

## Technical Factsheet: Magnetic separator

With the BFI magnet separator technology a chemical free, energy saving and very efficient separation of magnetic particles is possible. The high efficiency is based on the optimized positioning of the magnets for ensuring maximum removal efficiency up to 99% considering the particle properties and the use of permanent magnets. The energy saving consists of the pressure less operation compared to discontinuous sand filter requiring a pressure of 4 bar, leading to a high pump energy demand. A further advantage is the achievement of high concentration factors (= ratio of solid content inlet magnetic separator/solid content produced sludge) up to 1000 depending on process and steel grades compared to sand filters: factor 10-20 leading. Furthermore are the back flush water volumes of the BFI magnet separator technology with 0,06% of the treated flow much lower compared to 3-5% at discontinuous sand filtration, leading to lower sludge dewatering efforts (investment costs, operational costs).

### Working principle

- ▶ Particle separation by permanent magnets, shifted arranged in three lines in a flow through tank considering the particle properties
- ▶ Permanent magnets are placed in non-magnetic protection tubes
- ▶ Magnet/protection tube cleaning with two movable nozzle bars after emptying the tank and moving out of the magnets by hydraulic system
- ▶ Tailored water saving magnet cleaning by variation of spray time and water pressure
- ▶ Total cleaning time between stopping and restarting the feed flow about 5 minutes
- ▶ Flow rate of 50 m<sup>3</sup>/h with compact dimensions of height: 3.15 m, width: 1.47 m and length 1.90 m with a transport weight of 750 kg

### Advantages

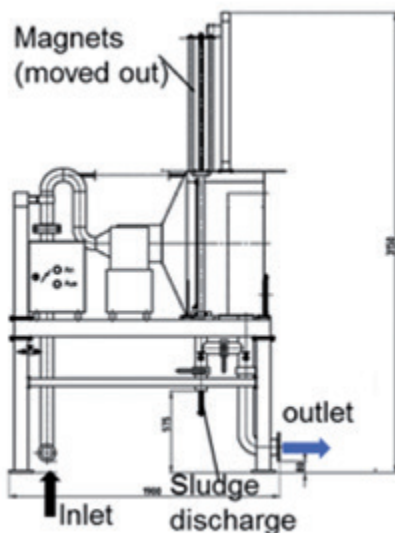
- ▶ High concentration of particles about factor 250 to 1000
- ▶ Solids contents in sludge up to 30 wt.-%
- ▶ Low backwashing water: Magnetic separator 0.06% - Sand filter: 3-5% of treated vol-ume flow
- ▶ Low space demand
- ▶ Reduction of energy demand (no operation pressure needed)
- ▶ Constant particle content despite fluctuating inlet particle content

### General data

Potential applications	Cooling water (e.g. hot rolling, scarfing) Gas washing water (e.g. blast furnace, basic oxygen furnace) Metal working emulsions (e.g. cold rolling, grinding) Quenching bathes (e.g. polymer)
Average energy consumption	none
Average chemical consumption	none

### Remarks

- ▶ Reduction of disposal costs by internal metallurgical re-use of separated iron containing particles as ore or scrap substitute



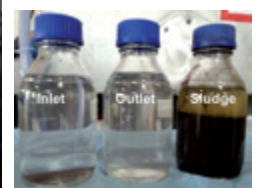
Pattern



Field trial



Covered Magnets



Inlet, outlet, sludge

**SWOT analysis**

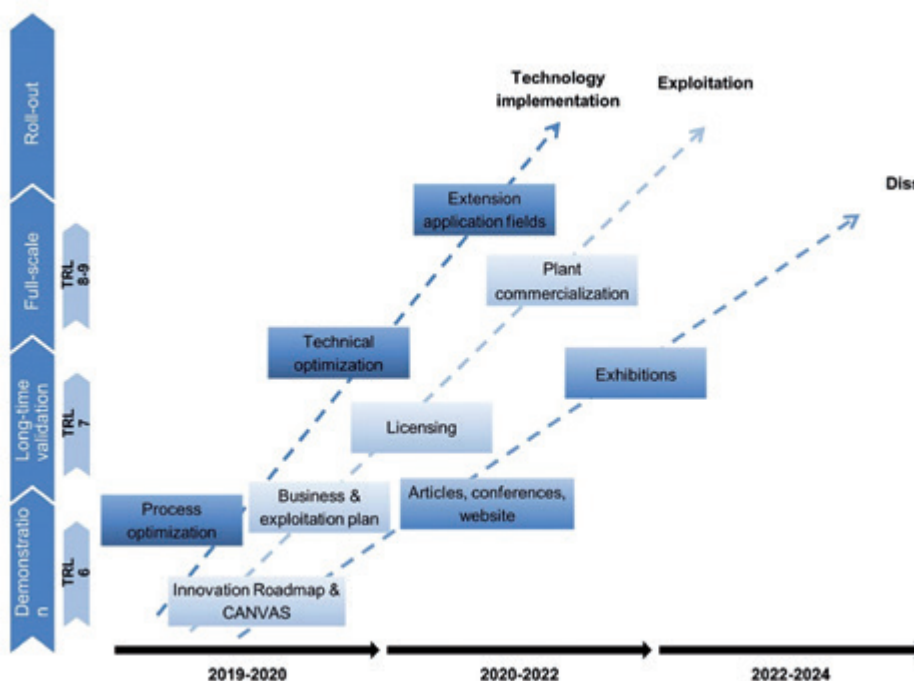
<b>INTERNAL</b>	<ul style="list-style-type: none"> <li>• Chemical free – metallurgical reuse of selective separated particles</li> <li>• Energy saving – pressure less operation</li> <li>• Low cleaning water demand</li> <li>• Low occurring sludge amount decreasing post treatment effort (only dewatering skip) – minimum factor 10 lower</li> <li>• Compact technology with no moving parts in direct contact with the solid containing cooling water avoiding wear and clogging</li> </ul>	<b>S</b>	<b>W</b>	<ul style="list-style-type: none"> <li>• Temperature limitation to 60°C inlet water temperature</li> <li>• Insufficient cleaning in case of high viscose oil in cooling water which is only at temperatures &gt; 40°C “water like”</li> </ul>
	<b>EXTERNAL</b>	<ul style="list-style-type: none"> <li>• Huge market potential in certain industries with different application fields e.g. treatment of different metal working fluids, gas washing waters and quenching liquids</li> <li>• Saving of operational costs (energy, chemicals) including low maintenance compared to conventional systems</li> <li>• Selective chemical free recovery of iron particles for metallurgical reuse</li> </ul>		<b>O</b>

**Key Performance Indicators (KPIs)**

KPI description	Unit	KPI
Solid removal rate	%	Up to 93
Outlet solid content	mg/L	10 - 15
Ratio sludge / treated volume	%	0,002 – 0,010
Solid content of sludge	wt.-%	19 - 31
Cleaning water demand	L	40

**References, patents and licensee**

References	–
Patents	–
Licenses	oxytec GmbH, Hamburg

**Overview Roadmap**

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