



Outotec

Boosting plant performance with
innovative solutions and services

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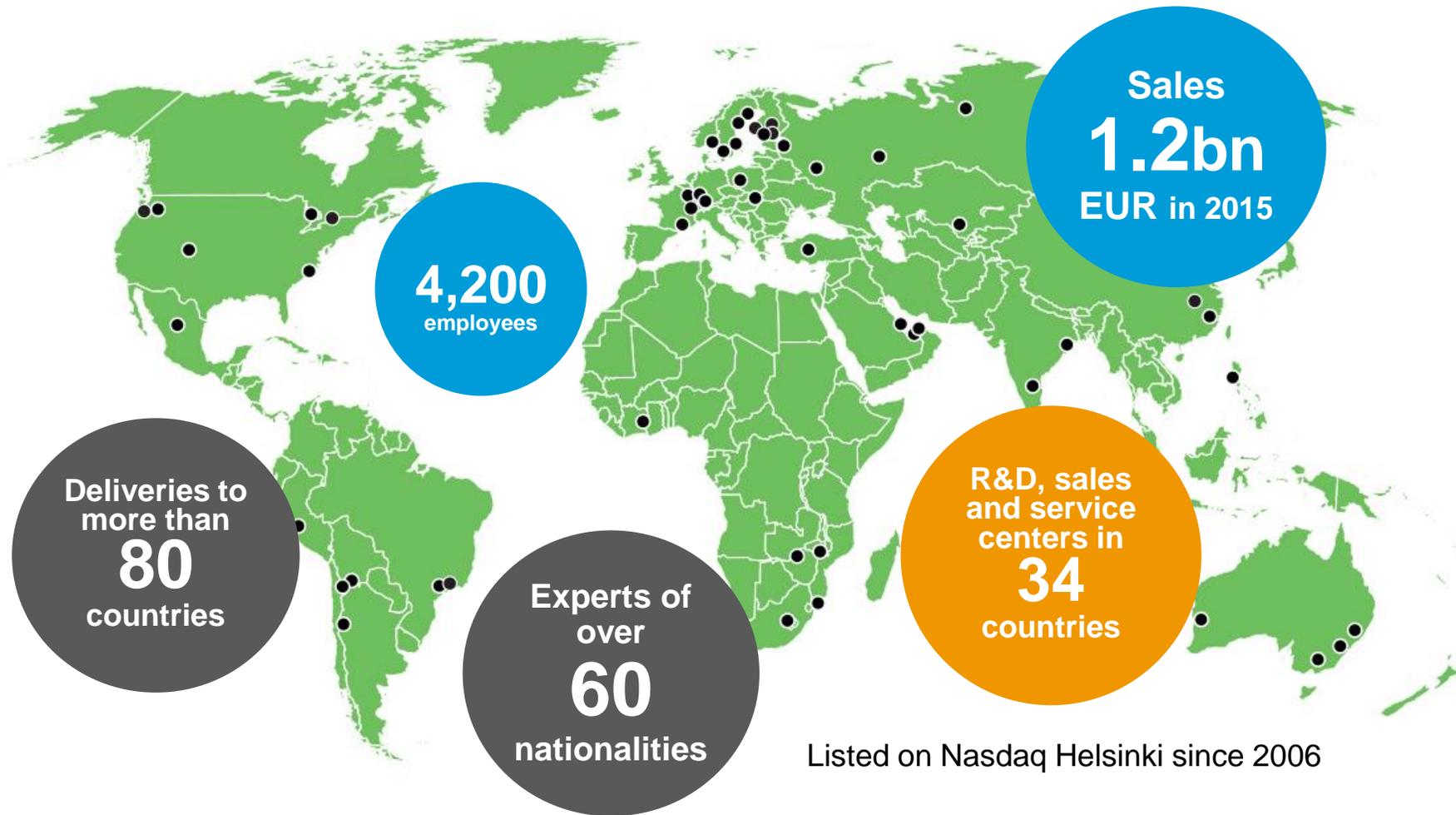
Process technology and services company



- Outotec provides leading technologies and services for the sustainable use of Earth's natural resources.
- As the global leader in minerals and metals processing technology, we have developed many breakthrough technologies over the decades for our customers in mining and metals industries.



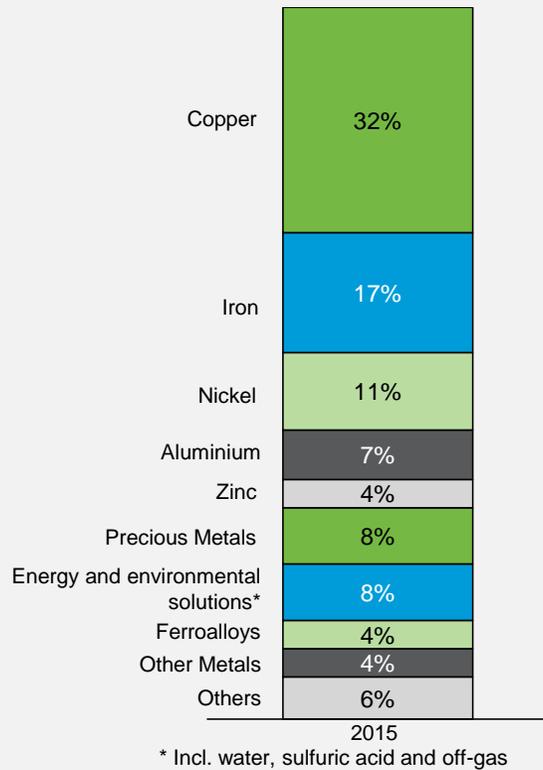
Local operations, global presence



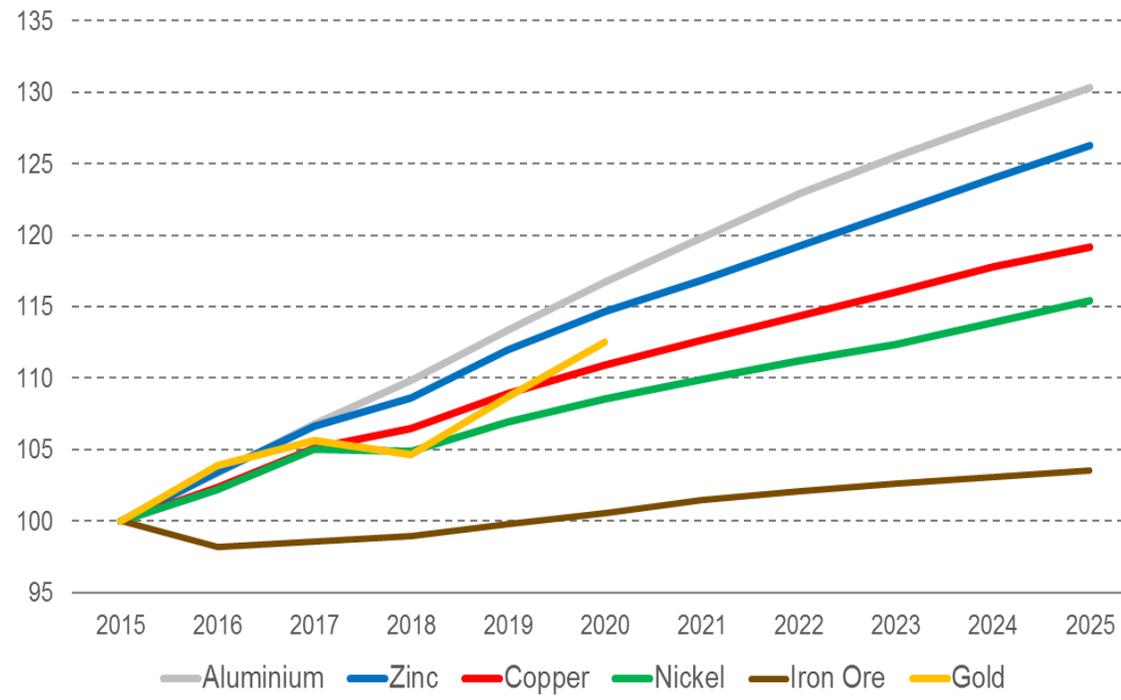
Wide supplier network with established long-term relationships.

Metals demand is forecasted to grow 2-4%

Share of Outotec sales by end product



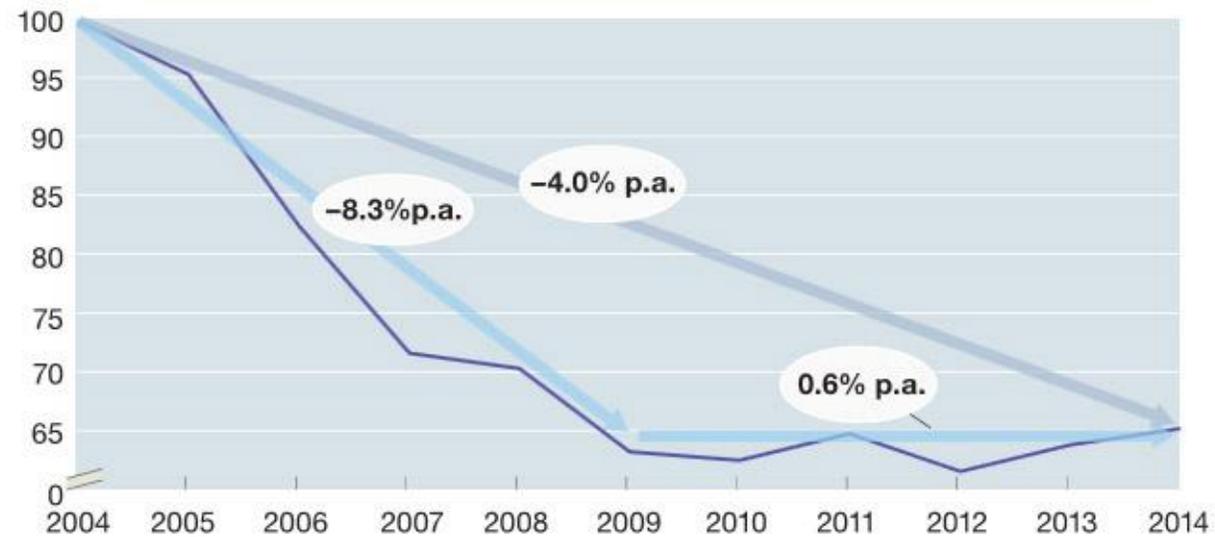
	SUPPLY		DEMAND	
	2016F Production, Mt	2016F Consumption, Mt	CAGR% 2015-25E	Increase, Kt/a
Aluminium	57,8	57,6	2,7 %	1692
Copper	22,5	22,3	1,8 %	419
Zinc	14,0	14,5	2,4 %	367
Nickel	2,0	1,9	1,4 %	29



Source: Wood Mackenzie, Morgan Stanley, Outotec analysis

MineLens Mining Productivity Index August 2016

MineLens Productivity Index,
indexed to 2004 = 100

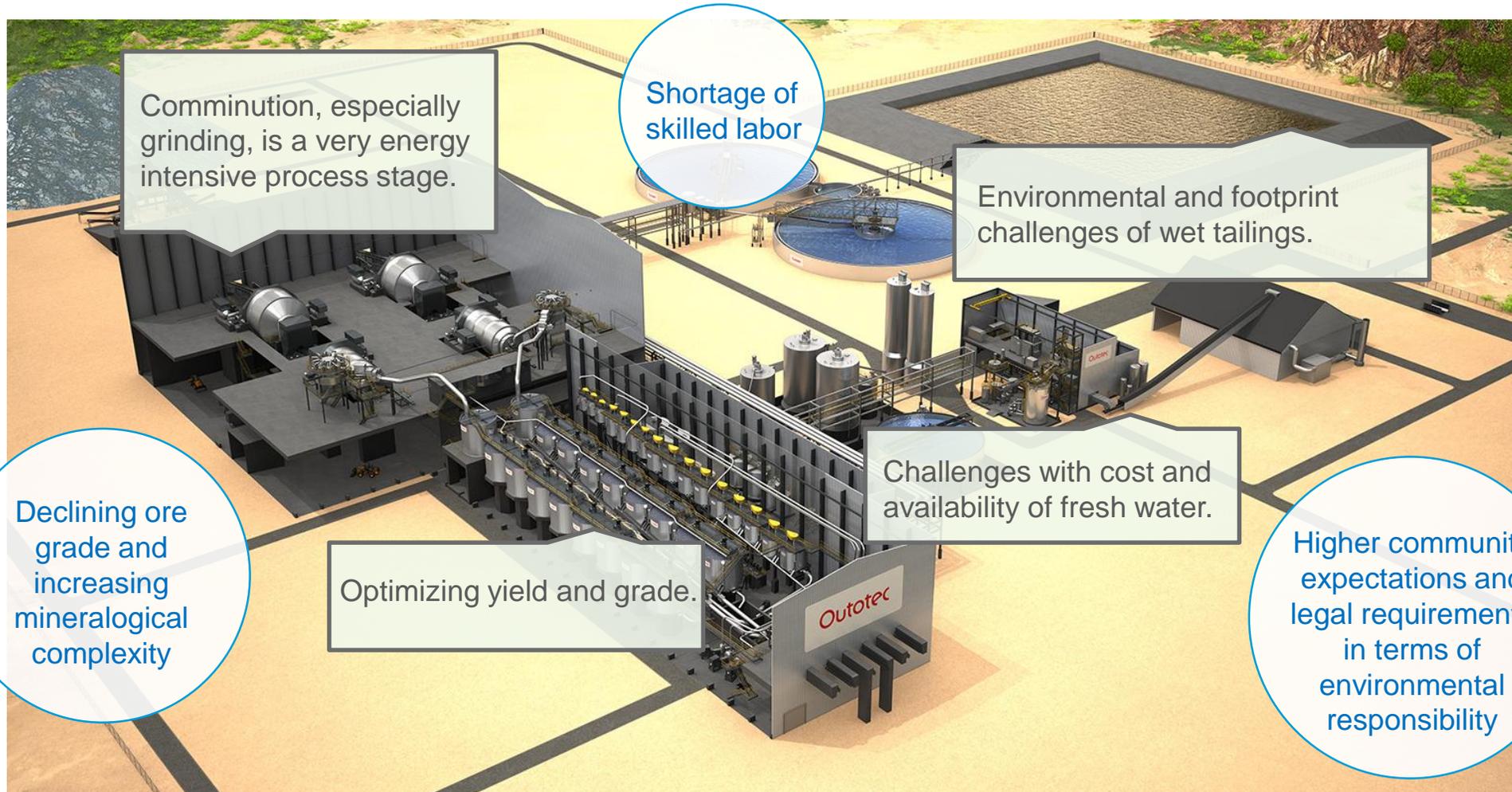


McKinsey&Company

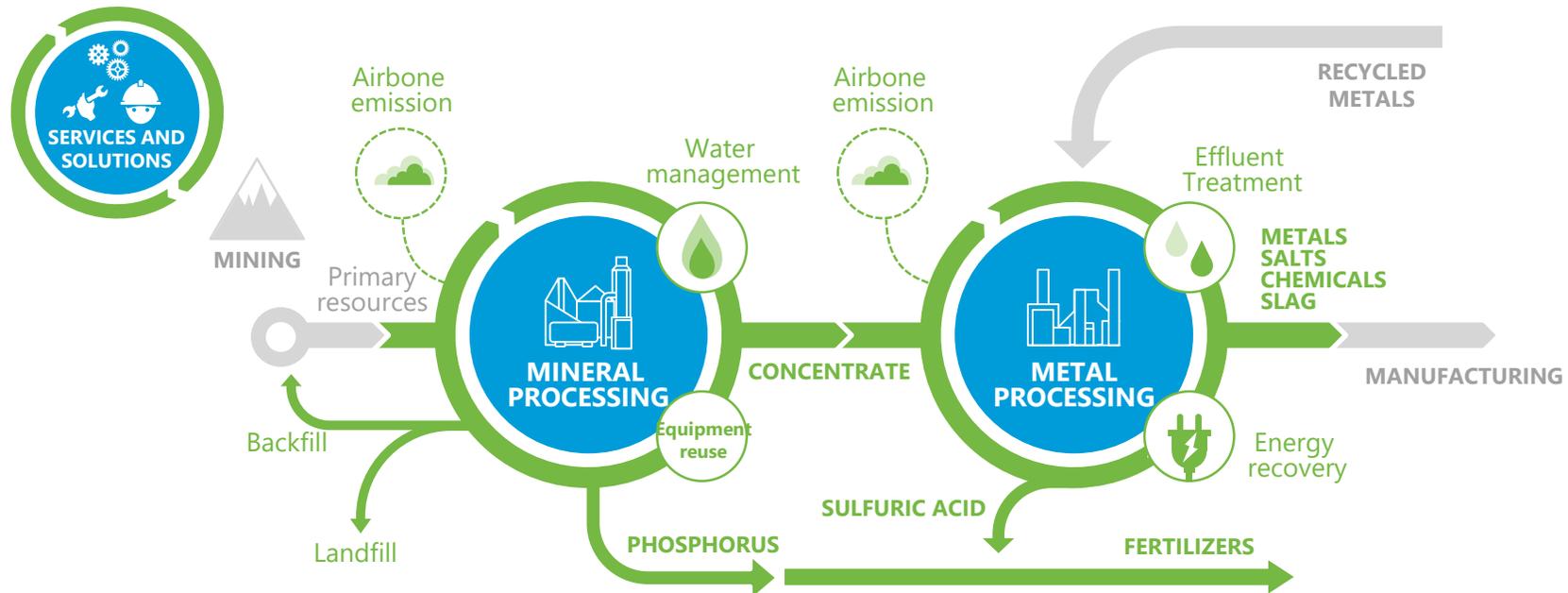
"Mining productivity performance industry-wide has stabilized since 2009 and started to show a small improvement, but is still far below where it was a decade ago."

McKinsey & Company

Today's challenges and bottlenecks in concentrator plants

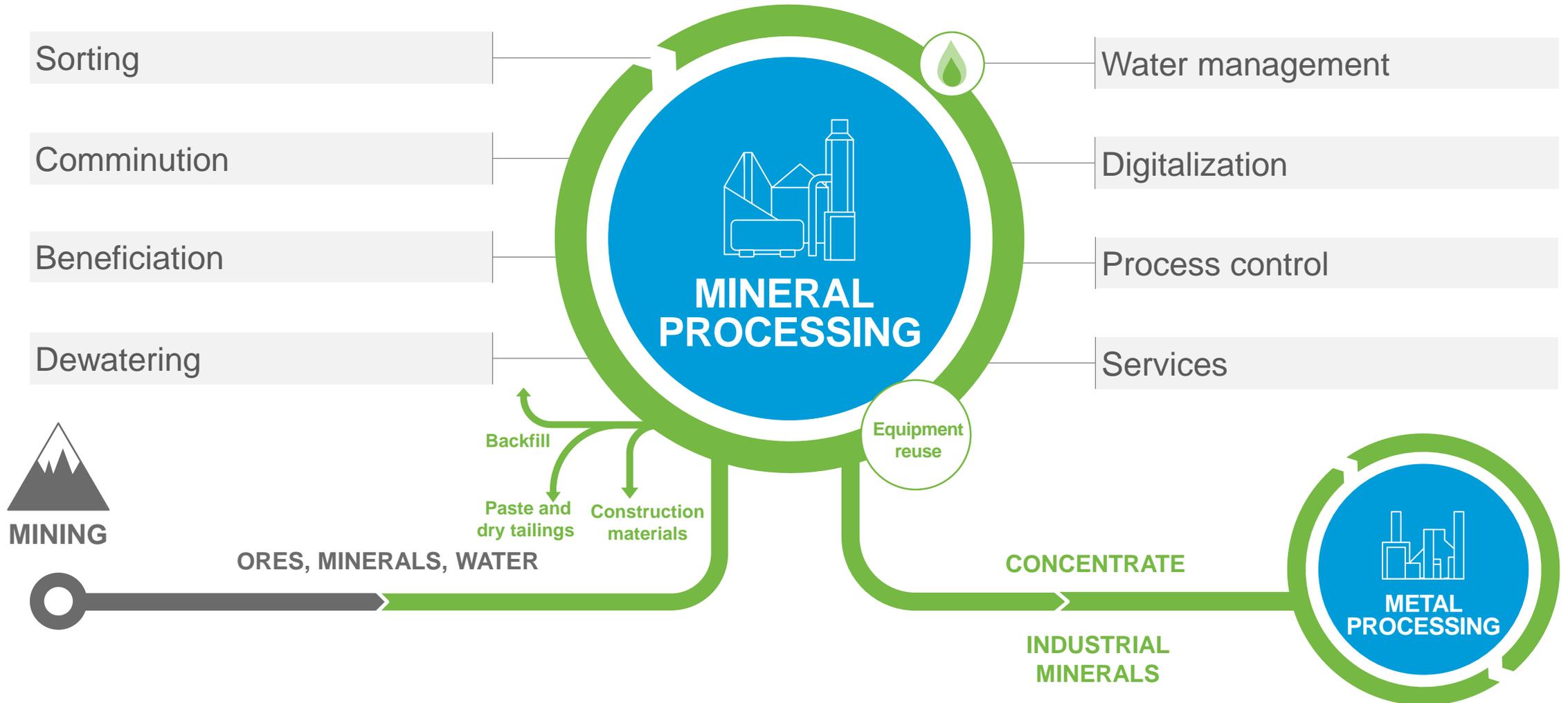


To gain the best results in productivity improvement, a holistic approach across the value chain is necessary



Outotec technologies and services to tackle the challenges

Services and solutions for mineral processing



Comminution technology and services



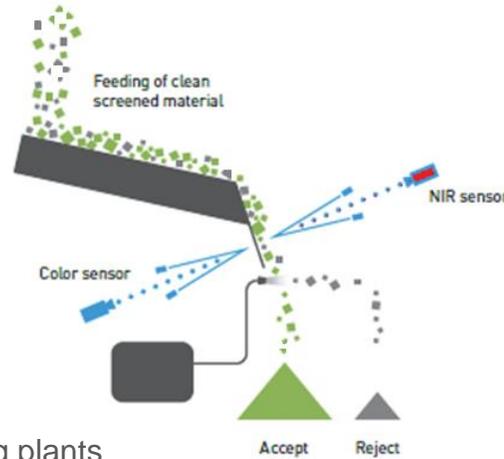
Applications:

- Crushing
- Screening
- Ore sorting
- Grinding
- Classification
- Process control and analyzers
- Life-cycle services

Our latest innovations:

- Sensor-based ore sorting
- HIGmill fine grinding solution with GrindForce rotor and stator design

Sensor-based ore sorting removes waste from the ore feed



Integrated crushing, screening and sorting plants



- Sensor-based ore sorting solution removes waste in crushing and grinding
- Increases productivity and significantly reduces energy and water consumption
- Outotec has the expertise and capability to design, supply, and build state-of-the-art sorting plants with fast and reliable ramp-up

Complex ore bodies require finer grind to maximize mineral recovery



- Outotec HIGmill™ provides an advanced, energy efficient, fine and ultra-fine grinding solution.
- Tall, narrow and vertical design ensures mineral particles remain in constant contact, significantly increasing grinding efficiency
- New feature: Outotec GrindForce™ rotor and stator design further improves the energy and wear performance.

Beneficiation technology and services



Applications:

- Froth flotation
- Magnetic separation
- Gravity separation
- Process control and analyzers
- Life-cycle services

Our latest innovations:

- cPlant Flotation: modular container-based flotation plant
- Large 630 m³ cells: TankCell e630
- Light element analyzer

Modular flotation plant to reduce project costs

- Outotec cPlant Flotation – Small & mid capacity flotation plant (25 to 200 tph)
- Based on pre-fabricated and functionally tested modules in container-sized frames
- Easy transportation and installation
- Reduced EPC project costs compared to a conventional flotation plant:
 - Up to 20% lower capital investment
 - Requires 30% less labor resources
 - 95% of installation & pre-commissioning done prior to delivery
 - Minimal civil engineering work required

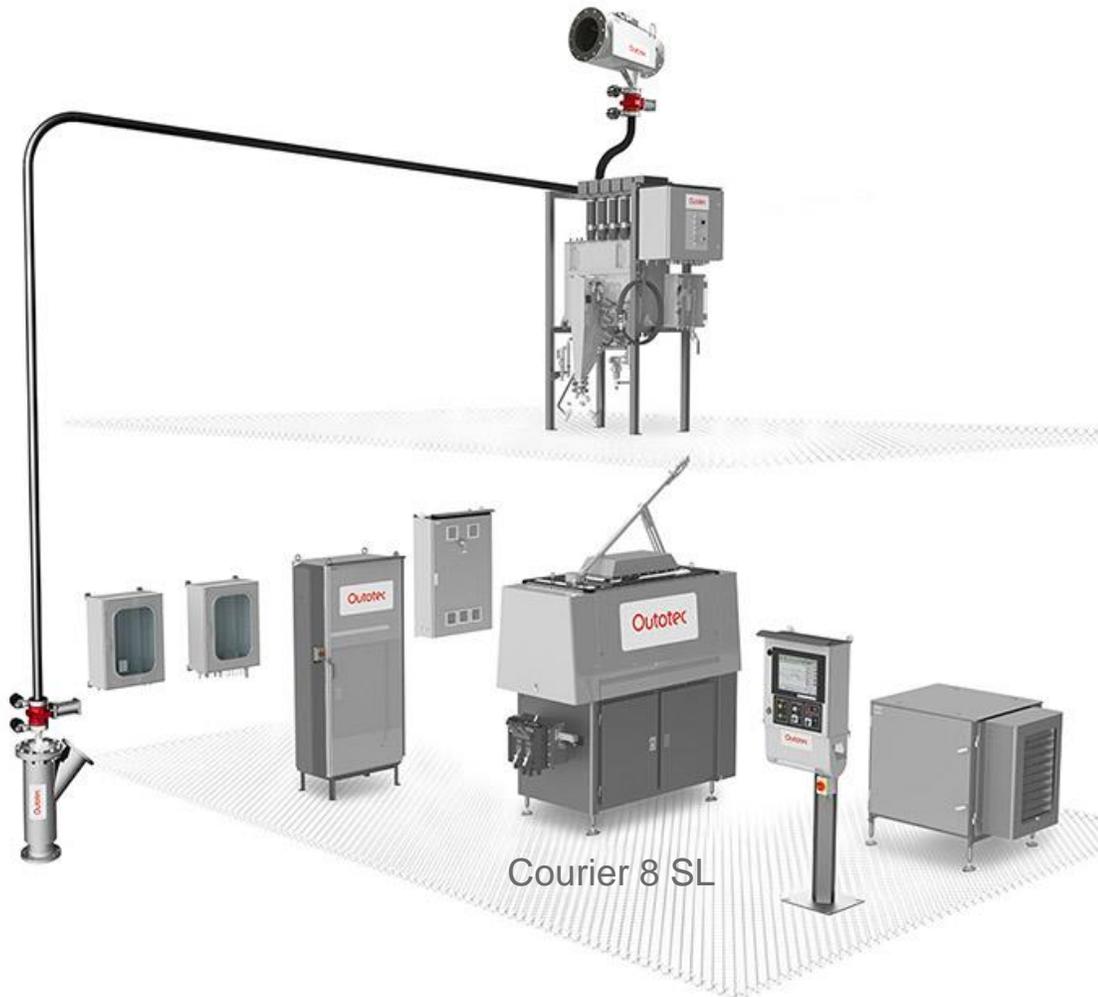


Large flotation cells outperform small cells



- TankCell e630 with a volume of 630 m³
- Particularly suitable for rougher and scavenger duties
- Outperforms smaller cells in energy efficiency
- Enables a significant increase in production capacity
- 10 to 20% less total capital cost compared to an equivalent plant using the smaller TankCell e300

On-line analyzer for light element analysis in slurry streams



- Courier 8 SL on-line analyzer for accurate monitoring of changes in feed mineralogy and improved concentrate quality control
- Laser-induced breakdown spectroscopy (LIBS) measurement principle
- Measures light elements such as Li, C, Mg, Al, Si, P, S, K and Ca
- Can be used also for measurement of heavier elements like Fe, Ni, Cu Zn and As

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Li	Be											B	C	N	O	F	Ne																														
Na	Mg											Al	Si	P	S	Cl	Ar																														
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr																														
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La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu																																	
Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr																																	

Dewatering technology and services



Applications:

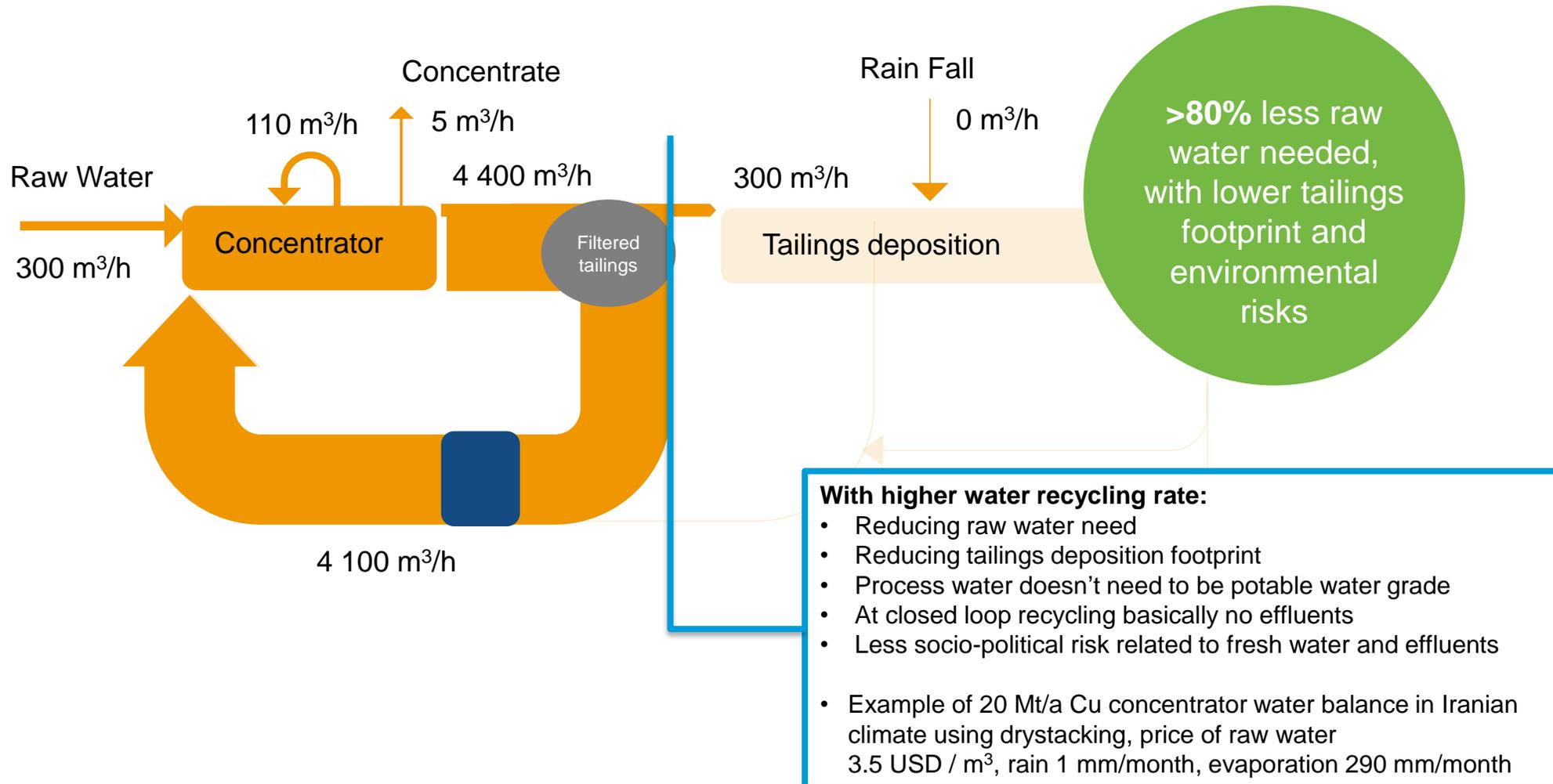
- Thickening
- Filtration
- Water treatment
- Tailings management
- Process control and analyzers
- Life-cycle services

Our latest innovations:

- Towards closed-water loop with water quantity and quality management
- Large-scale dry tailings and paste thickening solutions
- Modularized paste backfill plants

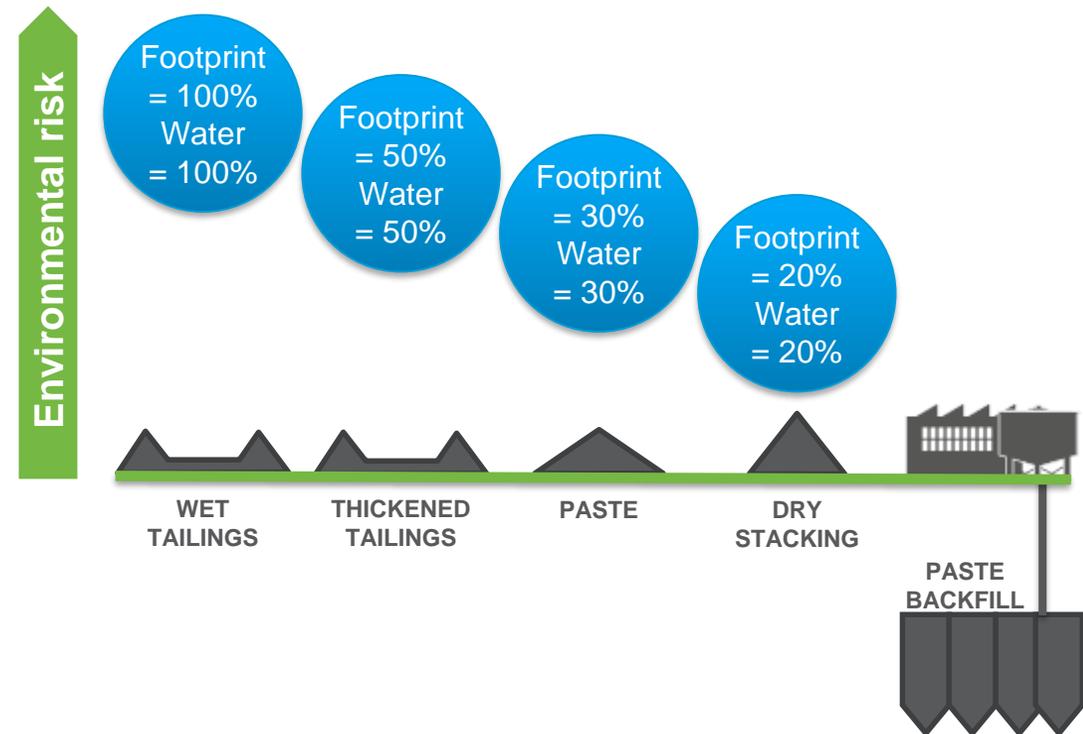
Towards closed water loops

Cu 20 Mt/a with Thickened and Filtered Tailings (Dry Iranian Climate)



Holistic tailings management can bring significant water savings and reduces environmental risks

- Holistic tailings management covers both surface and underground operations.
- Thickened, paste and dry tailings technologies combined with closed water loops are the best available technologies for conserving water within the concentrator environment.
- The short- and long-term risks can be significantly reduced by reducing the amount of water in the surface tailings storage facility.

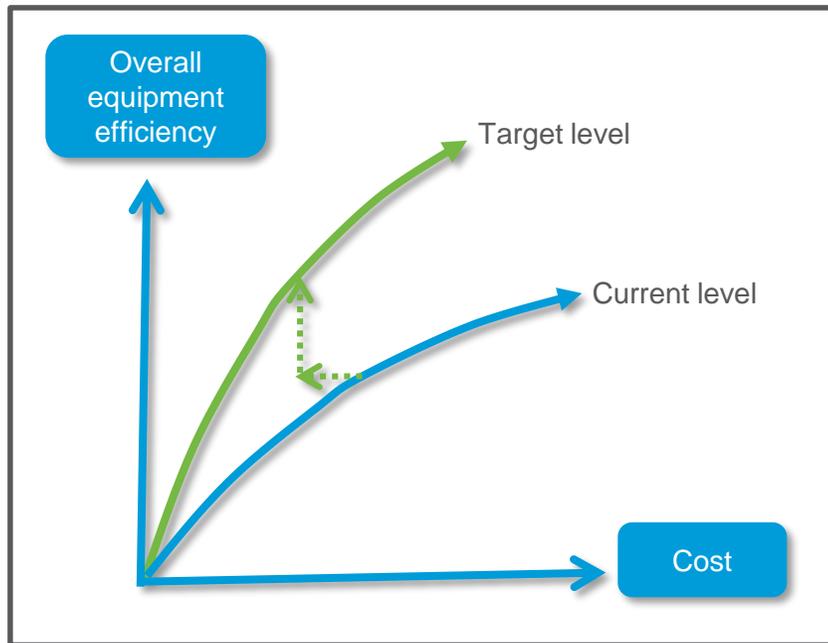


Performance solution to boost business results

Performance solution to boost your business results

We want to improve your business performance throughout the life cycle of your plant with safe, sustainable and reliable solutions.

By collaboration and understanding of your business we apply our in-depth process, operation and maintenance expertise and world-class technologies.



You get

- Improved Health & Safety
- Decreased Operating Cost
- Improved Equipment / Process Efficiency
- Improved Environmental Efficiency
- Improved Capital Efficiency

Outotec Performance Solution

Four step holistic approach to improve performance and productivity



Wide range of services to assess the current situation



Equipment inspections



Process feasibility studies



Inventory assessment



Plant performance assessment



Process evaluation



Health and safety services



Research and test services



Process advisory services

Turn-key flotation retrofit with fast turnaround Yamana Gold



Challenges

- Poor flotation performance in terms of copper and gold recovery
- Flotation circuit had poor availability due to heavy sanding
- Substantial maintenance requirements due to heavy corrosion
- Limited time available for shutdown

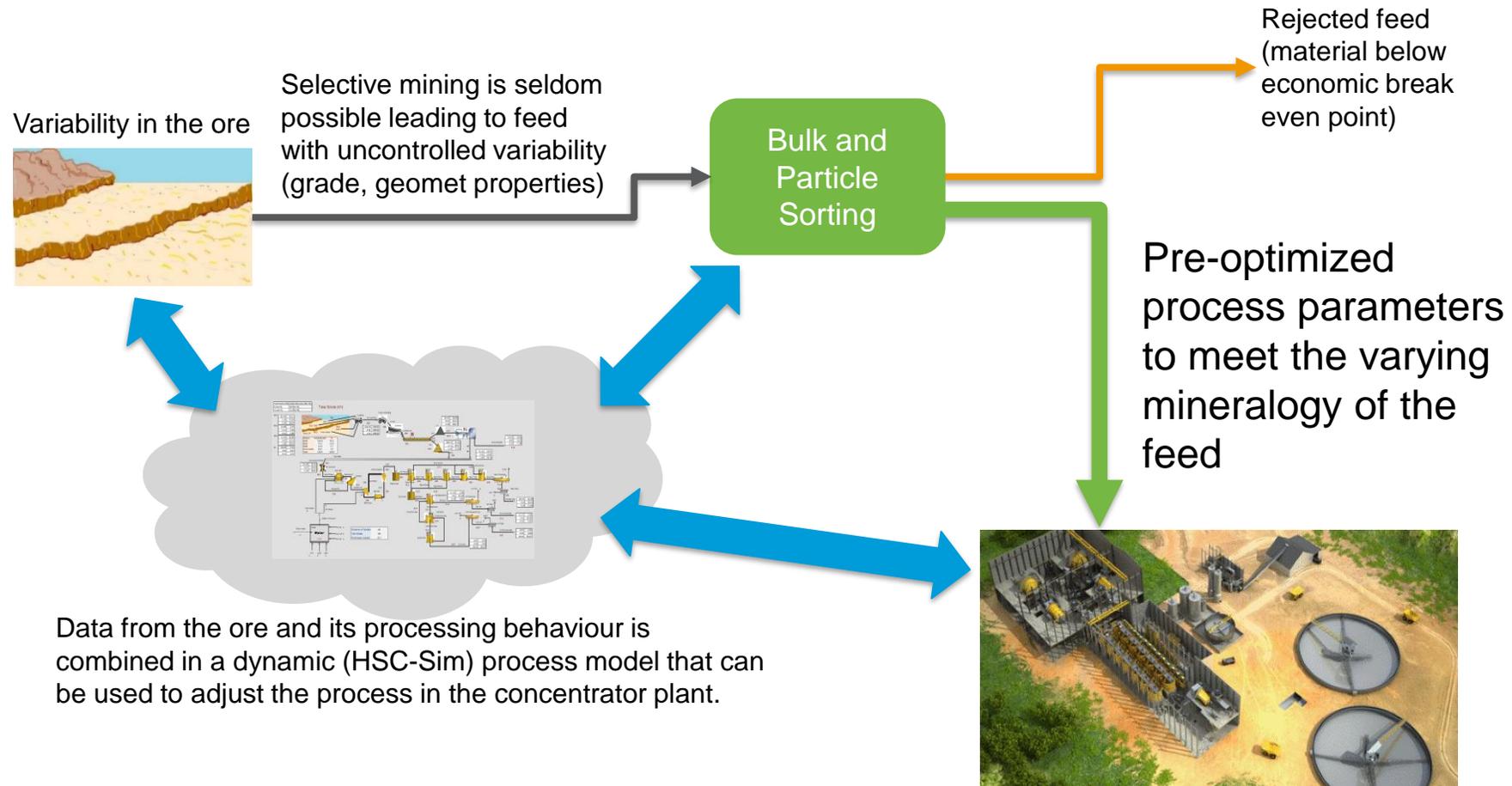
Solution

- In-depth metallurgical assessment identified large improvement potential
- Retrofit of 2 lines of 5 existing 160m³ flotation cells with TankCell160
- A full turn-key delivery, including shutdown planning, scheduling and management and manufacturing steel works and tanks
- Advanced operator training

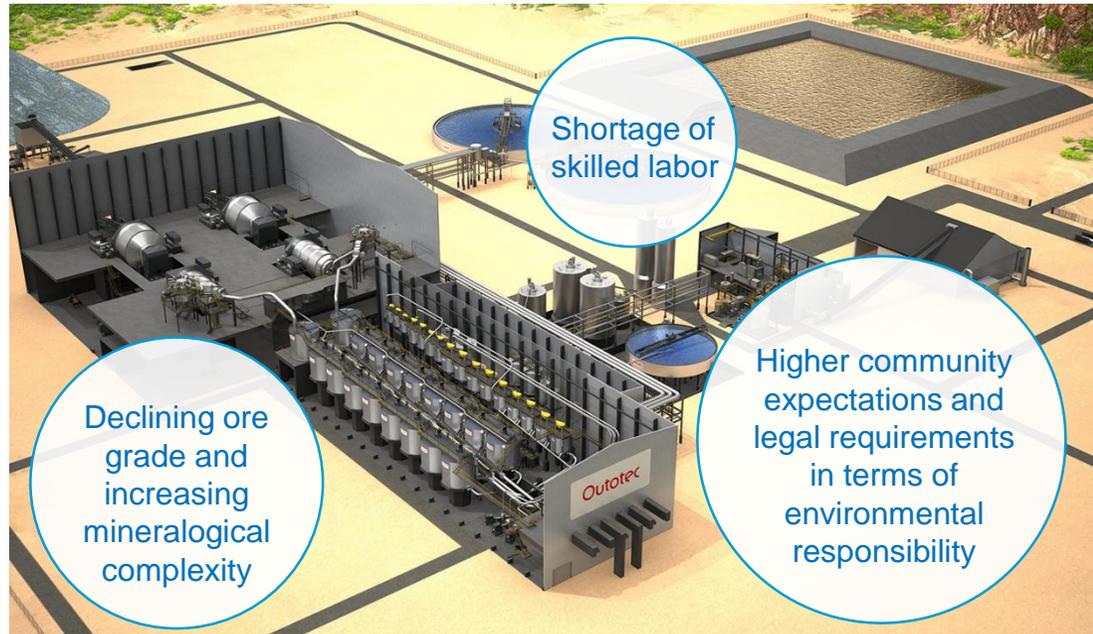
Benefits

- Greater stability and control of flotation cells allowing for increased process optimization
- Decreased energy consumption (40%)
- Minimized production losses during installation and commissioning
- Minimized sanding increases flotation circuit availability, leading to increase in production
- Improved flotation performance, recovery of copper and gold

Leveraging digitalization for real time optimization of the process to address the variability of the ore



Summary – Overcoming challenges in minerals processing



Today's challenges such as declining ore grade, more complex ores, higher community expectations, shortage of skilled labor set higher requirements.

Outotec has the technology and services to overcome the challenges throughout the minerals processing value chain.

We want to collaborate and improve your plant's performance throughout its life cycle with safe, sustainable and reliable solutions.

Outotec



Sustainable use of
Earth's natural resources