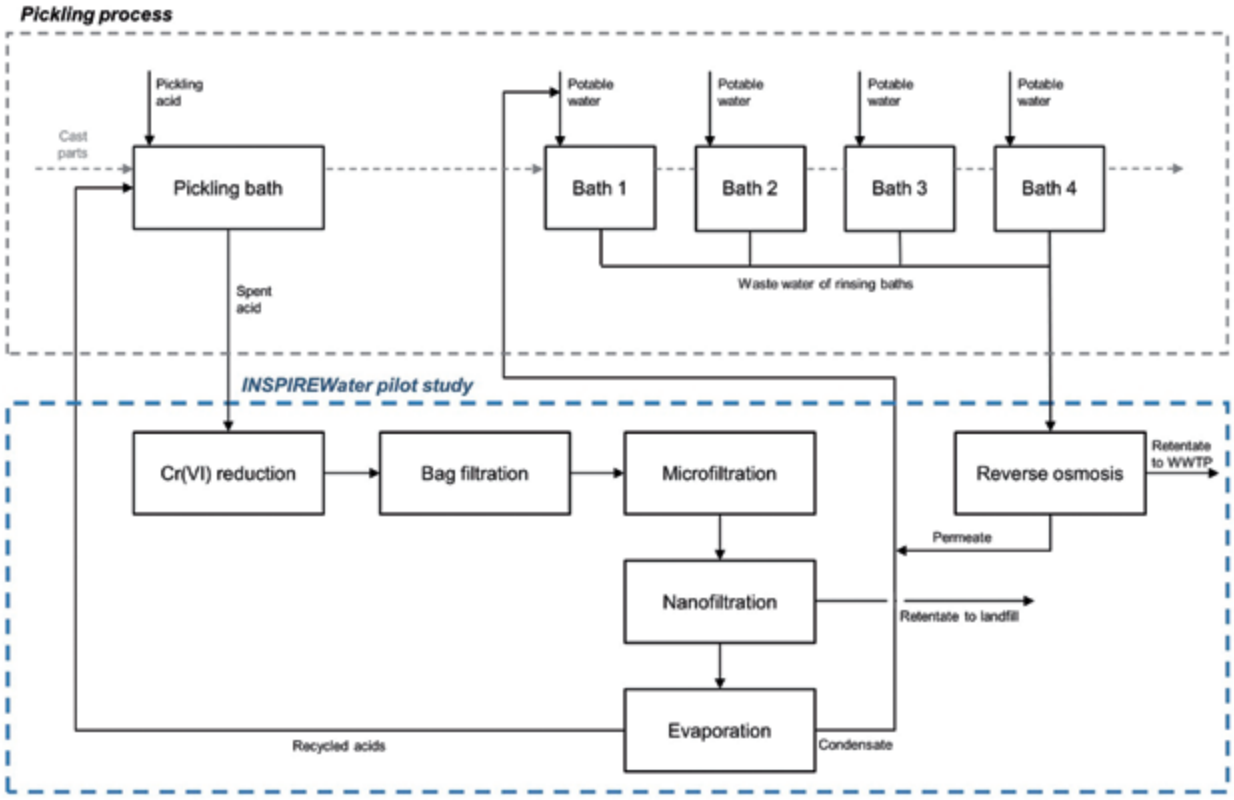

Figure 2: The closed loop recovery system for both pickling acid and rinse water at the SANDVIK demonstration case.

INSPIREWATER activities and results

	›55 % phosphoric acid recycling	**LCA**	By reducing phosphorus consumption the total environmental impact is reduced by ›80 %
	›90 % water reduction, towards zero liquid discharge	**LCC**	Operational cost can be reduced due to less resource and energy consumption
	15 – 20 % less energy consumption	**Technology**	Well established technologies are combined to an innovative process

Summary

P-recycling from spent pickling acid is leading to an economic and ecological more favorable process

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