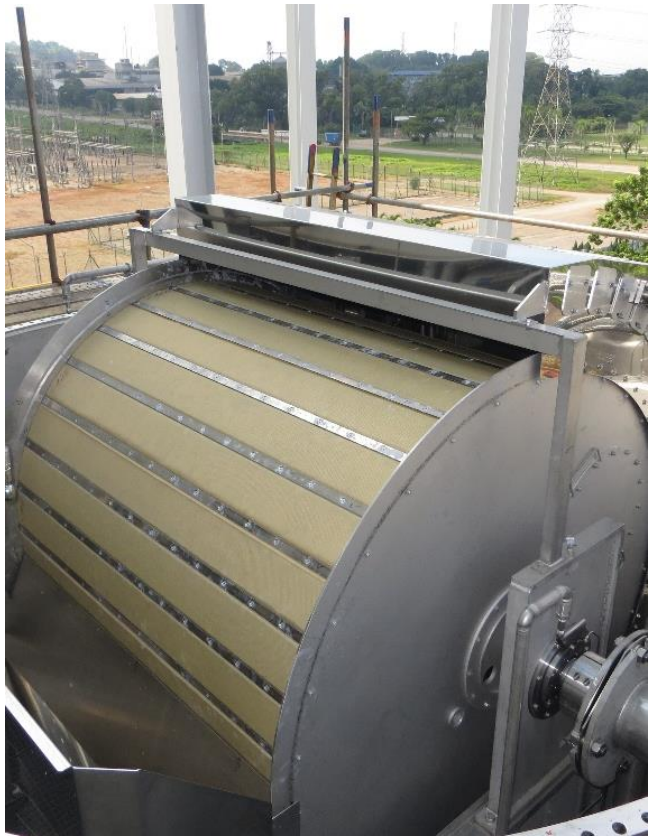
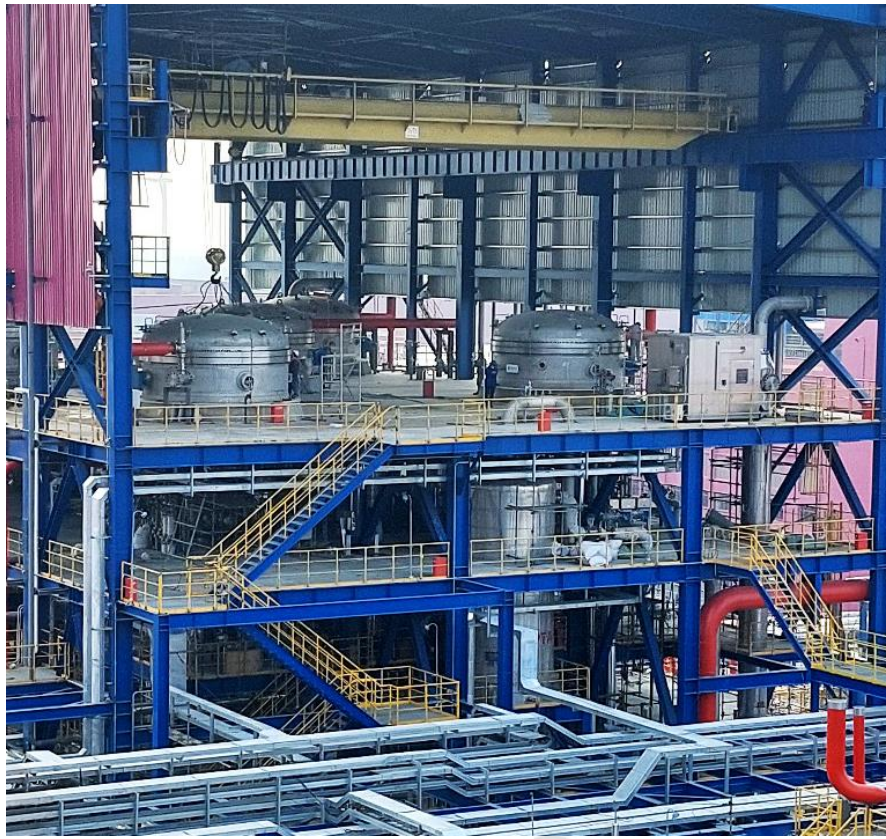
BOKELA

Filtration of Digester Blow-off

An option for the next generation refinery design

Jurgen Hahn
BOKELA GmbH





© BOKELA. Contents, texts and pictures of this presentation are protected by copyright. This presentation or any extract from it may not be passed on or published in any form.

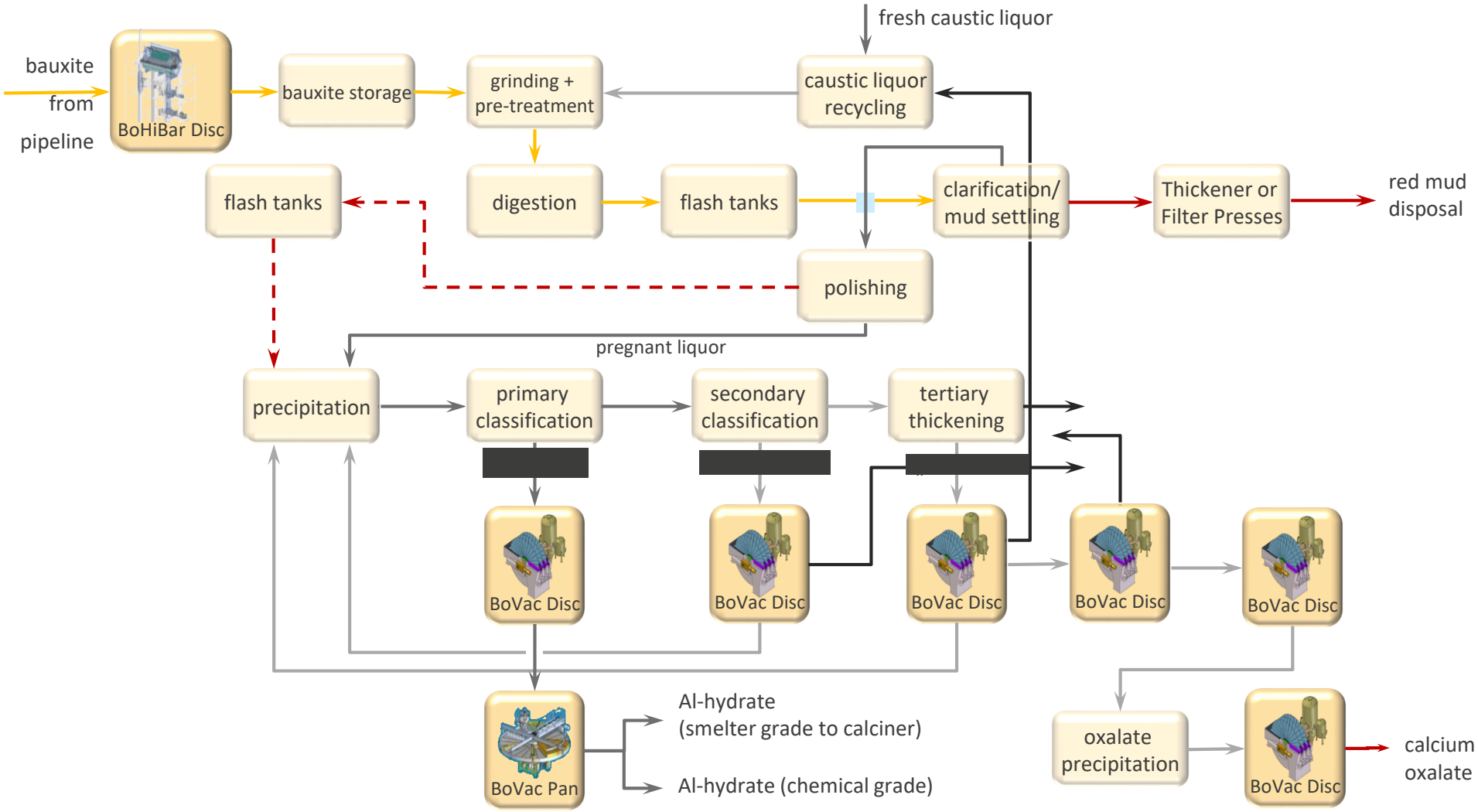
Name: Jurgen Hahn

Degree: Diploma in Chemical Engineering at Karlsruhe University, Germany, 1989

Current position: Senior Manager Product and Business Development

Work experience: Jurgen has been involved in the development, design and operation of filter plants for applications in the ore and materials processing industry for more then 30 years. Jurgen joined BOKELA company in 1989 and worked in his early years on filter revamping projects world-wide, dealing with the modification and modernization of numerous filter types as for instance rotary disc, drum, pan filters, filter presses, Kelly filters etc. in different industries. His practical experience and know-how gained in these projects was the basis for the development of BOKELA's high performance rotary filter technologies. In 2001 Jurgen became sales director of BOKELA and is internationally regarded as one of the most renowned rotary filter experts. Since 2022 he is responsible for the communication with all engineering companies worldwide as well as the product development within the company.

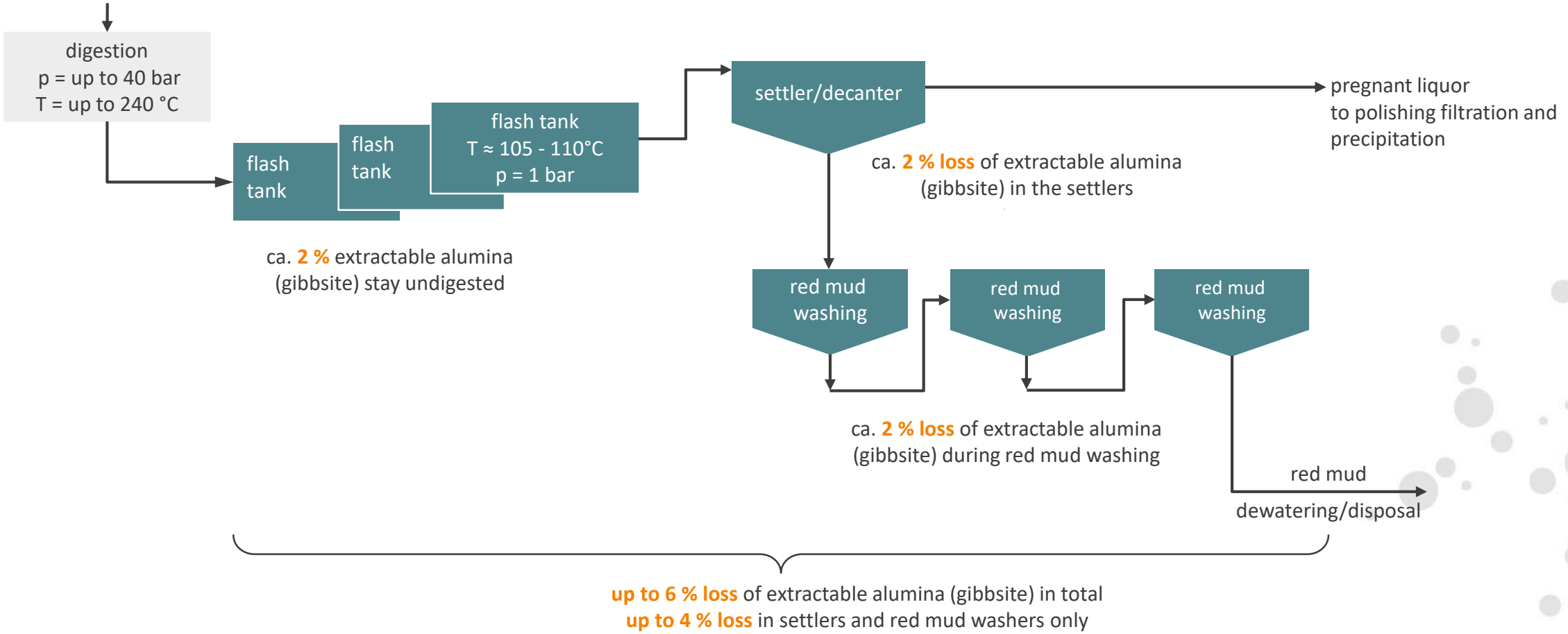
FILTRATION IN ALUMINA REFINERIES



VIEW OF AN ALUMINA REFINERY

LOSS OF EXTRACTABLE ALUMINA

Red side of Bayer process



LOSS OF EXTRACTABLE ALUMINA

Red side of Bayer process

digestion
p = up to 40 bar
T = up to 240 °C

flash tank

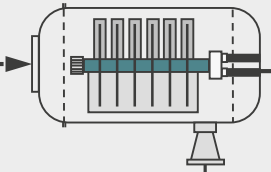
flash tank

flash tank
T ≈ 105 - 110°C
p = 1 bar

pregnant liquor
to polishing filtration and
precipitation

direct filtration by BoHiBar Filtration

- no cooling down
- short residence time



pregnant liquor with
T ≈ 105 …165°C
p ≈ 1 … 6 bar

solids

red mud
washing

red mud
washing

red mud
dewatering/disposal

Target: loss of extractable alumina in settlers & washers minimized to **< 1 %**

CHALLENGES

For implementation of filtration

The duty

- Filtration within minutes and under pressure to minimize loss of already dissolved Al into red mud
- Remove as much pregnant liquor from solids as possible

The challenges

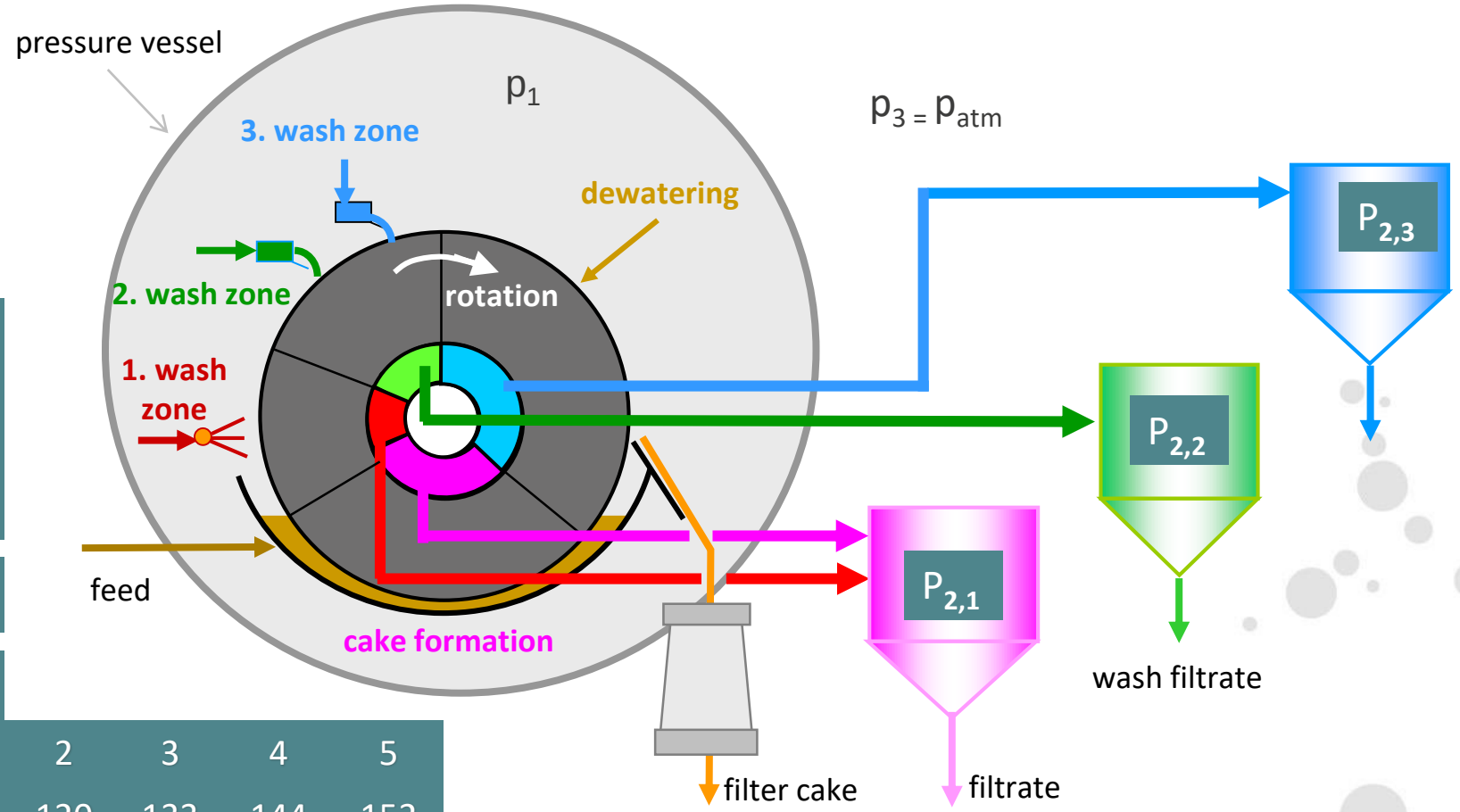
- Cake wash on disc filters, if possible
- Filtration at up to 200°C
- Operation without air
- Low feed solids of 50 - 200 g/l
- Filter cloth material

CAKE WASH

On vacuum disc filters

BOHIBAR FILTRATION AT 160°C

With back pressure at filtrate side to prevent flushing



p_1 = pressure in filter vessel

$P_{2,i}$ = pressure in receivers

p_3 = atmosphere pressure

$p_1 > p_{2,i} > p_3$

$\Delta p_{Filtration} = p_1 - p_{2,i}$

Boiling temperatures of H_2O

Vapor pressure [bar]	1	2	3	4	5
Boiling temp. [° C]	100	120	133	144	152

FILTRATION OF PTA

With BoHiBar drum filter

FILTRATION OF PURE TEREPHTHALIC ACID (PTA)

Under full steam atmosphere (no air) with BoHiBar Drum Filter

TYPICAL PROCESS & OPERATION DATA		
Pressure in vessel	[bar]	3 – 6
Temperature	[°C]	145 – 165
Solids throughput	[tDS/h]	82
Solids in feed	[wt-%]	38 – 41
Cake moisture	[wt-%]	max. 8
Wash efficiency	[%]	90
Overall wash ratio	[t/t]	max. 0.4

LOW FEED SOLIDS AND FILTER FABRIC

Low feed solids can be dealt with as follows

- More filtration area and/or more filter units
- Use of pressure decanter

Suitable filter fabrics (subject to pilot testing)

- PEEK
- PTFE
- New developments

ROTARY PRESSURE FILTERS – BOHIBAR FILTERS

Also known as hyperbaric filters

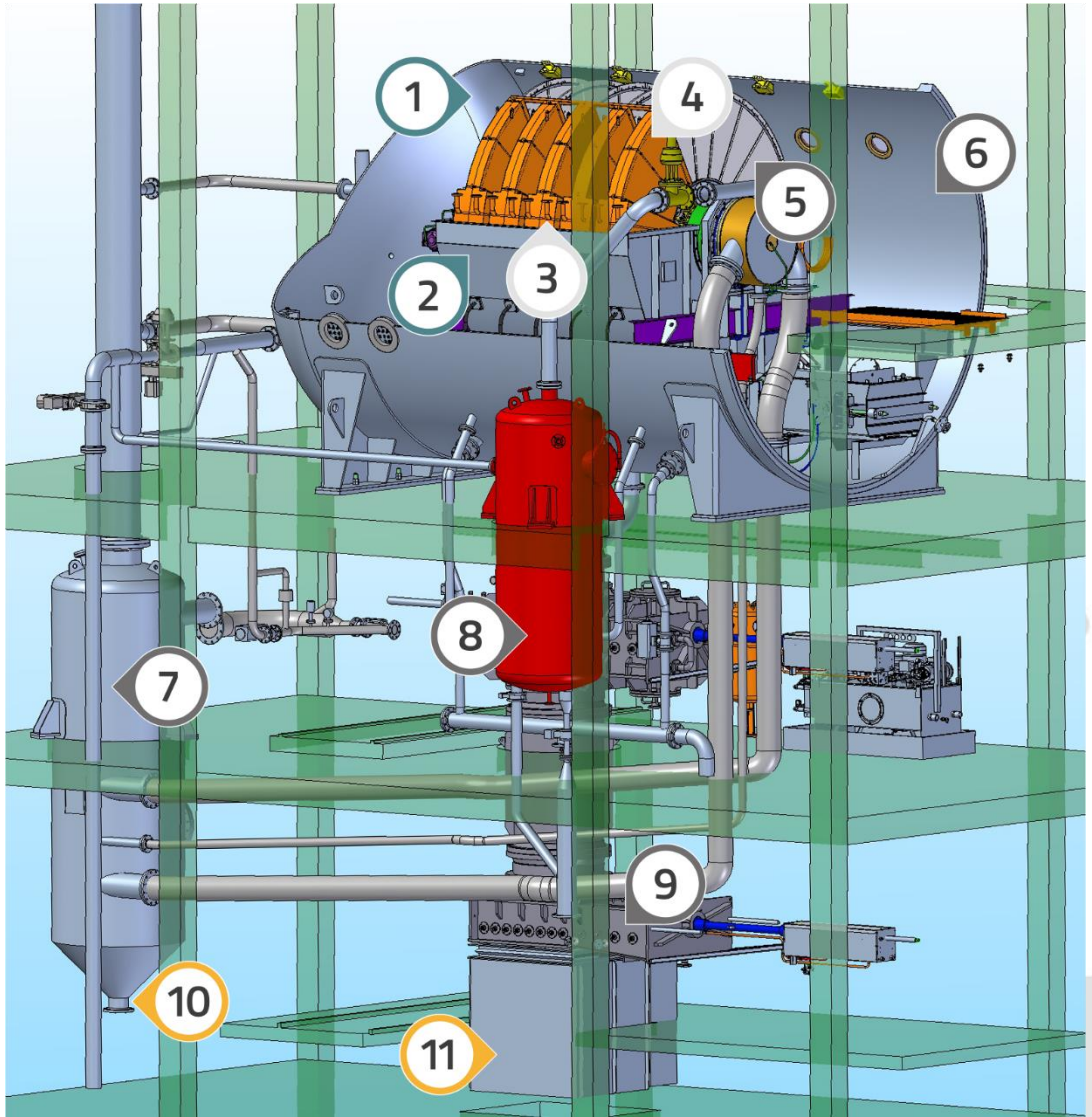
BoHiBar Disc Filter

BoHiBar Drum Filter

BOHIBAR DISC FILTER

Plant design

1. Compressor
2. Slurry
3. Superheated steam
4. Steam cabins
5. Disc filter
6. Pressure vessel
7. Filtrate receiver
8. Cake blow-off tank
9. Discharge sluice
10. Filtrate
11. Filter cake



FILTRATION OF BAUXITE

With hyperbaric disc filter

FILTRATION OF DIGESTER BLOW-OFF

- 1 Mio t/a alumina → 2 Mio t/a red mud
- Ca. 250 t/h solids to be filtered
- Use of pressure decanter considered

BoHiBar Disc Filter S168

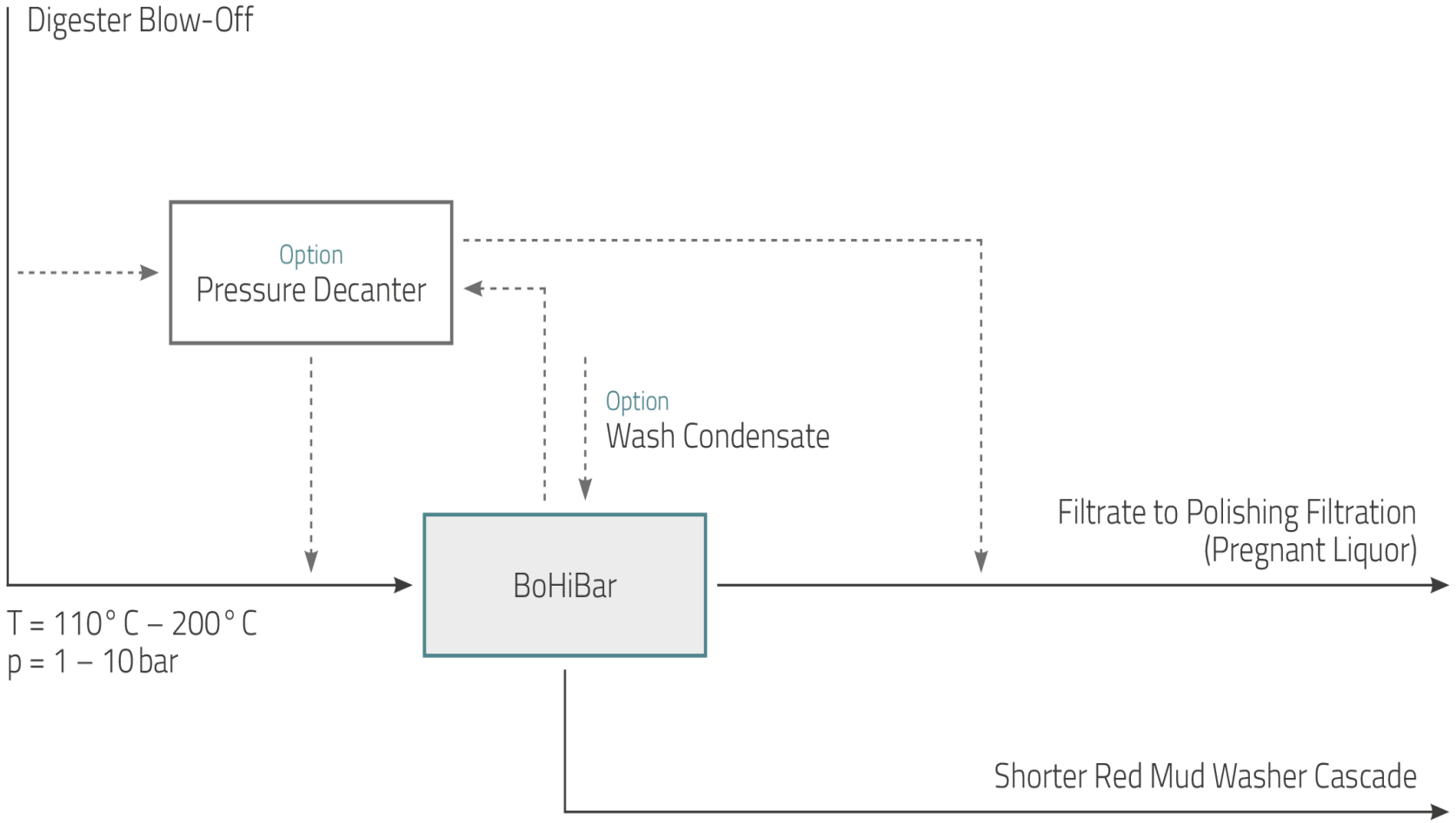
- Exp. solids throughput: 100 – 150 t/h
- 3 units (2 operating + 1 standby)

BoHiBar Drum Filter XL26

- Exp. solids throughput: 20 – 25 t/h
- 12 units (10 operating + 2 standby)

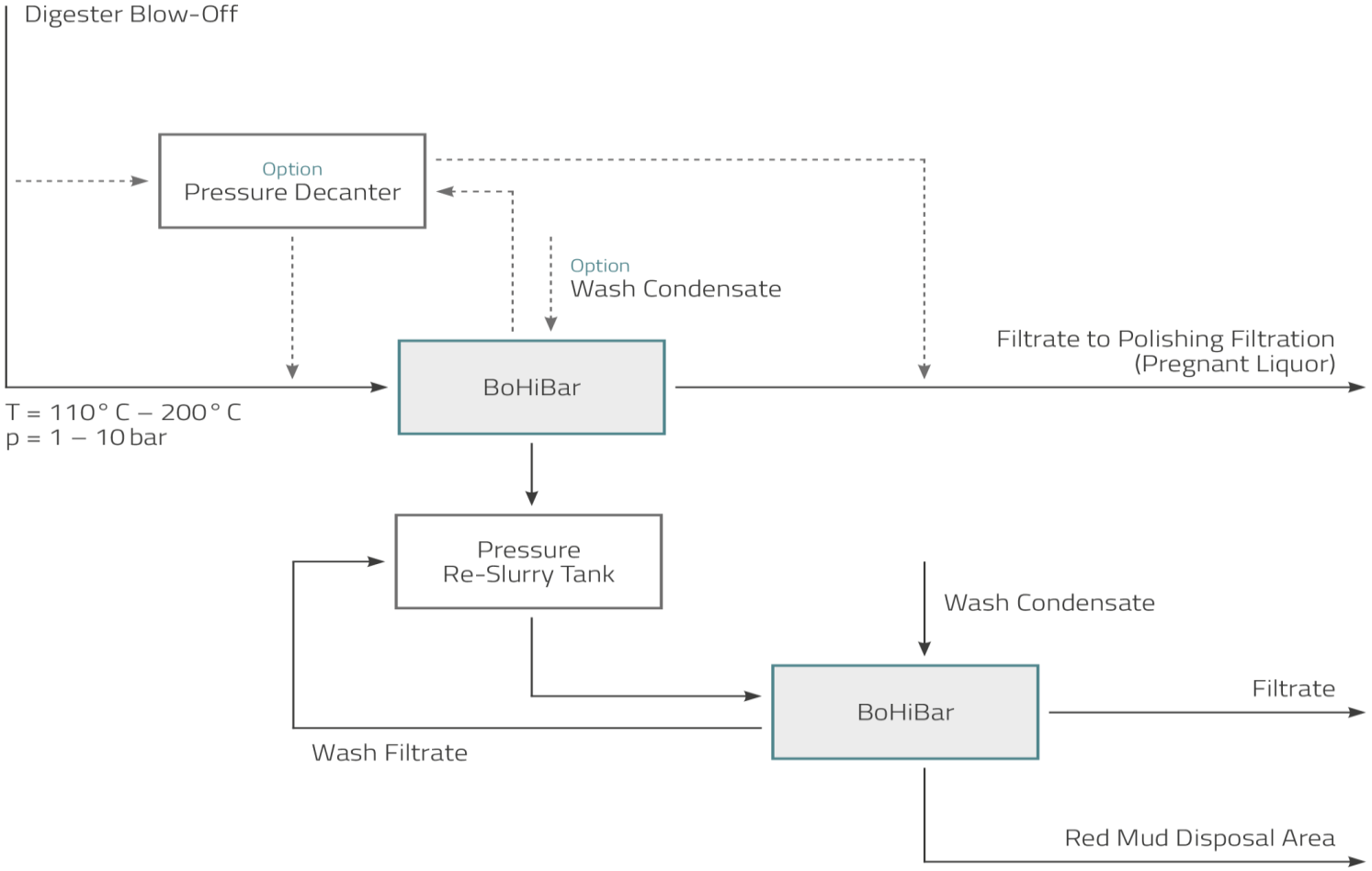
FILTRATION OF DIGESTER BLOW-OFF

With one filtration stage



FILTRATION OF DIGESTER BLOW-OFF

With two filtration stages



Duties of 2nd filtration stage

- Remove as much dissolved Al as possible
- Reduce moisture of red mud for safer disposal

BOKELA

THE FILTRATION PEOPLE

Thank you for your attention.