TAILINGS and WATER MANAGEMENT BUSINESS INTEGRATION

Dagsseminar - Overskuddsmasser fra Norsk Bergindustri

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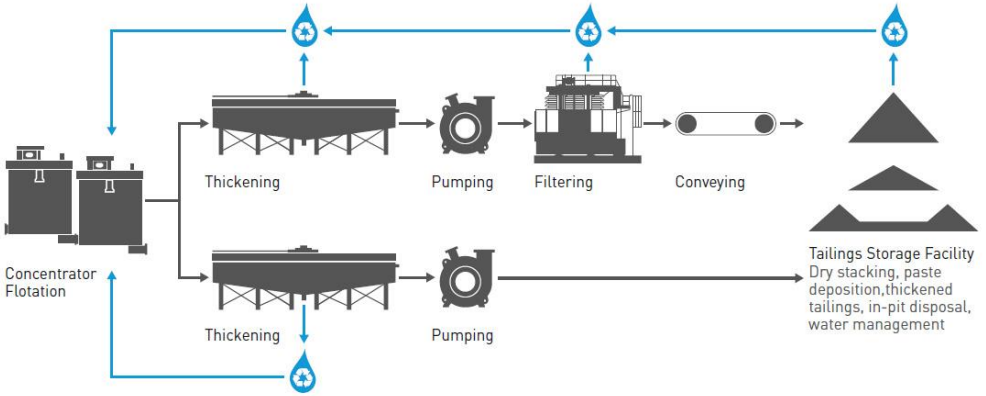
Technological Portfolio
Tailings Dewatering & Water Treatment



Design process – Outotec's dewatering capability

Tailings dewatering for optimal disposal and process water treatment to improve process performance

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Technical capabilities

Mineral processing technological integration - **Tailings and Water management**

Engineering Solutions

Trade-off and strategic studies
Feasibility studies
Engineering design
Operational planning

Thickened tailings and Paste plants

Thickeners (HRT, HCT, PT)
Flocculant addition systems
Pumps, pipelines, spigotting operation and return water handling

Tailings filtration Plants

Filters (CC, FFP, PF)
Mixers, conveyors and stackers or trucks bays

Mine backfill Plants

Filters (CC, FFP, PF)
Mixers, silos
Conveyors, Underground reticulation, backfilling scheduling

Process Water Treatment

Process water balance
Process water treatment
Return water quality
Water discharge compliance

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Agenda

Overview of **key industry challenges** and business responses and the importance of **integrating tailings and water management** within the mining cycle

Tailings thickening and filtration plans capabilities. **Safe surface tailings disposal operations and its integration within the mining cycle**

Outotec's **tailings and water stewardship** approach and Life of Mine engineering solutions to customers worldwide

Implementing **sustainable environmental solutions**. Cases as example of our current engagement

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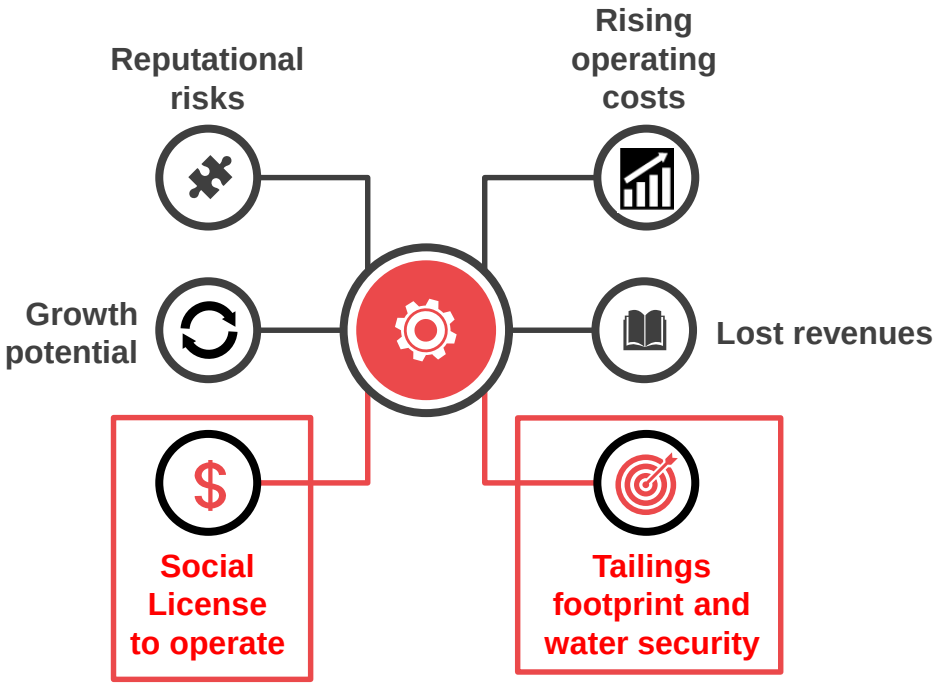
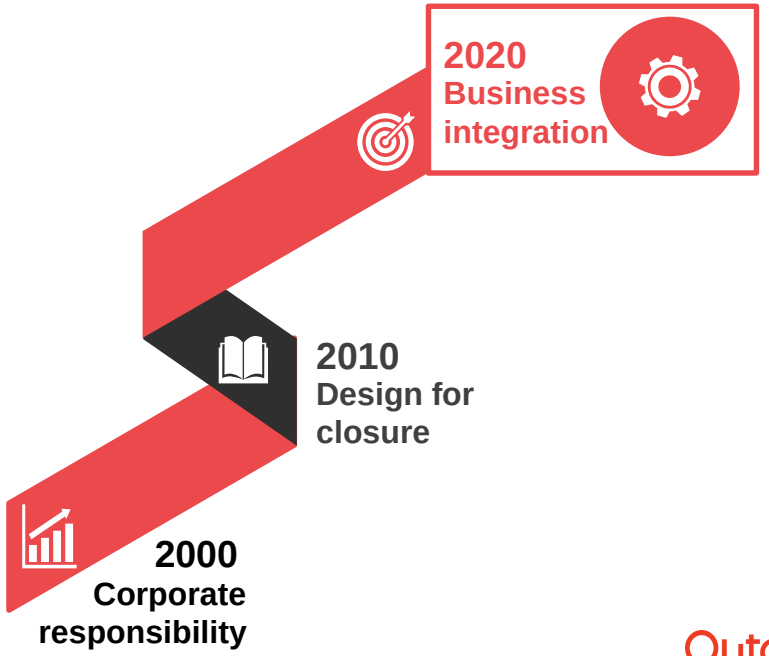
Tailings management industry challenges

Driven by economics



Evolving business responses on tailings management

Driven by compliance and moving towards transparency and stewardship



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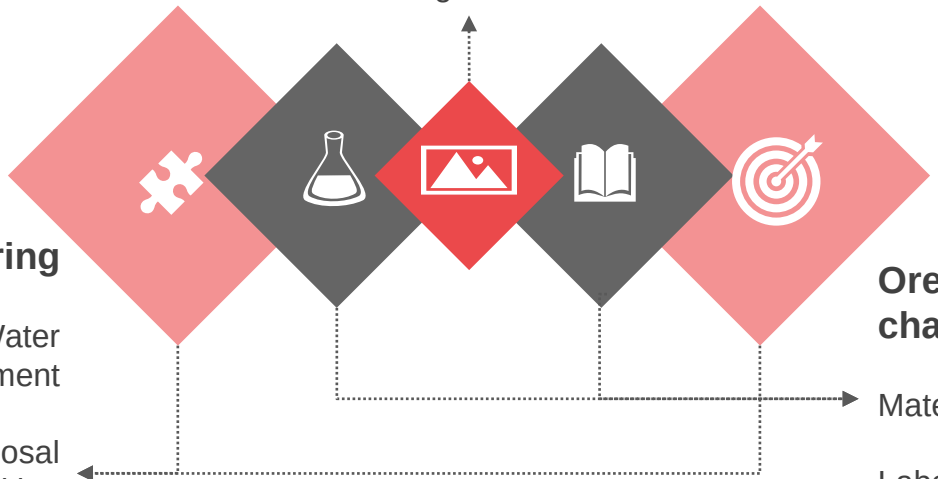
Project stewardship

Environmental protection

Understanding site and surroundings

Soil and Water footprint Baseline

Planning for closure



Safe Design and Engineering

Tailings Dewatering &Water Treatment

Pumping, distribution and disposal
Dry placement and stacking

Construction, Operation and Maintenance

Ore, waste, Tailings & Water characterization

Materials Management

Laboratory testing
(lab, bench, pilot scale)

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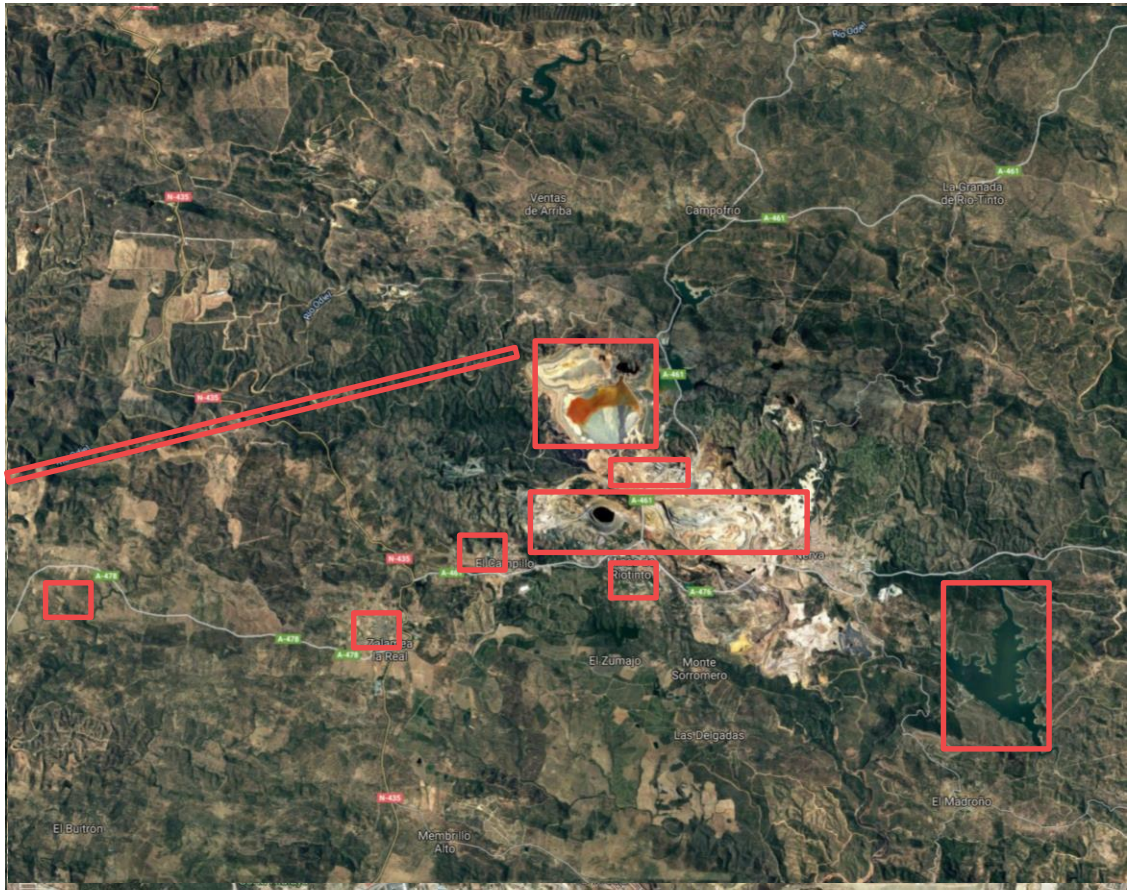
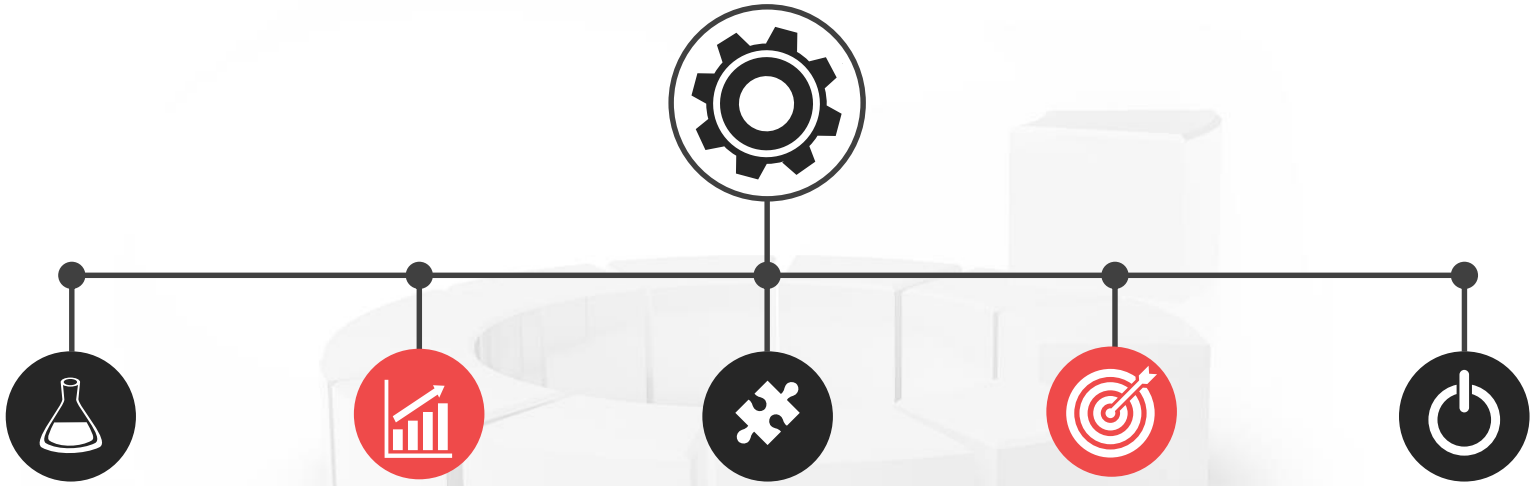
Spatial stakeholder integration



Technical Services

Mineral processing technology leaders. **Tailings and Water FOCUS**



Laboratory
Test work

Pori Research Center
Lappeenranta
Technology Center

Conceptual
design
Prefeasibility

Tailings
management
Feasibility
Engineering and
project
integration

Dewatering Plant
Water Treatment
Plant
Equipment supply
and delivery

Dewatering Plant
Water Treatment Plant
Construction
Operation
Maintenance

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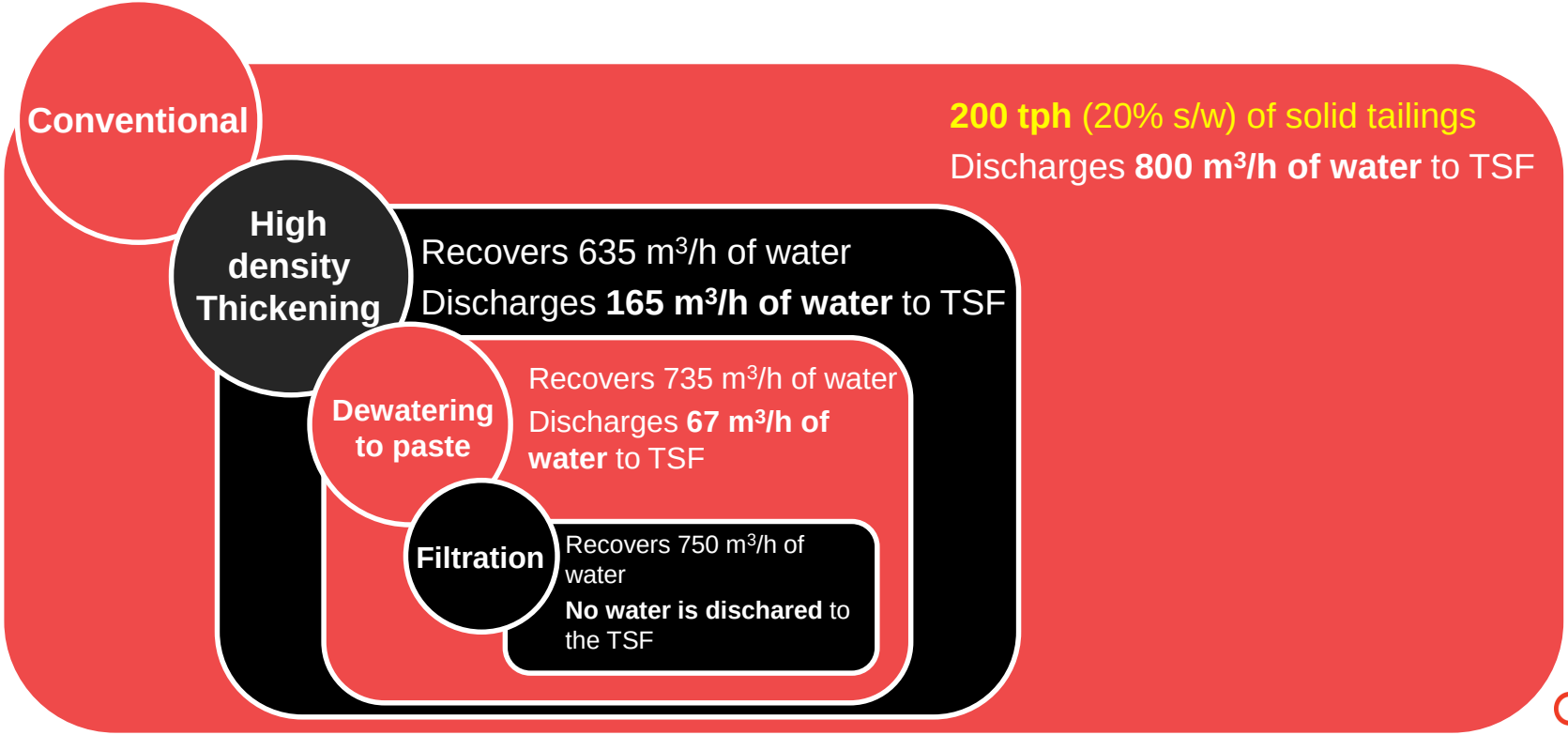
Tailings dewatering

In practical terms

Water as the key challenge

Thickened tailings disposal Vs Filter dry placement

Complete range of options Driven by tailings characteristics, sitting conditions and environmental restrictions



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Thickening plants

From High density non-segregating thickened tailings to paste tailings and cemented paste for UG backfill

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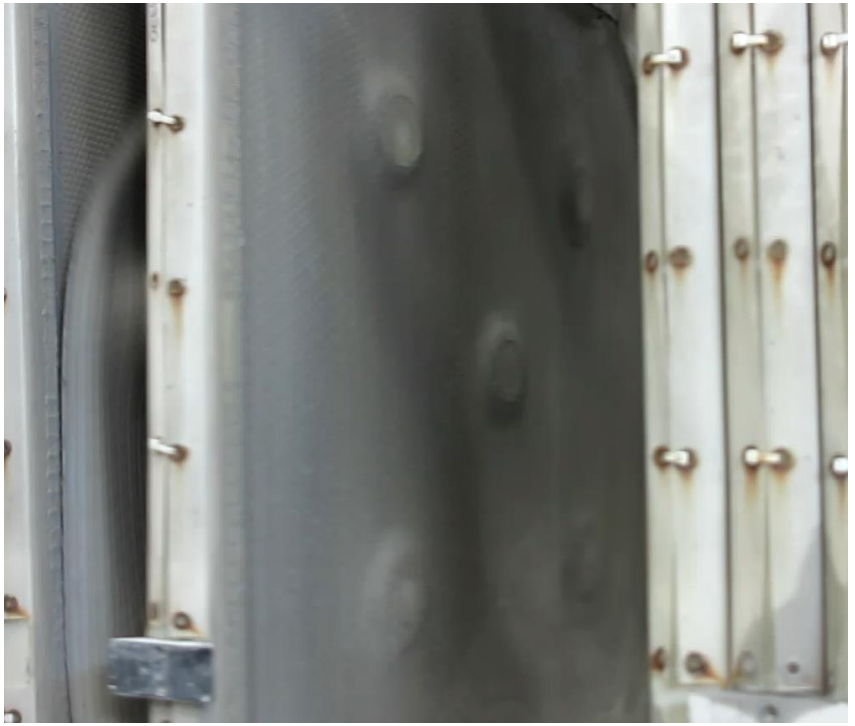

Filtration plants

Wet cake for mixing as backfill to pressure filtration for surface disposal

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Implementing sustainable environmental solutions

Case Studies

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Tailings management strategic assessments

PROJECT LIFE

From
Concept to
Implementation
Operation and
Closure

Tailings dewatering
Process Water Treatment
Water Treatment for Discharge to Public Domain

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Integrated Water Management

FACILITIES IN OPERATION

- **High density tailings disposal implementation**
- **Laboratory wáter testing**
- **Process wáter feasibility studies**
- **Operational integration**
- **EPCM**

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Tailings materials management

FACILITIES IN OPERATION

Tailings facility design and operational review

Sand separation for embankment construction

Materials distribution and disposal strategy

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Tailings disposal facility conversion

FACILITIES IN OPERATION

- **Laboratory testing**
- **Process and operating feasibility studies**
- **On-site pilot testing**
- **Dewatering, distribution and Disposal design**
- **EPC delivery**
- **O&M**
- **Training**

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Full stream filtration

PROJECT IMPLEMENTATION

- **Filtration**
- **Dry placement**
- **Design and engineering review**
- **Operational adjustements**

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Mine Backfill solutions

MINE BACKFILL

Design and Engineering

Pre-engineered compact Plants

Tailings reconditioning

Hydraulic fills

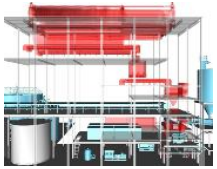
Capricorn Copper, Australia
50 m3/hr, 2018

Randgold - Kibali, DRC
190 m3/hr, 2015

Dugald River, Australia
130 m3/hr, 2018

Tritton, Australia.
120 m3/hr, 2009

Oceana Gold – Didipio, Indonesia
150 m3/hr, 2017



Pretium - Brucejack, Canada
150 m3/hr, 2016

Boliden - Garpenberg, Sweden
130 m3/hr, 2005

Wallaby, Australia
150 m^3/h, 2018

Tahoe – Escobal, Guatemala
150 m^3/h, 2016

Newmont - Tanami, Australia
150 m^3/h, 2011

Flying Fox, Australia
100 m^3/h, 2015

Spotted Quoll, Australia
130 m^3/h, 2011

La Mancha - Frog's Legs, Aus.
130 m^3/h 2010

Glencore - Lady Loretta, Aus.
130 m^3/h, 2013

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Thank you for your attention

Comments and queries welcome

For further information please contact

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