

Metso:Outotec

# Thickeners and Clarifiers

Clear  
performance.  
Sustainable  
profits.



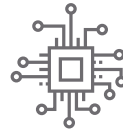
# Sustainable thickening and clarifying innovations

Metso Outotec is a global leader in the design, fabrication and supply of thickening and clarifying solutions. With leading process expertise and know-how based on decades of experience, Metso Outotec offers smart and sustainable solutions with unmatched performance when using our diverse and versatile product offering that consists of High Rate Thickeners, High Compression Thickeners, Paste Thickeners, Inclined Plate Settlers and Clarifiers.



## Exceptional track record

Metso Outotec has been consistent in answering customer challenges for nearly 50 years



## Sustained performance

Metso Outotec expertise covers a wide range of applications with sustainability at the forefront



## Leading innovator

Metso Outotec is the global leader in the design, fabrication and supply of thickening and clarifying solutions



# Planet Positive

Sustainability is one of Metso Outotec's key strategic priorities - we are committed to limiting global warming to 1.5 °C. The thickening & clarifying solutions are a part of the recently launched Planet Positive offering, since they are designed to improve water-efficiency, lower emissions & lower amount of energy consumed.

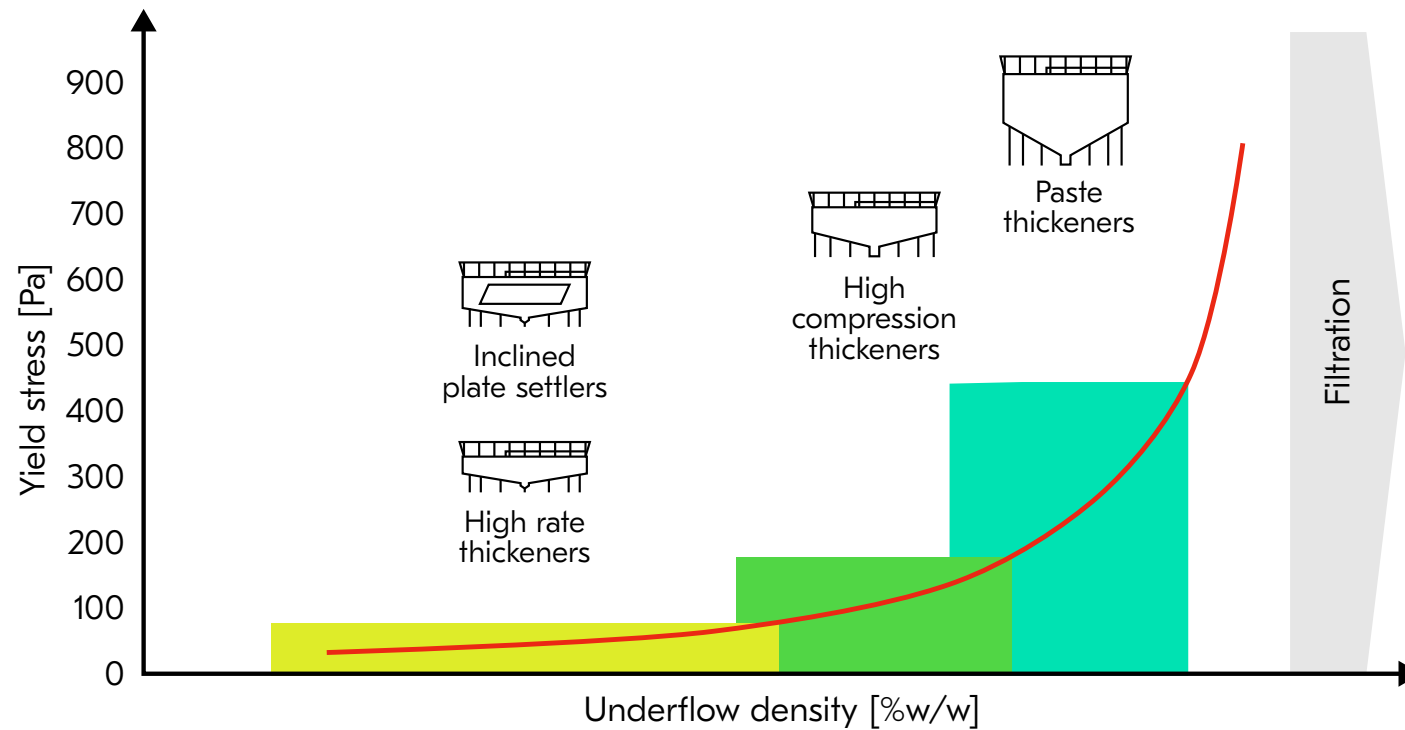
Planet Positive is our all-encompassing approach to sustainability, which covers the environmental, social and financial aspects. Our Planet Positive offering has a central role in our sustainability agenda and 1.5 °C journey as it represents the key means of improving the resource efficiency of our customers' operations.

Our long-term goal is to provide customers with products and services that are even more sustainable. We will continuously develop our thickening and clarifying offering, with a focus on energy efficiency, reducing emissions, water efficiency, circular solutions and safety.

# Thickeners and clarifiers

## Product selection

Setting the industry standard in performance, Metso Outotec has an exceptional track record for innovation with a diverse portfolio of thickening and clarifying products to suit a wide range of applications.



# Thickeners and clarifiers

## Typical applications

|                             | Alumina, Bayer process        |                 |                       |         | Potash | Coal          |                  |             | Blast furnace flue dust | Base metal concentrates |           |        | Flotation tailings | Iron ore    | Gold     | Copper CCD | Nickel laterite CCD | Molybdenum concentrate | Mineral sands slimes | Platinum    | Uranium  |                  |                     |
|-----------------------------|-------------------------------|-----------------|-----------------------|---------|--------|---------------|------------------|-------------|-------------------------|-------------------------|-----------|--------|--------------------|-------------|----------|------------|---------------------|------------------------|----------------------|-------------|----------|------------------|---------------------|
|                             | Red mud clarifiers (settlers) | Red mud washers | Red mud final washers | Hydrate |        | Coal tailings | Clean coal fines | Dense media |                         | Copper                  | Zinc/Lead | Nickel |                    | Concentrate | Tailings | CCD        | Tailings            |                        |                      | Concentrate | Tailings | Acid leached ore | Uranium precipitate |
| Inclined Plate Settlers     |                               |                 |                       |         | ●      | ●             |                  | ●           | ●                       |                         |           |        |                    | ●           | ●        |            |                     |                        | ●                    |             |          |                  | ●                   |
| High Rate Thickeners        |                               |                 |                       |         | ●      | ●             | ●                | ●           | ●                       | ●                       | ●         | ●      | ●                  | ●           | ●        | ●          | ●                   | ●                      | ●                    | ●           | ●        | ●                | ●                   |
| High Compression Thickeners |                               |                 |                       | ●       |        |               |                  |             |                         |                         |           |        | ●                  |             | ●        | ●          | ●                   | ●                      | ●                    |             | ●        | ●                |                     |
| Paste Thickeners            | ●                             | ●               | ●                     | ●       |        |               |                  |             |                         |                         |           |        | ●                  |             |          |            | ●                   |                        |                      |             |          | ●                |                     |

## Thickeners and clarifiers

# High Rate Thickeners

Metso Outotec High Rate Thickeners include a number of innovative features in design. Our Directional Autodil™ and Turbodil™ systems auto-dilute feed while optimizing performance and flocculant consumption. Our innovative Metso Outotec Reactorwell™ incorporates interconnected upper and lower zones to further improve performance.



### HRT

1m - 125m Diameter

#### Key features

- Delivers consistent and high-density underflow
- Uses flocculation chemistry to increase settling rates
- Maximizing life cycle profitability through our patented feedwell technology
- Automated operation, suitable to advanced control systems
- Tailored to the customer needs



### HRT-S

3m - 10m Diameter

#### Key features

- Standardized design with preset diameter range
- Prescribed product application limits
- Simplified delivery model
- Predetermined engineering scope
- Fully containerized equipment

# High rate thickeners

## Product portfolio

The HRT suits all applications where flocculants can be used in the process. Equipment is tailored to the customer needs.

The HRT-S is a pre-engineered range of high rate thickeners providing the same performance metrics as the HRT but with selected application range enabling accelerated project deliveries.

|                     | HRT       | HRT-S   | Design factors   |
|---------------------|-----------|---------|--|
| <b>Diameter (m)</b> | 1 - 125   | 3 - 10  | <ul style="list-style-type: none"> <li>Feed rate t/hr or m<sup>3</sup>/hr</li> </ul>   |
| <b>Sidewall (m)</b> | 1.8 - 3.6 | 1.8 - 2 | <ul style="list-style-type: none"> <li>Solids residence time / compaction depth</li> <li>Clarification zone depth</li> <li>Geometry</li> </ul> |
| <b>Floor slope</b>  | 1:6       | 40°     | <ul style="list-style-type: none"> <li>Floor slope driven by yield stress and slurry transport</li> </ul>                                      |
| <b>K-factor</b>     | 20 - 70   | 30 - 50 | <ul style="list-style-type: none"> <li>Underflow density / yield stress</li> <li>Particle size</li> <li>Bed depth</li> </ul>                   |



Uses flocculation chemistry to dramatically increase settling rates



Consistent and high-density underflow



Automated operation



Good flocculation and feed distribution with our patented feedwell design

## Thickeners and clarifiers

# High Compression Thickeners

The Metso Outotec HCT delivers high performance for consistent process conditions, and reacts relatively quickly to changes. The HCT operation can be automated with control based on consistent solids inventory.



**HCT**

1m - 65m Diameter

### Key features

- Deeper bed and rotating pickets for improved dewatering
- Beneficial with compressible solids beds
- Well suited for applications where additional dewatering is required (e.g. CCD's, tailings, pre-leach)



## High compression thickeners

# Product portfolio

Achieve a higher density underflow with our High Compression Thickener. The HCT has been designed to suit customer needs with a deeper solids bed and higher rake torque than our High Rate Thickener or conventional thickeners.

|                     | HCT       | Design factors   |
|---------------------|-----------|--|
| <b>Diameter (m)</b> | 1 - 65    | <ul style="list-style-type: none"> <li>▪ Feed rate t/hr or m<sup>3</sup>/hr</li> <li>▪ Solids loading t/m<sup>2</sup>/hr</li> <li>▪ Liquid loading m<sup>3</sup>/m<sup>2</sup>/hr</li> </ul> |
| <b>Sidewall (m)</b> | 4 - 6     | <ul style="list-style-type: none"> <li>▪ Solids residence time / compaction depth</li> <li>▪ Clarification zone depth</li> <li>▪ Geometry</li> </ul>   |
| <b>Floor slope</b>  | 1:4       | <ul style="list-style-type: none"> <li>▪ Floor slope driven by yield stress and slurry transport</li> </ul>  |
| <b>K-factor</b>     | 70 - 200+ | <ul style="list-style-type: none"> <li>▪ Underflow density / yield stress</li> <li>▪ Particle size</li> <li>▪ Bed depth</li> </ul>   |



Uses flocculation chemistry to dramatically increase settling rates



Consistent and high-density underflow



Enables process automation

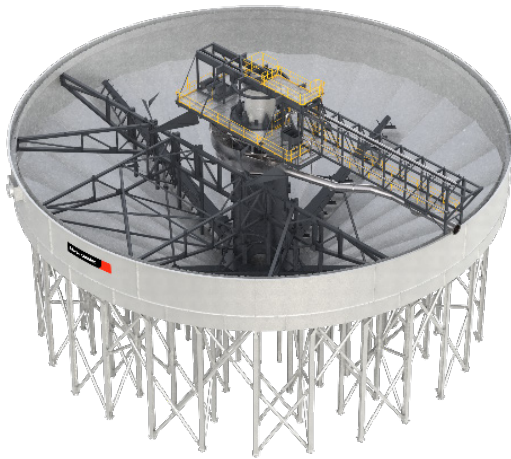


Maintains a constant solids inventory and solid/liquid interface

## Thickeners and clarifiers

# Paste Thickeners

The 2nd Generation PT has a high sidewall and steep floor slope. With integrated automation, it reacts to changing process conditions. The thickener utilizes control based on consistent solids inventory to achieve and maintain the required underflow density. The PT-S has a higher sidewall, with simplified approach to operation and control, with storage volume to suit plant operation.



**PT**  
1m - 45m Diameter

### Key features

- Deeper bed for increased dewatering
- Suited where maximum gravity dewatering or higher slurry discharge yield stress is required
- SMART rakelift, rake design, rotating & static pickets and advanced control for robust management of solids transport



**PT-S**  
10m - 22m Diameter

### Key features

- Standardized product with preset diameter sizes and drive selection
- Designed to suit mine backfill applications, with varying solid inventory / storage
- Simplified operation does not require advanced control systems

## Paste thickeners

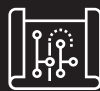
# Product portfolio

Metso Outotec Paste Thickeners provide unmatched performance in high density separation. Achieving a solids density is one thing - doing it in a managed way is another. Metso Outotec 2nd Generation Paste Thickener provides ease of operation and reliability even in the most challenging applications. The PT-S is a pre-engineered range of paste thickeners to suit mine backfill applications, without rake lift or advanced control systems.

|                     | PT         | PT-S                    | Design factors   |
|---------------------|------------|-------------------------|--|
| <b>Diameter (m)</b> | 1 - 45     | 10 - 22 (2m increments) | <ul style="list-style-type: none"> <li>▪ Feed rate t/hr or m<sup>3</sup>/hr</li> <li>▪ Solids loading t/m<sup>2</sup>/hr</li> <li>▪ Liquid loading m<sup>3</sup>/m<sup>2</sup>/hr</li> </ul> |
| <b>Sidewall (m)</b> | 5 - 12     | 10                      | <ul style="list-style-type: none"> <li>▪ Solids residence time / compaction depth</li> <li>▪ Clarification zone depth</li> <li>▪ Geometry</li> </ul>   |
| <b>Floor slope</b>  | 1:1.73     | 1:1.73                  | <ul style="list-style-type: none"> <li>▪ Floor slope driven by yield stress and slurry transport</li> </ul>  |
| <b>K-factor</b>     | 200 - 400+ | 400                     | <ul style="list-style-type: none"> <li>▪ Underflow density / yield stress</li> <li>▪ Particle size</li> <li>▪ Bed depth</li> </ul>   |



Increased beaching angle at tailings deposition



Consistent performance in changing process conditions



Rake load management by Smart Rake Lift (PT)

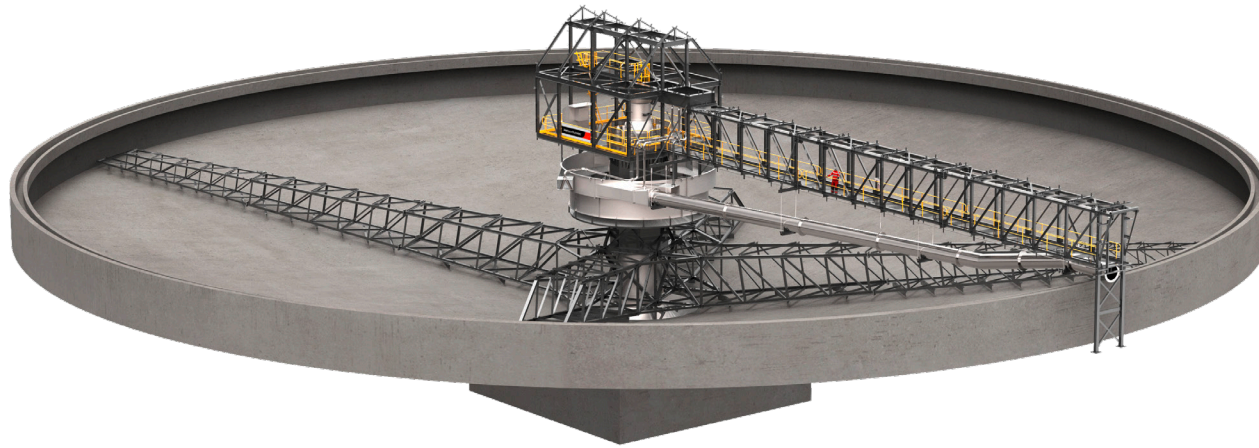


Maximized underflow density

## Thickeners and clarifiers

# Clarifiers

Metso Outotec has been consistent in answering customer challenges for nearly 50 years, leading the innovations of the thickener and clarifying industry (e.g. Feedwell technology).



### Clarifiers

1m - 125m Diameter

#### Key features

- For use with or without flocculation
- Robust design well suited for mining applications
- Overflow clarity typically down to 50mg/l

## Clarifiers

# Product portfolio

Raked clarifier with advanced feedwell design for a wide range of mining clarification duties.

Complementary automation improves thickening and clarifying performance by controlling the key variables.

|                     | Clarifier | Design factors   |
|---------------------|-----------|--|
| <b>Diameter (m)</b> | 1 - 125   | <ul style="list-style-type: none"><li>▪ Feed rate t/hr or m<sup>3</sup>/hr</li></ul>   |
| <b>Sidewall (m)</b> | 1.8 - 3.6 | <ul style="list-style-type: none"><li>▪ Solids residence time / compaction depth</li><li>▪ Clarification zone depth</li><li>▪ Geometry</li></ul> |
| <b>Floor slope</b>  | 1:6       | <ul style="list-style-type: none"><li>▪ Floor slope driven by yield stress and slurry transport</li></ul>  |
| <b>K-factor</b>     | 10 - 30   | <ul style="list-style-type: none"><li>▪ Underflow density / yield stress</li><li>▪ Particle size</li><li>▪ Bed depth</li></ul>                   |



Excellent overflow clarity to minimize fresh makeup water



Can be sized for use with or without the addition of flocculant



Industry leading feedwell technology to ensure efficient use of the clarification area

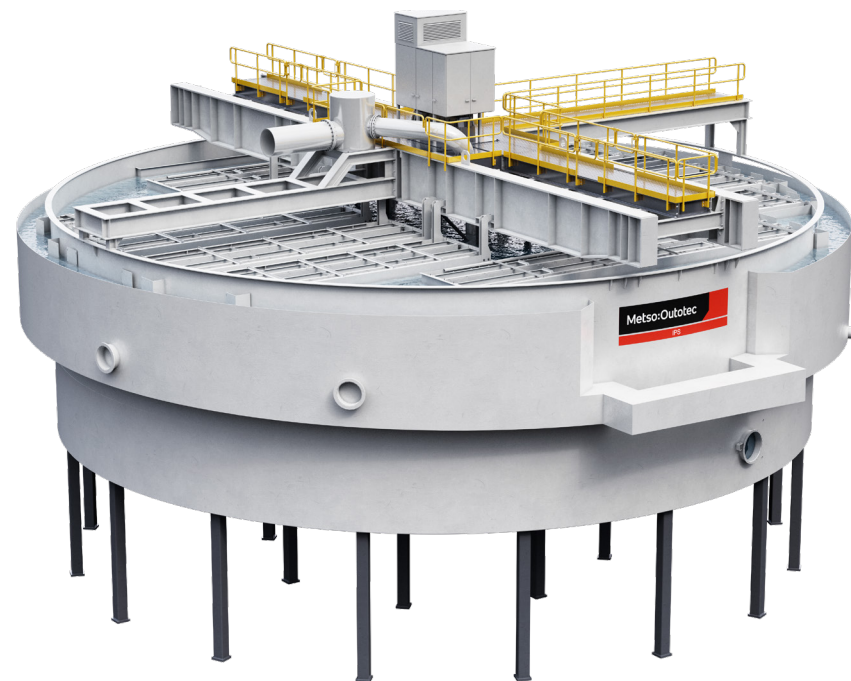


Designed for arduous mining applications

## Thickeners and clarifiers

# Inclined Plate Settlers

Metso Outotec's IPS offers good clarity of the overflow liquid and maximum density of the underflow solids discharge with minimum space requirements. Easy to install, relocate and adapt to process changes with a wide product offering for a range of applications, the Metso Outotec IPS offers maximum return on investment to customers.



Uses flocculation chemistry to dramatically increase settling rates



Decreased CAPEX and up to 20% lower OPEX cost



Compact and efficient design reduces plant footprint by ~50%

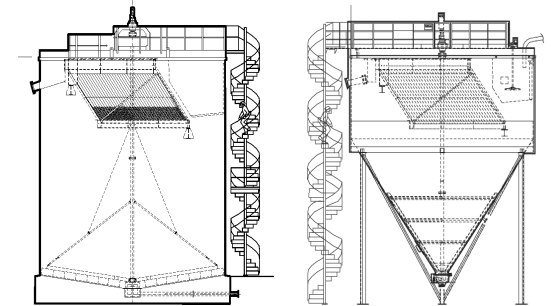
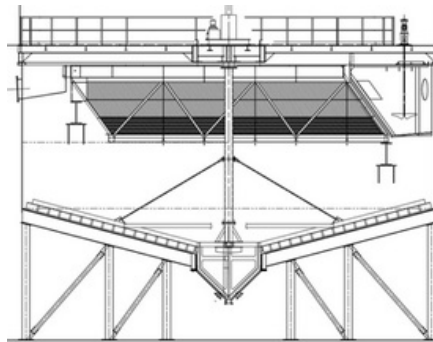
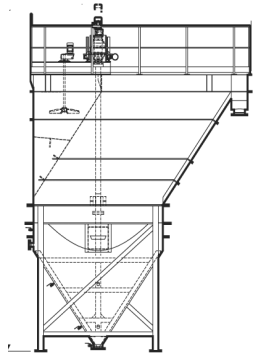


Increased uptime from robust design, maximized throughput and ease of maintenance

# Inclined plate settlers

## Product portfolio

The IPS equipment has proven to provide maximum recovery rates and a decreased plant footprint for a wide range of applications.



**LTO**  
15 - 500m<sup>2</sup>

### Key features

- Small to medium flow range
- Suits slurries containing coarse particles, can be fitted with rake mechanism and rake lift
- Standardized design with modular options for extra sludge retention

**LTC**  
440 - 5400m<sup>2</sup>

### Key features

- Multiple inclined plate packs in a conventional thickener tank with standard center drive rake mechanism
- Substantial reduction in TIC due to large settling area to floor area ratio

**LTE**  
220 - 1140m<sup>2</sup>

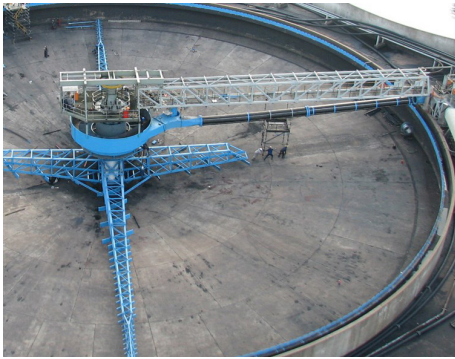
### Key features

- Cylindrical or Conical tank with inclined plate packs, for high thickening performance & extended sludge buffering
- Gives maximum clarification area from minimum floor space
- Minimize/eliminate flocculants

# Thickener modernizations, upgrades and retrofits

## Service offerings

Restore your thickener to its original condition or upgrade for increased performance.



### Bridge & Mechanism Upgrade

Improve performance and extend the life of equipment by upgrading your aged thickener. The thickener bridge and mechanism are often upgraded in conjunction with the entire feed system. Upgrading these mechanical elements helps you to cope with new process requirements and increased capacity.



### Froth Management Upgrade

Improve minerals recovery and minimize operating costs with our thickener froth management upgrade. The upgrade helps with froth control, particularly on concentrate thickeners, which can carry valuable minerals into the thickener overflow. Reducing or eliminating froth can save an operation millions in lost minerals per year, as well as reducing maintenance and reagent costs.



### SCD Split Ring Upgrade

Geared slewing bearings are crucial components of the Centre Column drive and critical for the efficient operation of any Metso Outotec thickener. The SCD split ring series has been designed to meet the same capacity as the original slewing bearings, offering drastically reduced plant downtime and ensures continued operation of the thickener.



### Feed System Upgrade

Meet plant targets in the face of higher throughput, changing ore characteristics, and new operational requirements. A Metso Outotec upgrade of your thickener feed system is tailored for changing process conditions and requirements experienced throughout the lifetime of any minerals processing plant.





