

MDF-Turpentine: startup of production

PCA 2026 International Conference, Lisbon

September 14th, 2026

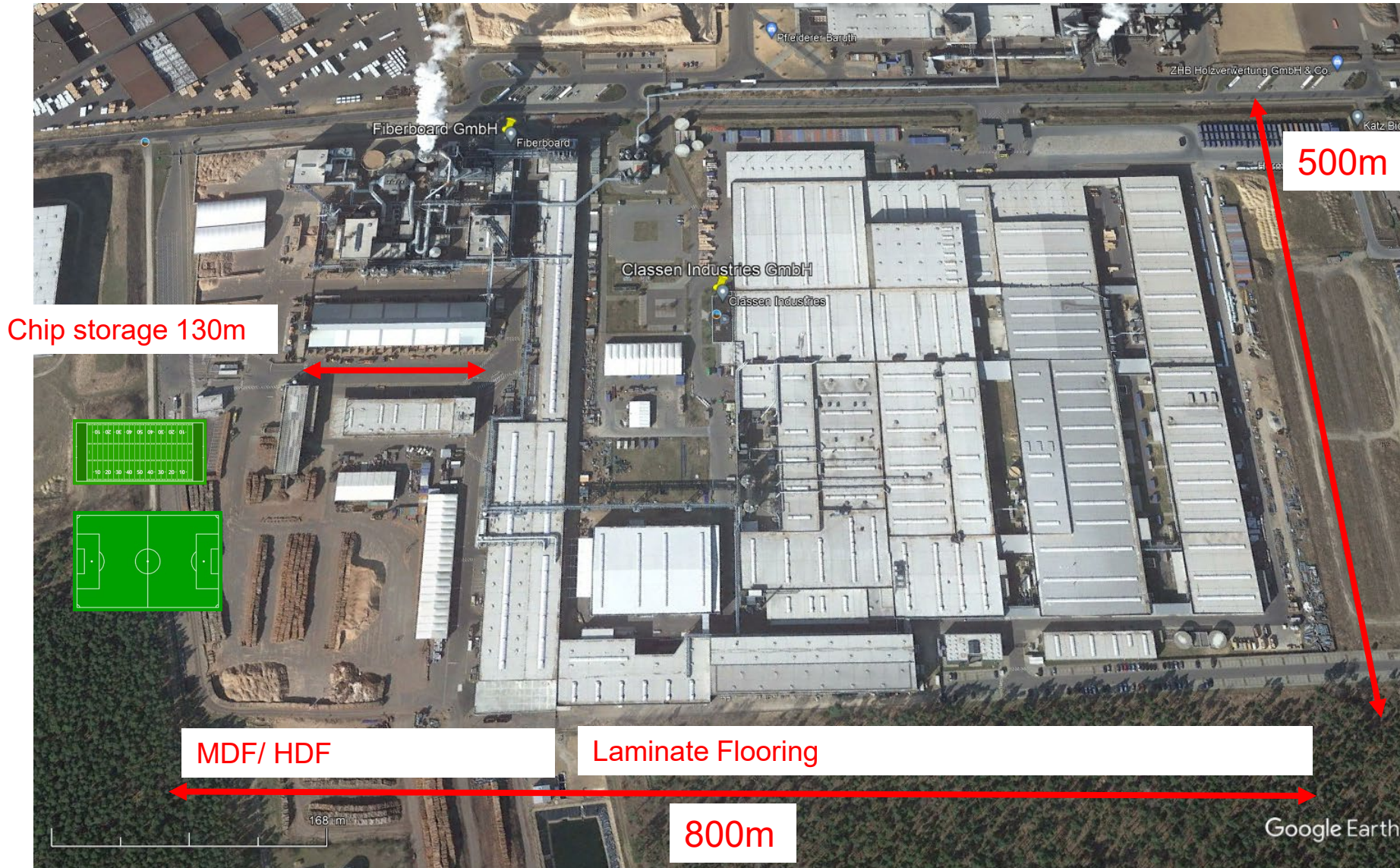
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Bernd Bungert, Thomas Heine, Christian Dümichen,
Carsten Buhlmann, Sebastian Wendel, Maciej Gorecki
Fiberboard GmbH, Classen Group
Baruth, Germany

Baruth: integrated MDF/HDF production facility



- Fully integrated: from tree to laminate flooring
- **Capacity MDF: 500. 000 m³**
- **Capacity wood 400 000 t**
- **Capacity Laminate: 80 million m², of which 25 million m² digital printing**
- State-of-the-art logistics concept
- **€ 550 million total investment**

New route to turpentine

First presented at PCA meeting in Dublin in 2023 and in San Diego 2025

(link and more info on last slide)

- Tree tapping
- Extraction from pine stumps
- Kraft process at pulp mills

- **Medium Density Fiberboard production (MDF)**

- Quality (almost) like gum turpentine
- No sulfur
- Continuous production (no seasonal dependence)
- Worldwide potential: 120,000 t/year

Gum Turpentine (GT)

Wood Turpentine

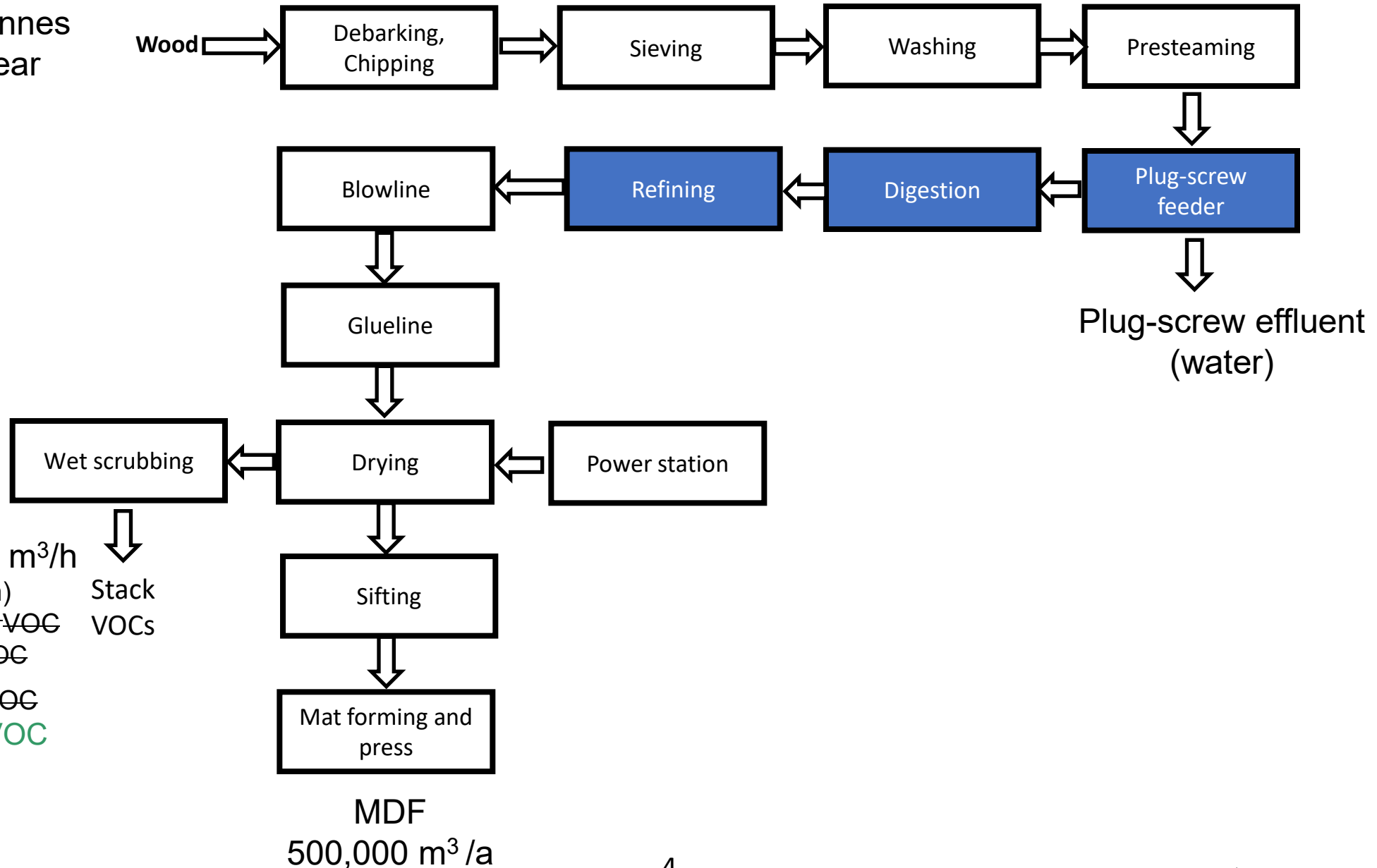
Crude Sulfate Turpentine (CST)

MDF-Turpentine (MDF-T) (vapour method)

„MDF-Turpentine“ (liquid method)

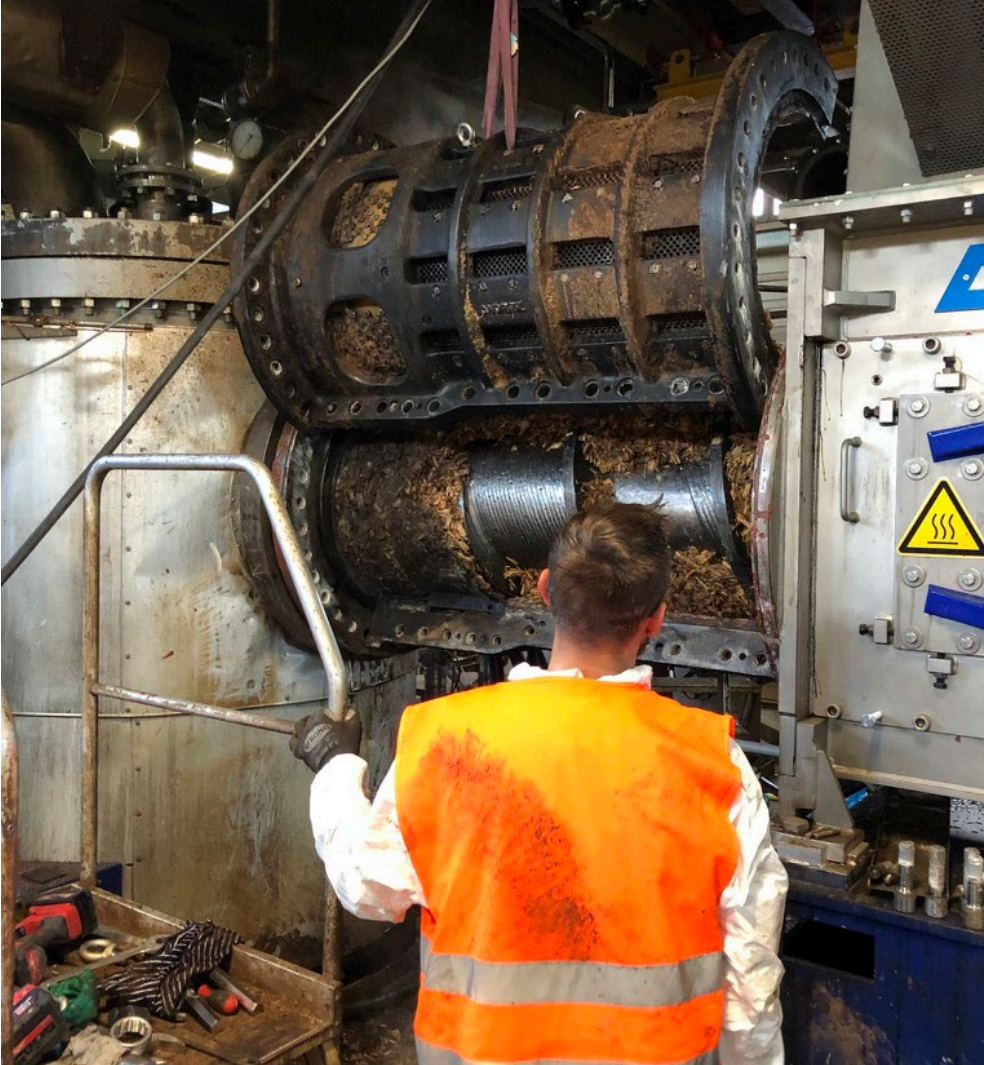
MDF Process

400,000 tonnes
(dry) per year

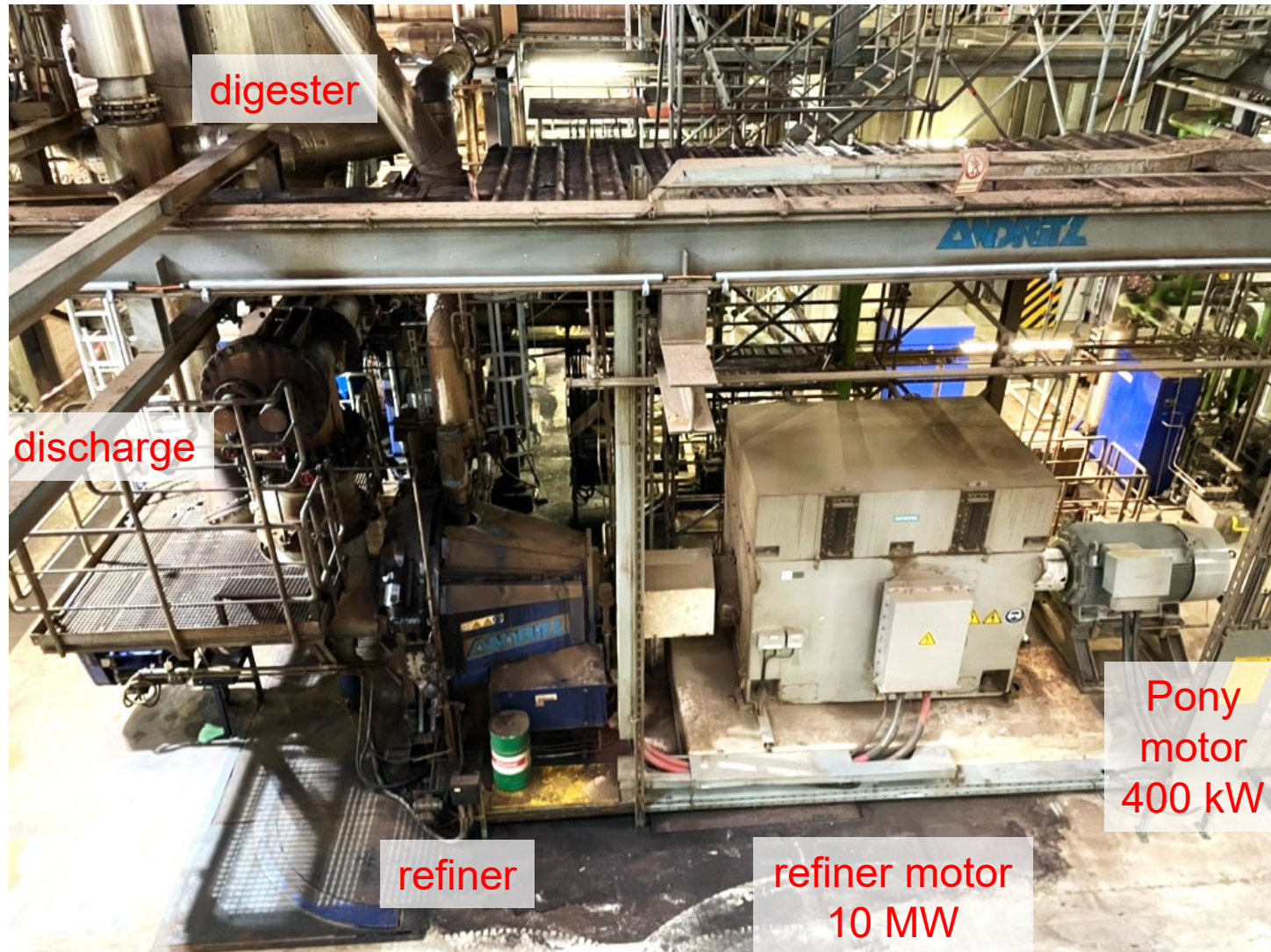
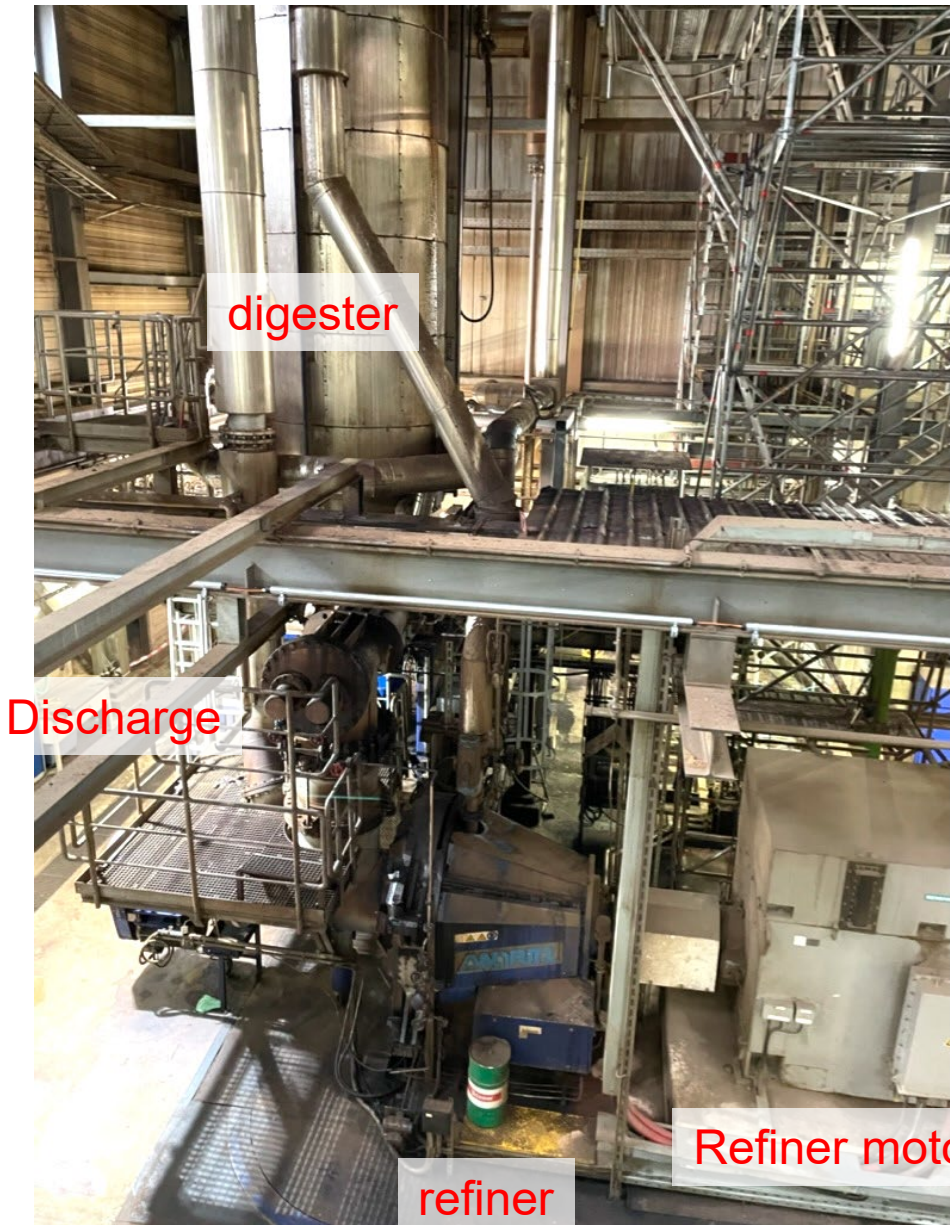


Plug-Screw Feeder from presteamer to digester (cooker)

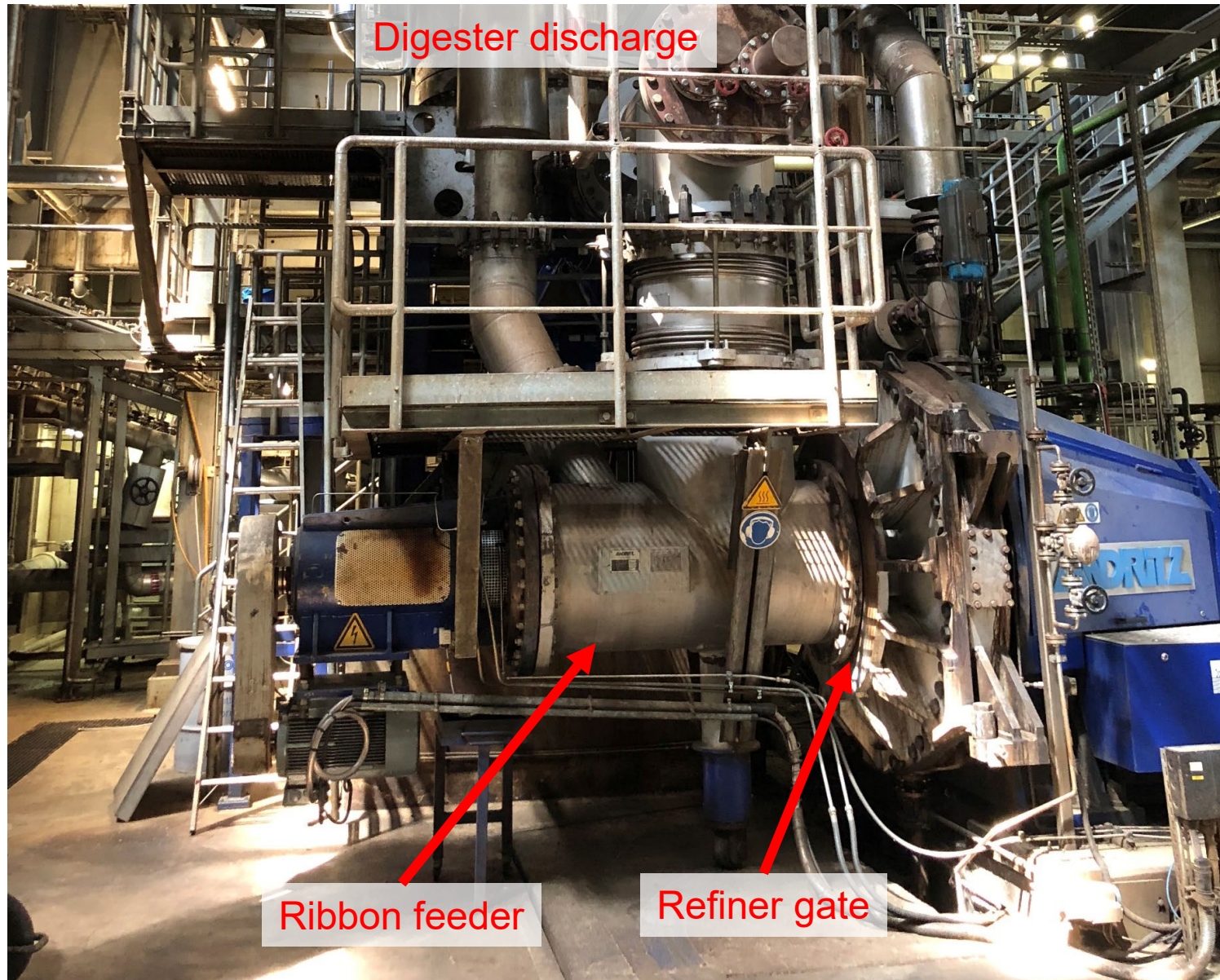
(sealing the feed of 52 t/h (dry = 100 t/h wet) from 1 bar to 10 bar! And dewatering at the same time ..)



Digester and Refiner



Refiner feed

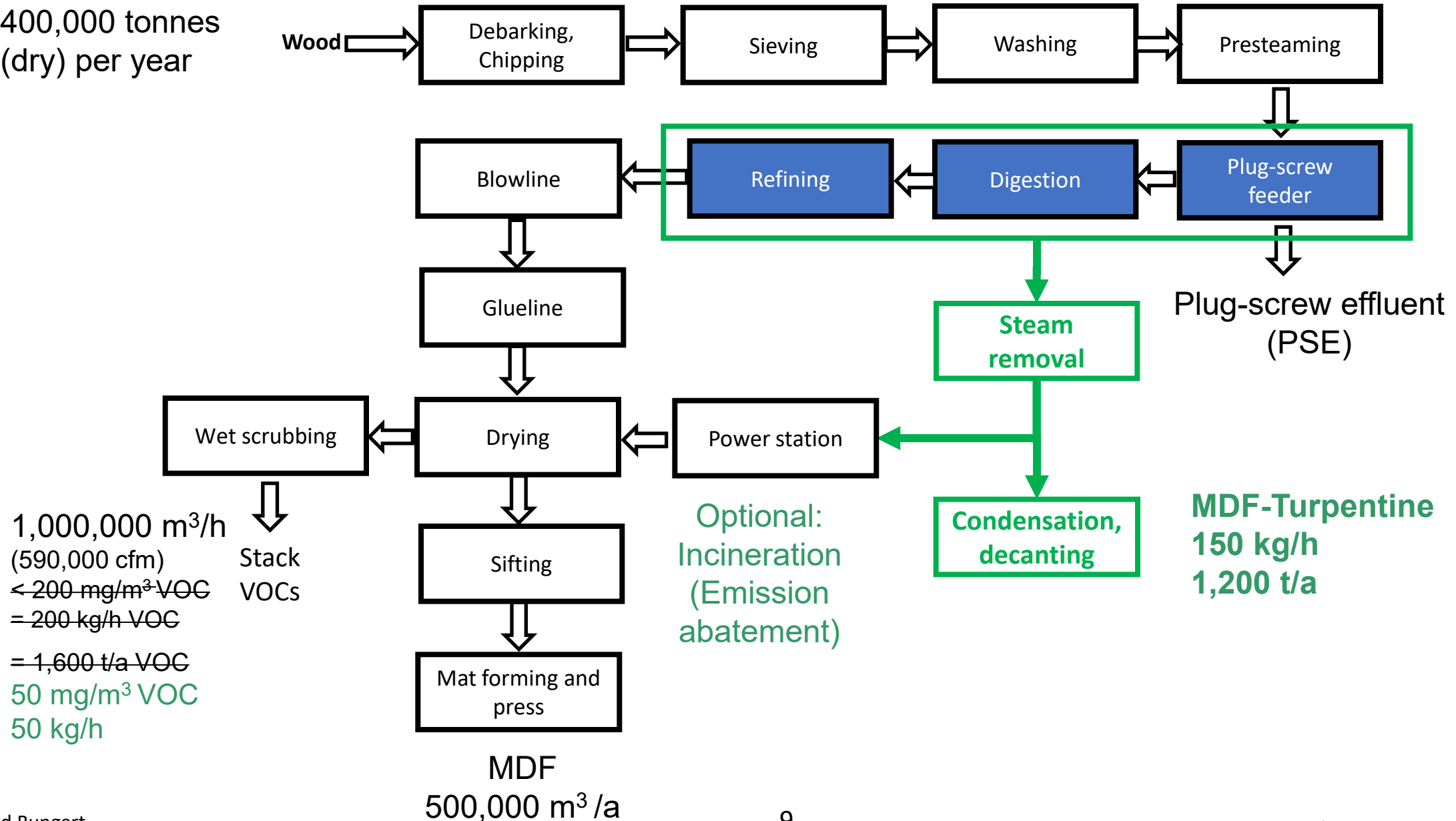


Refiner (rotor-stator mill)



MDF Process, MDF-Turpentine production

400,000 tonnes
(dry) per year



Pilot production

Phase separator (oil-separator)

turpentine receiver







MDF-Quality assurance by Gas Chromatography

DESCRIPTION

Turpentine produced by MDF-Turpentine process based on steam processing of wood chips obtained principally from scots pine (Waldkiefer, Pinus Sylvestris) obtained from the MDF plant of Fiberboard GmbH in Baruth/ Mark, Germany.

SPECIFICATION

Appearance :	Clear	
Colour :	Almost colourless, slightly yellow	
Alpha Pinene content (%) :	47 (standard value);	40 (min)
Beta Pinene Content [%]:	5 (standard value);	2 (min)
Delta 3 Carene Content [%]:	30 (standard value);	37 (max)
Limonene content [%]:	4 (standard value)	
Sulfur content [ppm]:	3-3.3 (standard value);	3.5 (max)
Water content [%]:	0 (standard value);	0,1 (max)

TYPICAL PROPERTIES

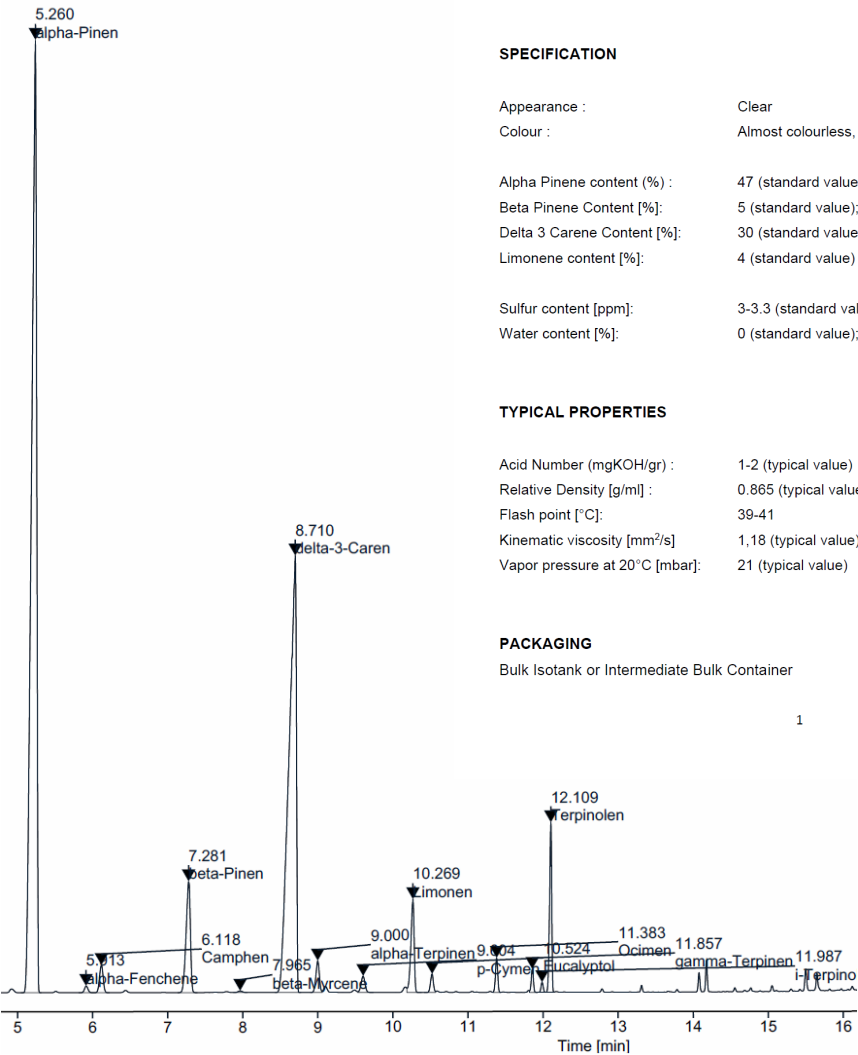
Acid Number (mgKOH/gr) :	1-2 (typical value)	
Relative Density [g/ml] :	0.865 (typical value)	
Flash point [°C]:	39-41	
Kinematic viscosity [mm²/s]	1,18 (typical value)	
Vapor pressure at 20°C [mbar]:	21 (typical value)	

PACKAGING

Bulk Isotank or Intermediate Bulk Container

1

Classten MDF-Turpentine PDS R04
Author: Dr. Bernd Bungert
Approved: A. Hennig
Date: 2024-10-15



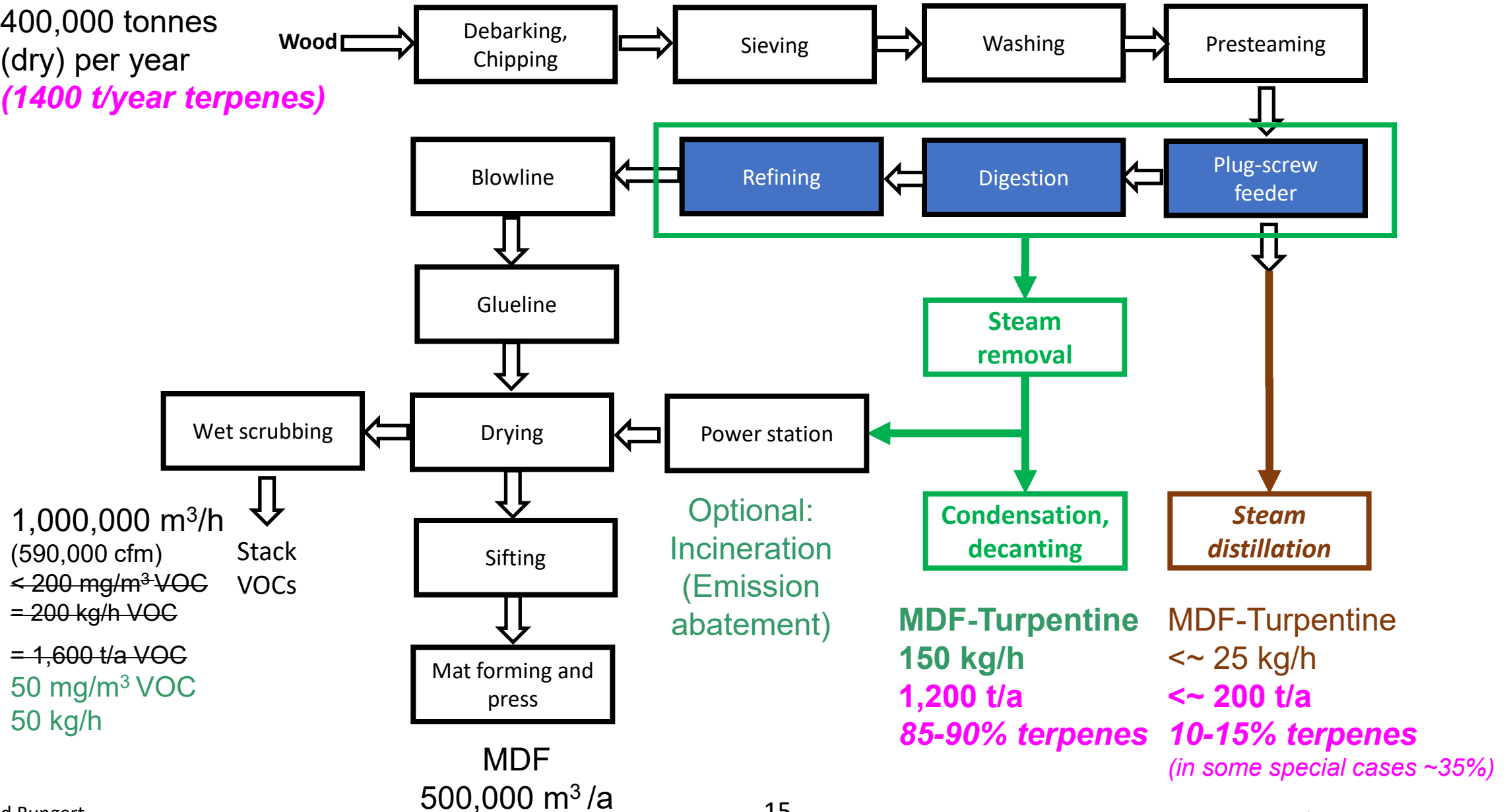
MDF-T: Quality and possible byproducts

- Digestion takes place for 3-5 minutes @ 170-180°C (364-382 °F)
- Decomposition of hemicelluloses and pentoses can lead to formation of furfural
- The MDF-T technology portfolio is able to handle any known impurities
- Sulfur is not present at all
- Direct use in formulation like GT not possible due to slight smell and pale yellow colour
- Perfect fit for customers who up to now use GT and fractionate
- In that case GT can be replaced by MDF-T

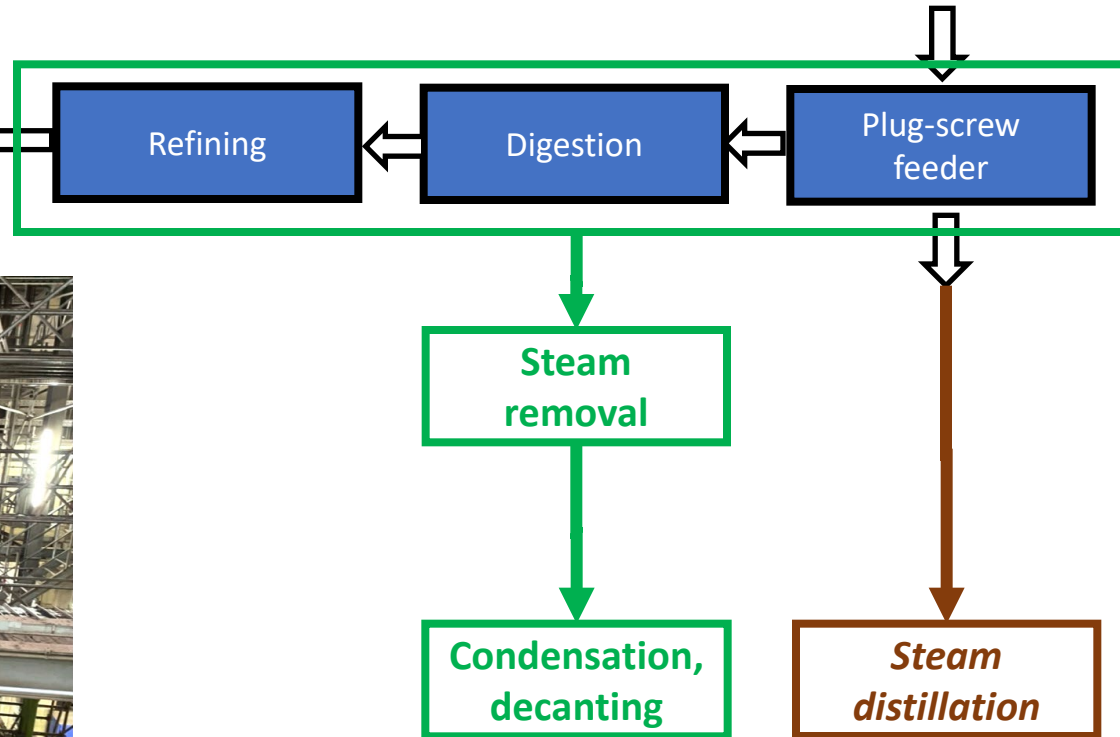
- Distillation runs in the 10 m³ scale confirm the commercial quality
- Technology can be applied worldwide

MDF Process, MDF-Turpentine production, *process alternatives*

400,000 tonnes
(dry) per year
(1400 t/year terpenes)



MDF Process, MDF-Turpentine production, *process alternatives*



MDF-Turpentine
150 kg/h
1,200 t/a

Vapour method
85-90% terpenes

„MDF-Turpentine“
<~ 25 kg/h
<~ 200 t/a

Liquid method
10-15% terpenes

- Unit for Liquid method has less investment
- Liquid method has less yield
- Steam distillation from PSE was first published in 1998
- Vapour method also solves emissions problems
- Vapour method has bar far the highest yield



IP Position: IP (2020), IP (2021)

- Granted
- One objection defeated before European patent court
- No other objections, deadline for objection passed

(12) NACH DEM VERTRAG ÜBER DIE INTERNATIONALE ZUSAMMENARBEIT AUF DEM GEBIET DES PATENTWESENS (PCT) VERÖFFENTLICHTE INTERNATIONALE ANMELDUNG

(19) Weltorganisation für geistiges Eigentum
Internationales Büro

(43) Internationales Veröffentlichungsdatum
02. September 2021 (02.09.2021)



(10) Internationale Veröffentlichungsnummer
WO 2021/170779 A1

(51) Internationale Patentklassifikation:
D21B 1/12 (2006.01) *B27N 3/04* (2006.01)
B27N 1/00 (2006.01)

(21) Internationales Aktenzeichen: PCT/EP2021/054788

(22) Internationales Anmeldedatum:
26. Februar 2021 (26.02.2021)

(25) Einreichungssprache: Deutsch

(26) Veröffentlichungssprache: Deutsch

(30) Angaben zur Priorität:
20160148.1 28. Februar 2020 (28.02.2020) EP

(71) Anmelder: **FIBERBOARD GMBH** [DE/DE]; An der Birkenpfuhlheide 4, 15837 Baruth (DE).

(72) Erfinder: **HENNIG, Andre**; c/o Fiberboard GmbH, An der Birkenpfuhlheide 4, 15837 Baruth (DE). **DÜMICHEN, Christian**; c/o Fiberboard GmbH, An der Birkenpfuhlheide 4, 15837 Baruth (DE). **SCHWENDY, Martin**; c/o Fiberboard GmbH, An der Birkenpfuhlheide 4, 15837 Baruth (DE). **Bungert, Bernd**; 14169 Berlin (DE). **HEINE, Thomas**; 13599 Berlin (DE).

(74) Anwalt: **MICHALSKI HÜTTERMANN & PARTNER PATENTANWÄLTE MBB**; Speditionstrasse 21, 40221 Düsseldorf (DE).

(81) Bestimmungsstaaten (soweit nicht anders angegeben, für jede verfügbare nationale Schutzrechtsart): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, IT, JO, JP, KE, KG, KH,



(54) Title: METHOD AND PROCESSING SYSTEM FOR REDUCING VOLATILE ORGANIC COMPOUNDS FROM WOOD CHIPS

(54) Bezeichnung: VERFAHREN UND VERARBEITUNGSSYSTEM ZUM REDUZIEREN VON FLÜCHTIGEN ORGANISCHEN VERBINDUNGEN AUS HACKSCHNITZELN

(12) NACH DEM VERTRAG ÜBER DIE INTERNATIONALE ZUSAMMENARBEIT AUF DEM GEBIET DES PATENTWESENS (PCT) VERÖFFENTLICHTE INTERNATIONALE ANMELDUNG

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(43) Internationales Veröffentlichungsdatum
26. Januar 2023 (26.01.2023)



(10) Internationale Veröffentlichungsnummer
WO 2023/001978 A1

(51) Internationale Patentklassifikation:
B27N 1/00 (2006.01) *B27N 3/04* (2006.01)
B27N 1/02 (2006.01) *B27N 3/18* (2006.01)

(21) Internationales Aktenzeichen: PCT/EP2022/070535

(22) Internationales Anmeldedatum:
21. Juli 2022 (21.07.2022)

(25) Einreichungssprache: Deutsch

(26) Veröffentlichungssprache: Deutsch

(30) Angaben zur Priorität:
21187502.6 23. Juli 2021 (23.07.2021) EP

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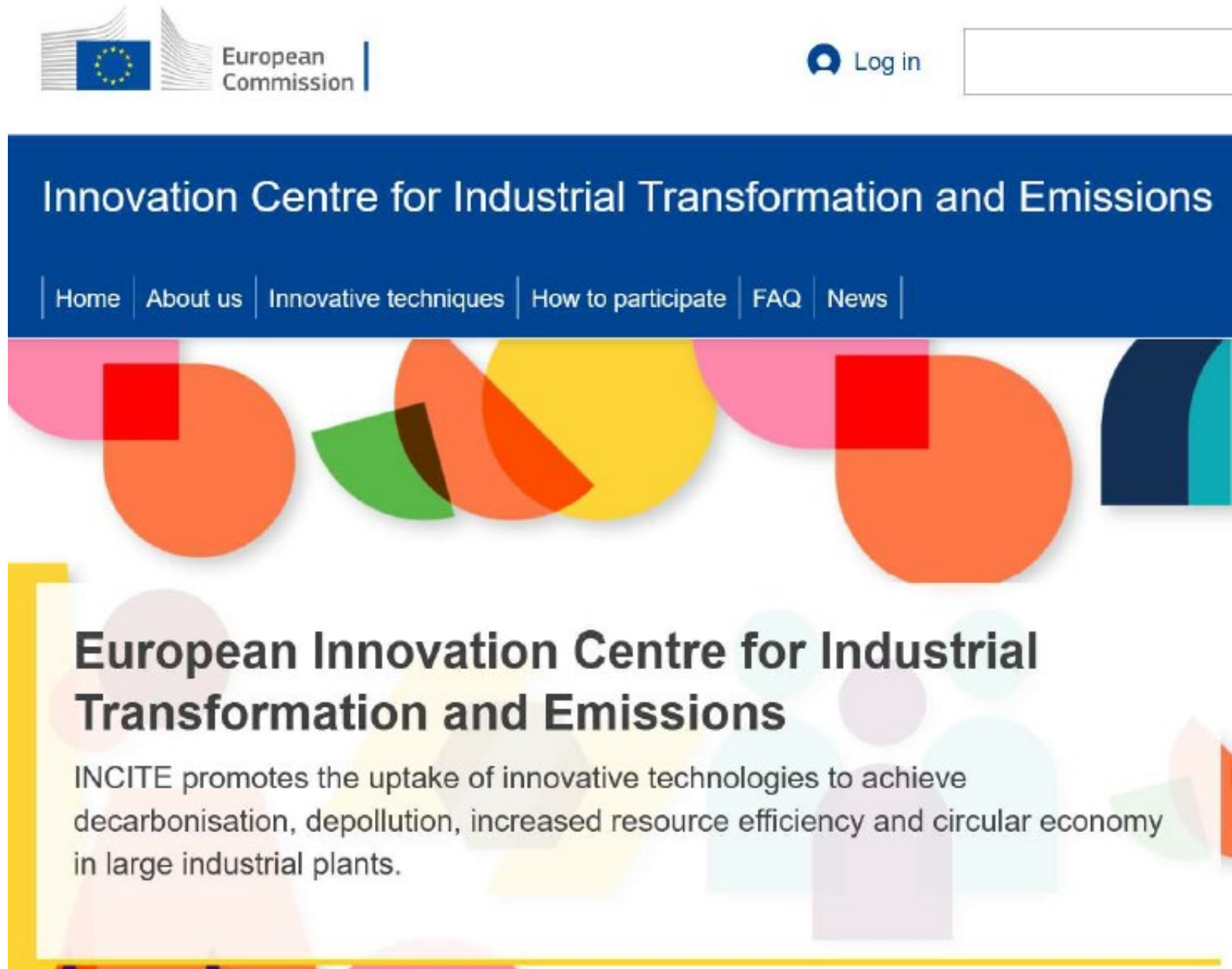
Veröffentlicht:
— mit internationalem Recherchenbericht (Artikel 21 Absatz 3)

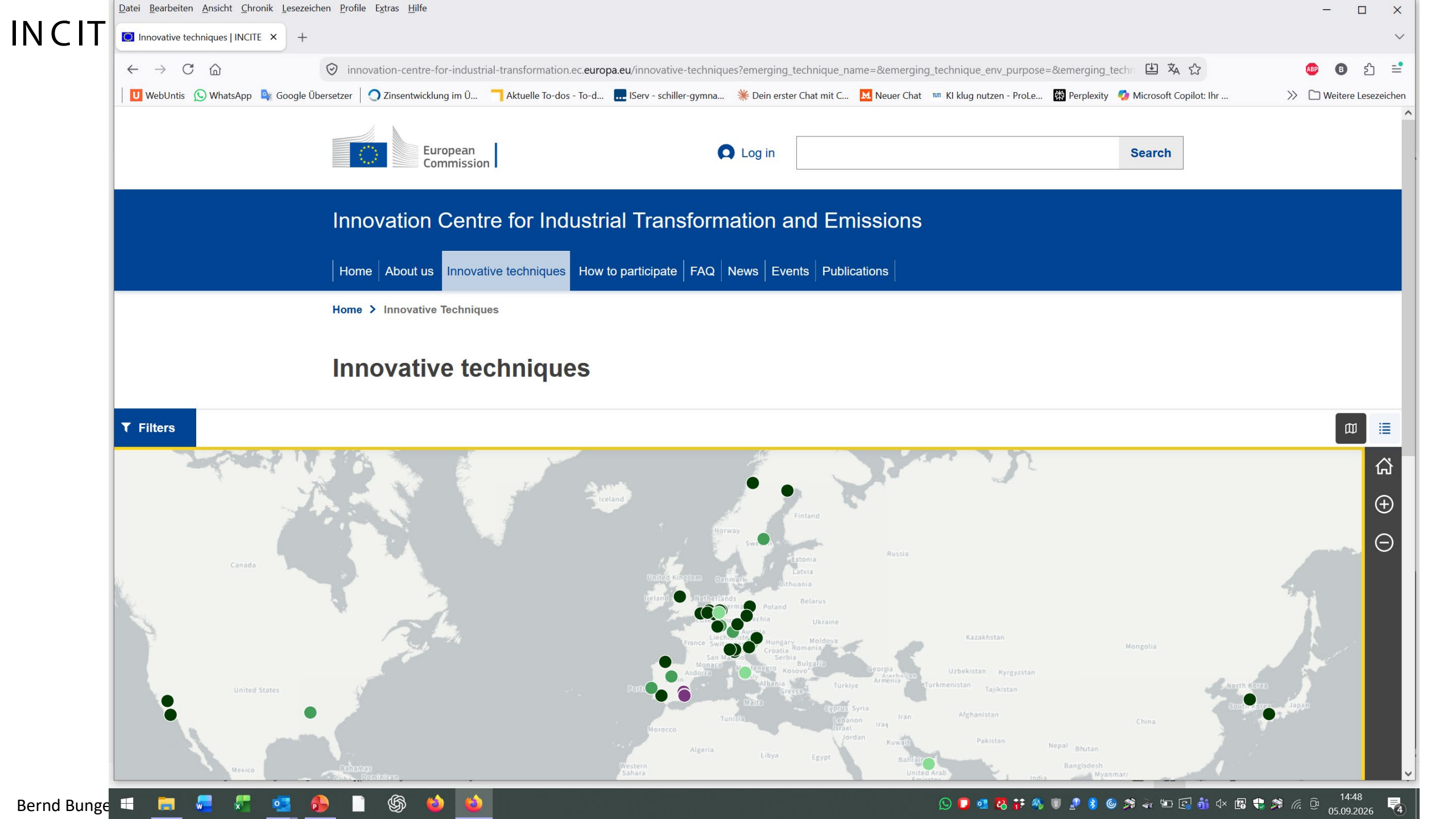
(54) Title: PROCESS FOR MANUFACTURING FIBER BOARDS WITH REDUCED VOC EMISSIONS

(54) Bezeichnung: VERFAHREN ZUM HERSTELLEN VON FASERPLATTEN UNTER VERRINGERTEM VOC-AUSSTOß

IP Position: patent family

- IP 3: Application for oriented strandboard (OSB), particleboard, lumber, ...
 - IP 4: Process optimization
 - IP 5: Process Optimization
 - IP 6: Process Control
 - IP 7: Purification of turpentine (can also be applied to desulphurization of CST)
 - IP 8: Optimization effecting downstream steps in MDF process
-
- Classen is ready and experienced to actively maintain their IP position
 - Classen is prepared to immediately sue any breach and any violation of their IP
 - Classen gives its licensees maximum security in terms of technology, reliability, competitiveness
 - **MFD-T has a strong IP position**





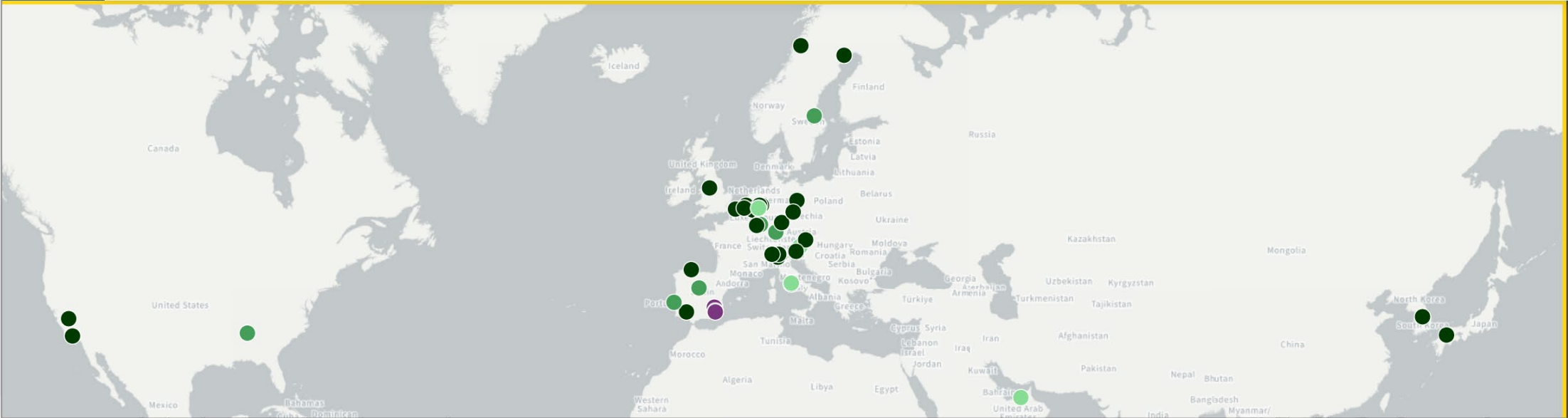
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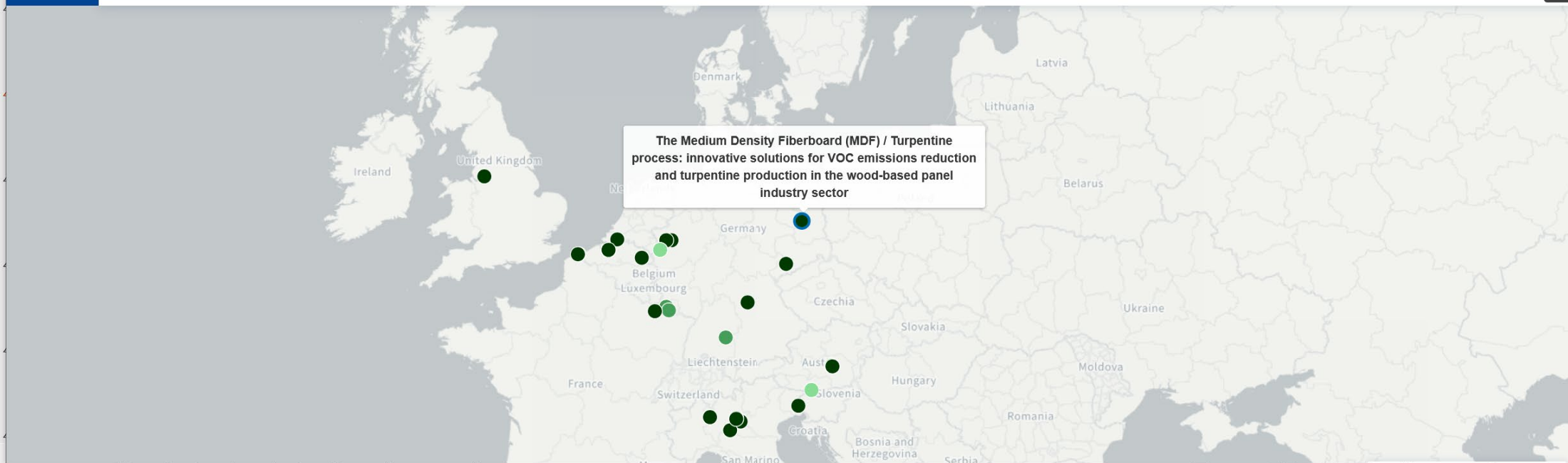
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Relevant industrial sector

INCITE, EU legislations

- INCITE has listed MDF-T as emerging technique to be considered in the BAT process (Best available technology)
- Technology is thus automatically considered state of the art
- Producing turpentine means reducing VOCs!
- VOC reduction generates revenue. There is no more excuse, not to reduce emissions and thus produce turpentine

European authorities will put pressure on producers to reduce their emissions

= Production of turpentine can quasi become mandatory!

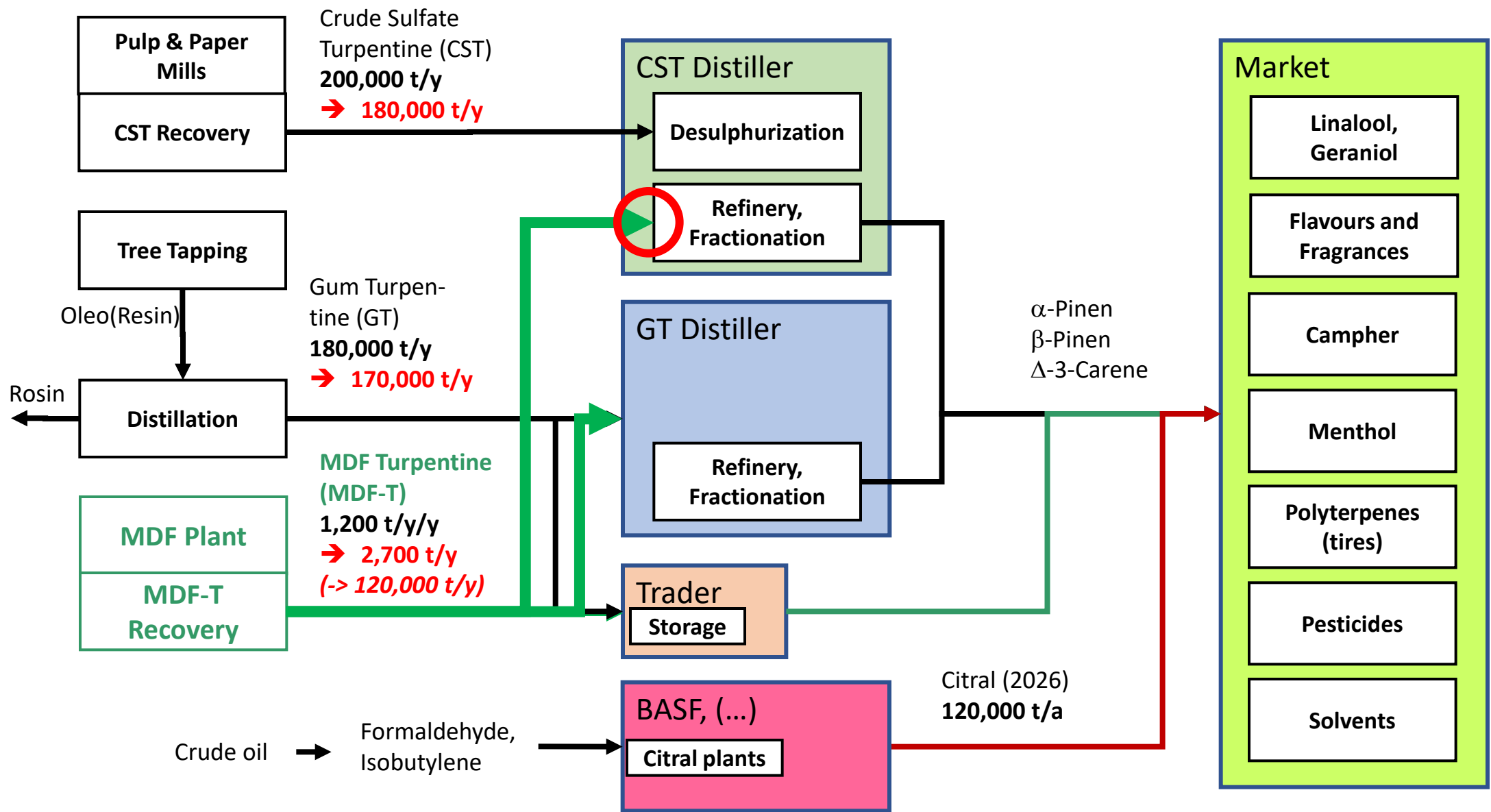
Project development (together with equipment manufacturer/ contractor and possibly buyer)

- 1) Address customer (licensor/ licensee/ possibly buyer)
- 2) Lab analysis of wood samples (licensor/ licensee/ buyer)
- 3) Questionnaire
- 4) First estimation of investment
- 5) Information to Turpentine buyers and first indication on price model
- 6) NDA with allowance for sample production (licensor/ licensee/ possibly buyer)
- 7) On-site assessment (licensor/ licensee/ possibly buyer)
 - Mobile turpentine condenser
 - Technical data
 - Heat sinks, data on steam and water
 - Plant concept
 - First estimation of business case
 - Sample generation (e.g. 5 days, min. 100 ml daily)
- 8) Sample analysis by turpentine buyers, bidding and selection. If ok:
- 9) LOI/ contract selected turpentine buyer (licensor/ licensee/ possibly buyer)
- 10) Term Sheets & License contract (licensor/ licensee/ possibly buyer)
- 11) Qualification: (licensor/ licensee/ buyer)
 - samples/ lab evaluation over time period (reproducibility)
 - IBCs (5-10 IBCs (?) for pilot plant trials)
- 12) Process Design Package (licensor/ licensee/ possibly buyer)
- 13) Project execution and parallel: Purchase and sale agreement turpentine buyer
- 14) Quality control, REACH
- 15) Production

Projects under development (α -pinene/ β -pinene// tonnes per year)

- | | |
|---|------------------|
| 1) North America (Pinus Palustris) | (63,5/ 13// 720) |
| 2) North America (Pinus Taeda) | (67/ 18// 680) |
| 3) South America (Pinus Taeda & Eliottii) | (57/ 22/ 486) |
| 4) South America (Pinus Radiata) | (29/ 61// 780) |
| 5) Europe Southwest (Pinus Pinaster) | (67/ 17// 750) |
| 6) Europe Middle and North (Pinus Sylvestris) | (47/ 5// 1500) |
| 7) Türkiye (Pinus Nigra) | (40/ 7// 1200) |
| 8) Türkiye (Pinus Nigra, Pinus Brutia) | (50/ 29// 1150) |
| 9) Australia and New Zealand (Pinus Radiata) | (34/ 42// 670) |
| 10) Europe Middle and North Baruth, Classen | (46/ 5/ 1200) |

Production and Market route for CST, GT, MDF-T, Citral (2027)



Market development: Identification of customers

Data base with all MDF plants in the world

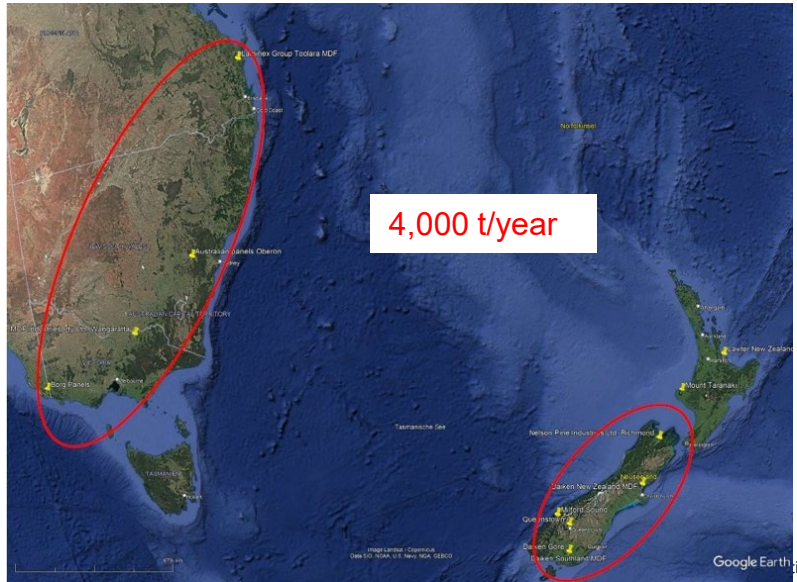
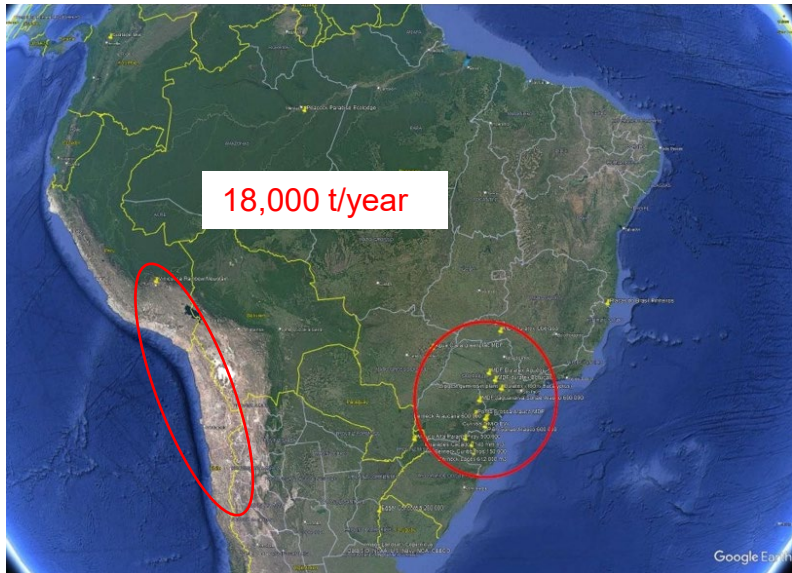
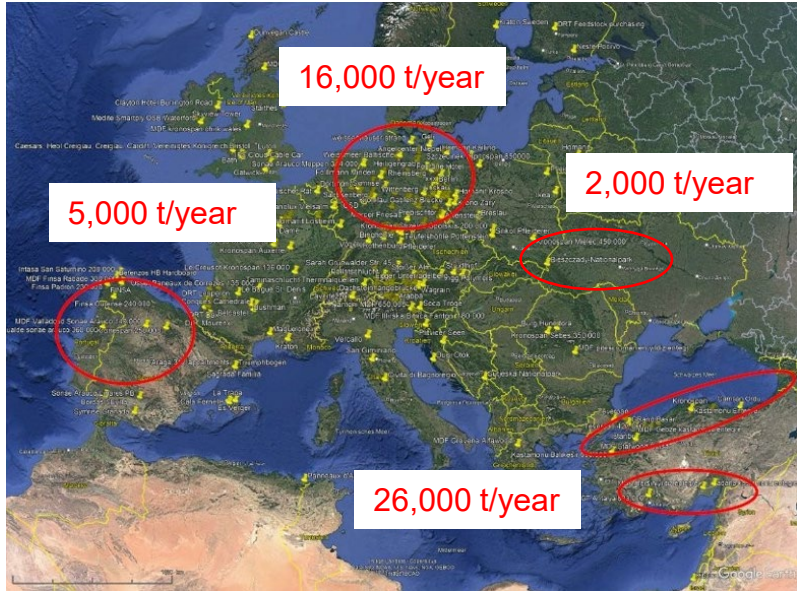
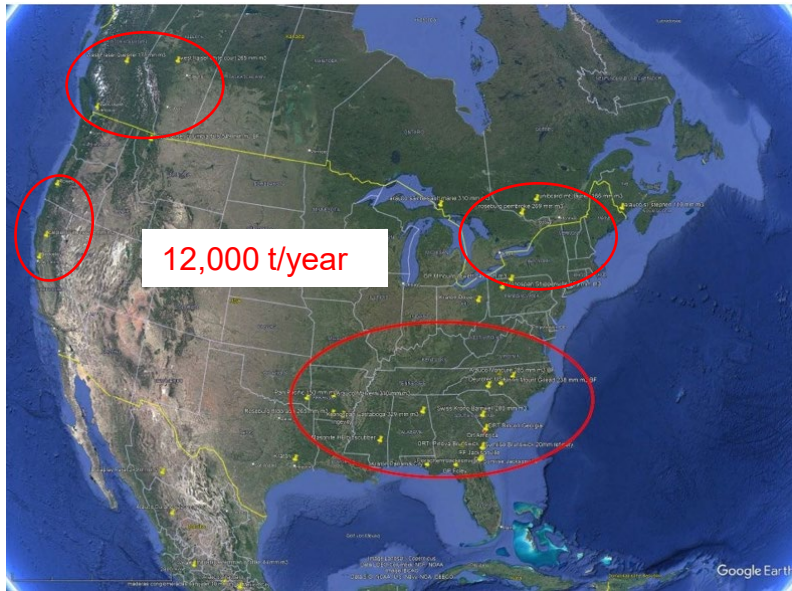
Project:	MDF-VOC					
Title:	MDF producers worldwide					
Date:	30.07.2026					
Author:	Bungert, Heinrich					
Revision:	R27					
Company	Country	Site	Region	State	Capacity [m3/a]	

Region	State	Capacity [m3/a]
Asia East		2.333.000
Asia Southeast		7.020.000
Aus, NZ		1.449.333
China		65.000.000
Europe Central and North		13.109.000
Europe East		6.006.000
Europe Southwest		1.973.000
Asia Middle East, India Iran		5.921.000
North America		6.255.000
South America		9.905.600
Africa		468.000
Türkiye		7.894.000
Total known		121.078.933
Total without China, Rus, Belarus		50.072.933

[illegible]

Market development: Maximum possible capacity (MDF-sites with pine)

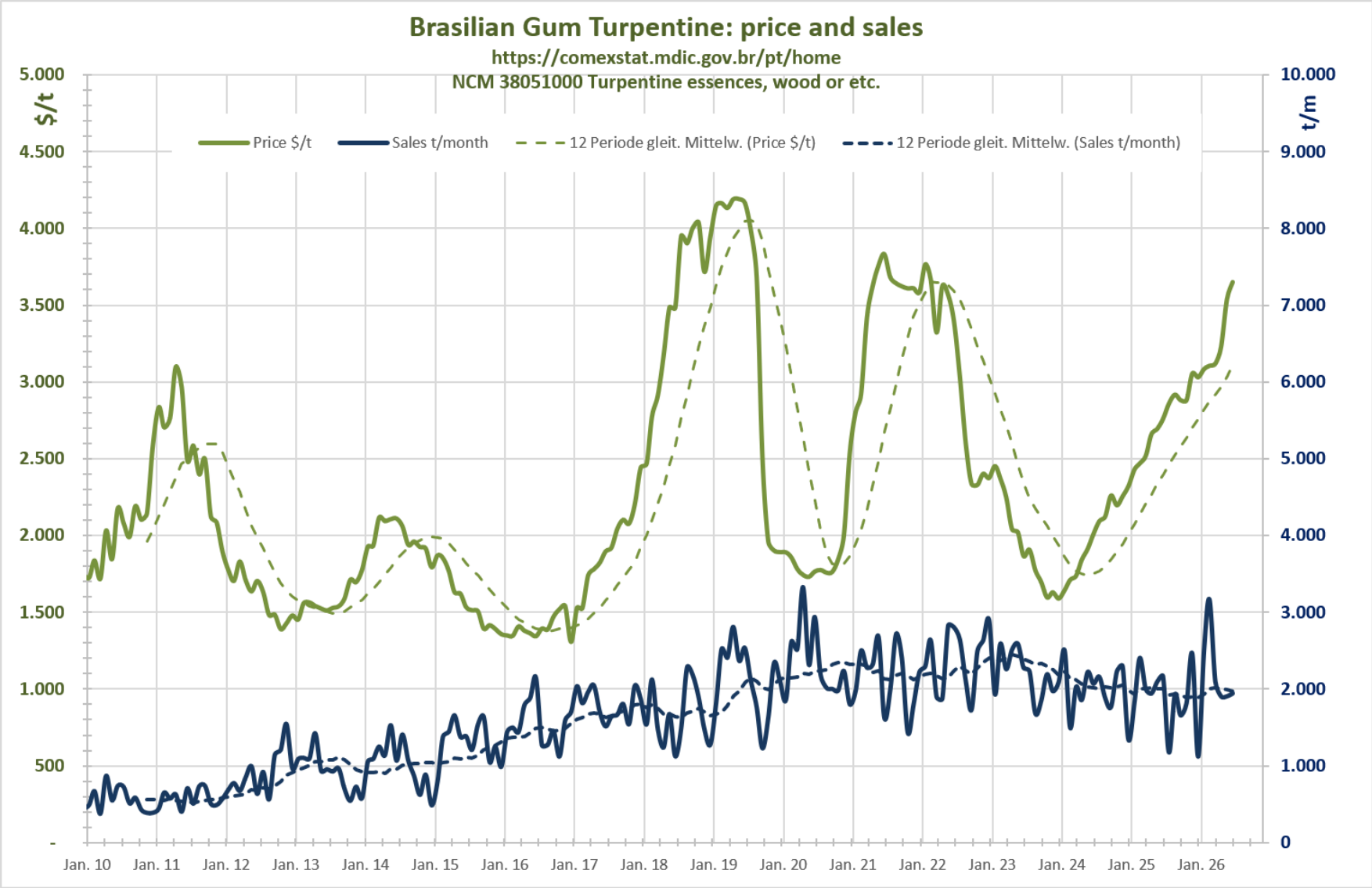
w/o China, Europe East: 81000 t/year



Market development: Sales goals

- 2026: 2-3 license contracts
- 2027: 2-3 Plants in construction
- 2028: 3-5 Plants
- 2029: 6-9 Plants

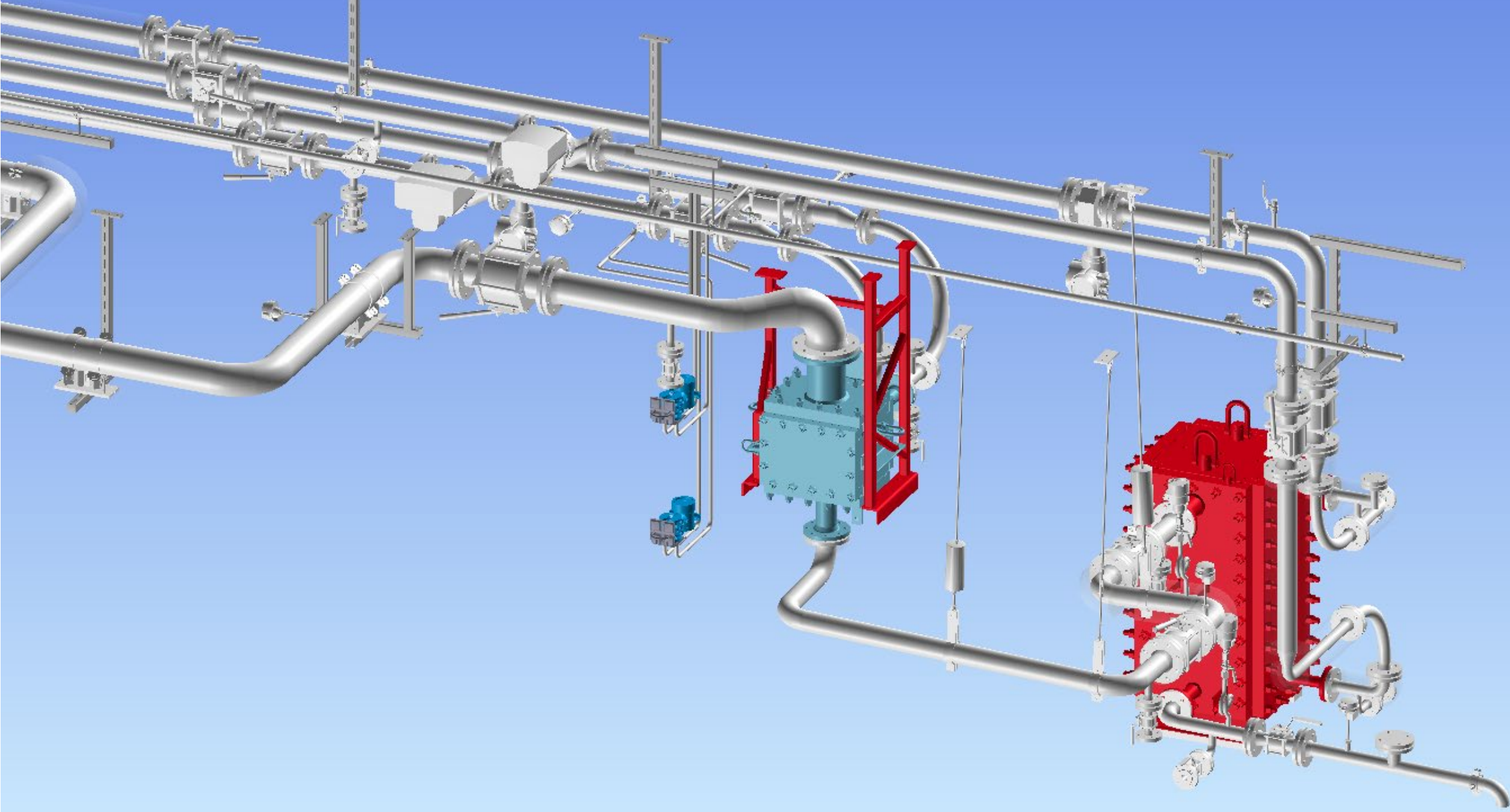
Market development: pricing, B GT index

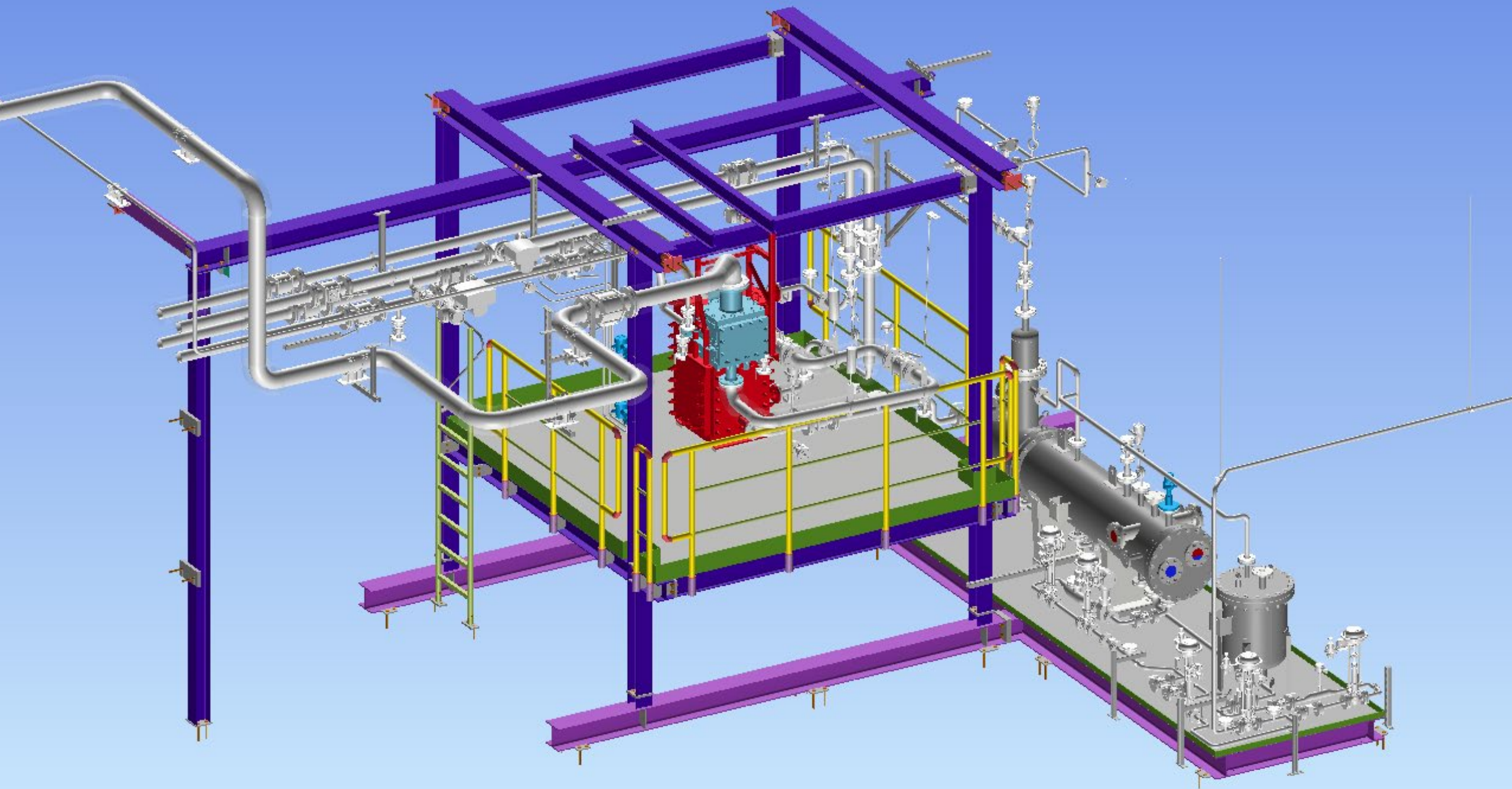


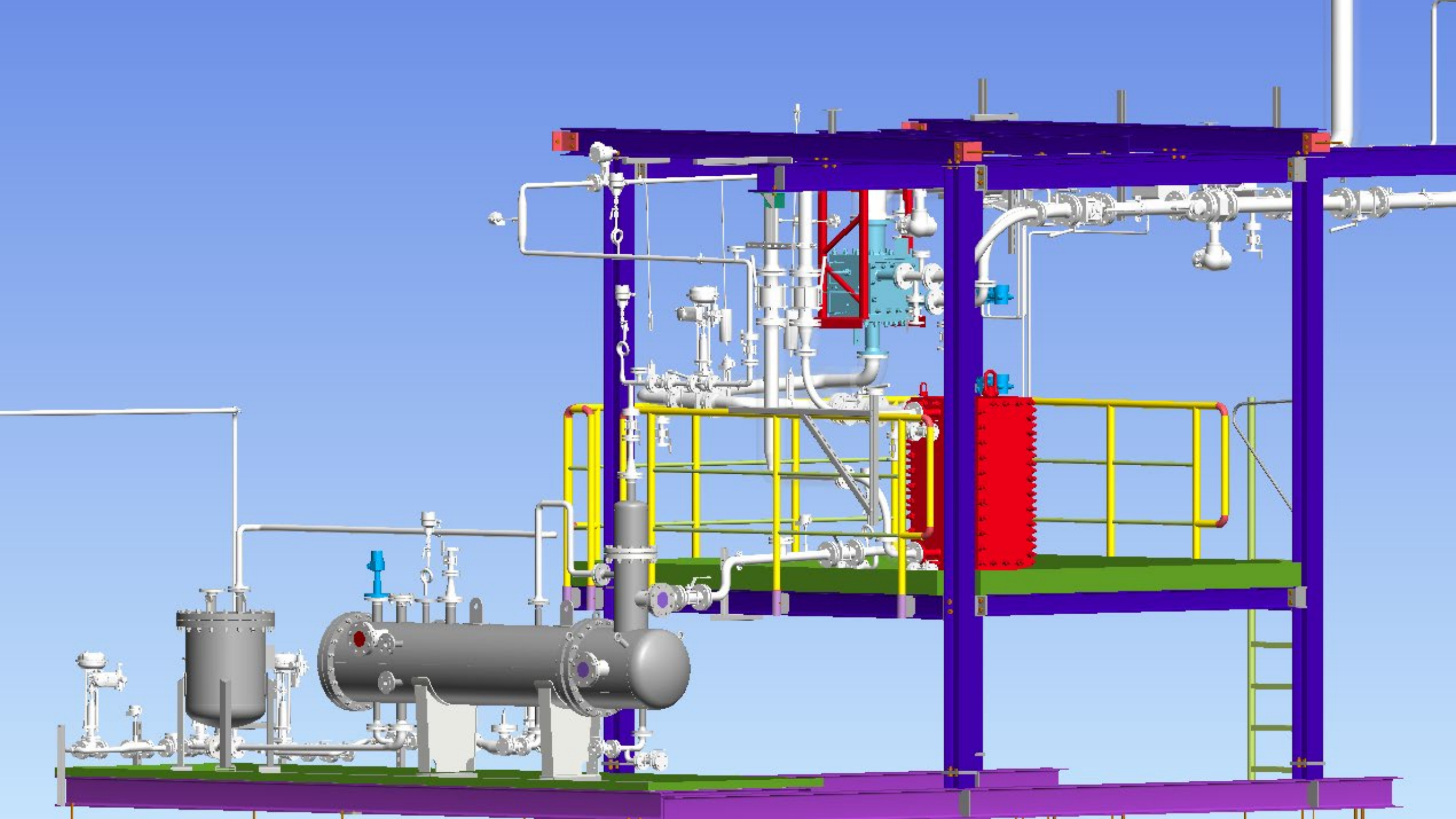
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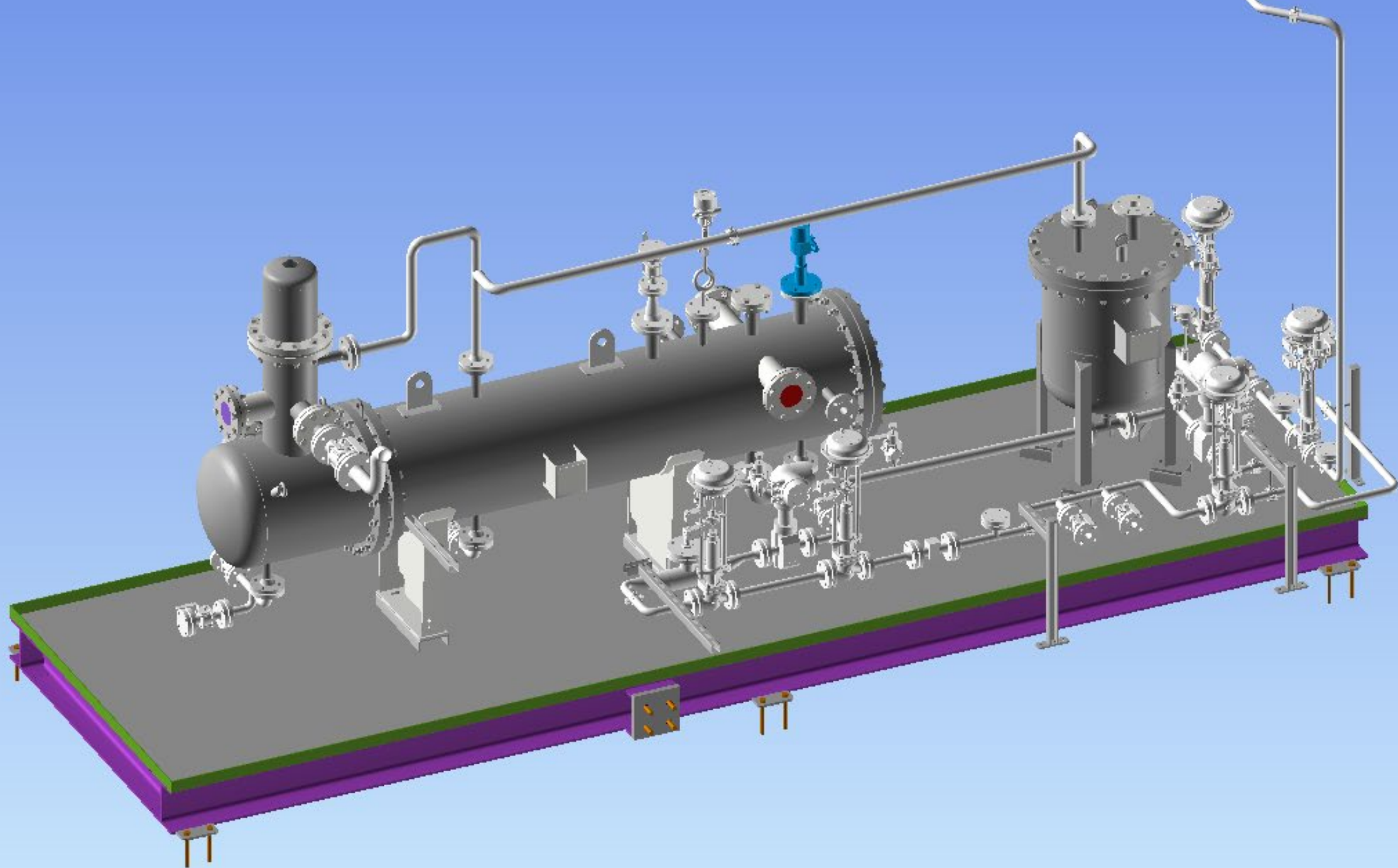
Production plant

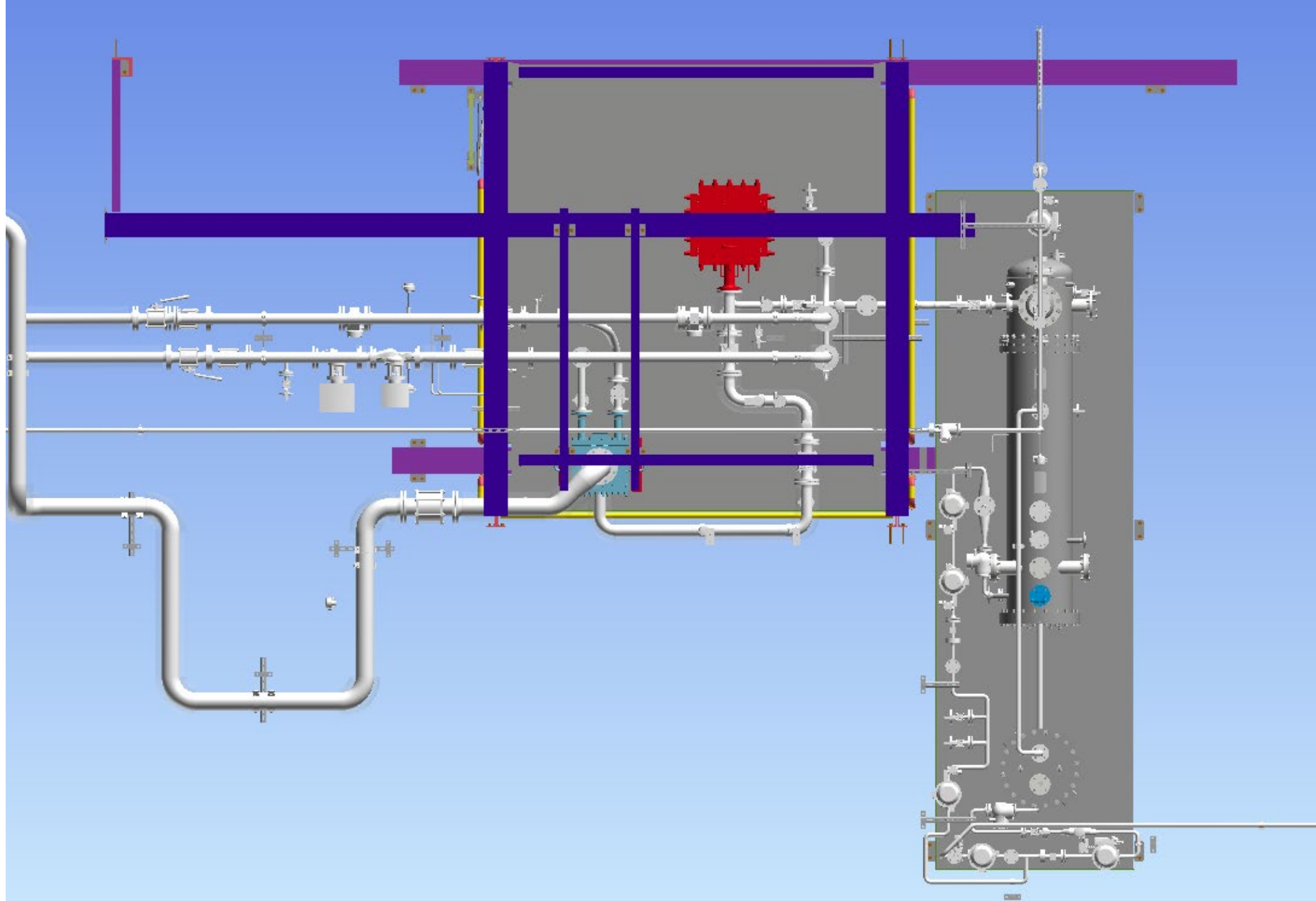
- Simple plant:
 - two-stage condensation, decanting, storage, tank-truck filling
 - Turpentine decanting at far below flash point (41°C, 95°F)
 - Residence time decanting under 5 minutes
- No Ex-Zones in your plant!
- Footprint less than 40m²
- Production readiness: December 2026

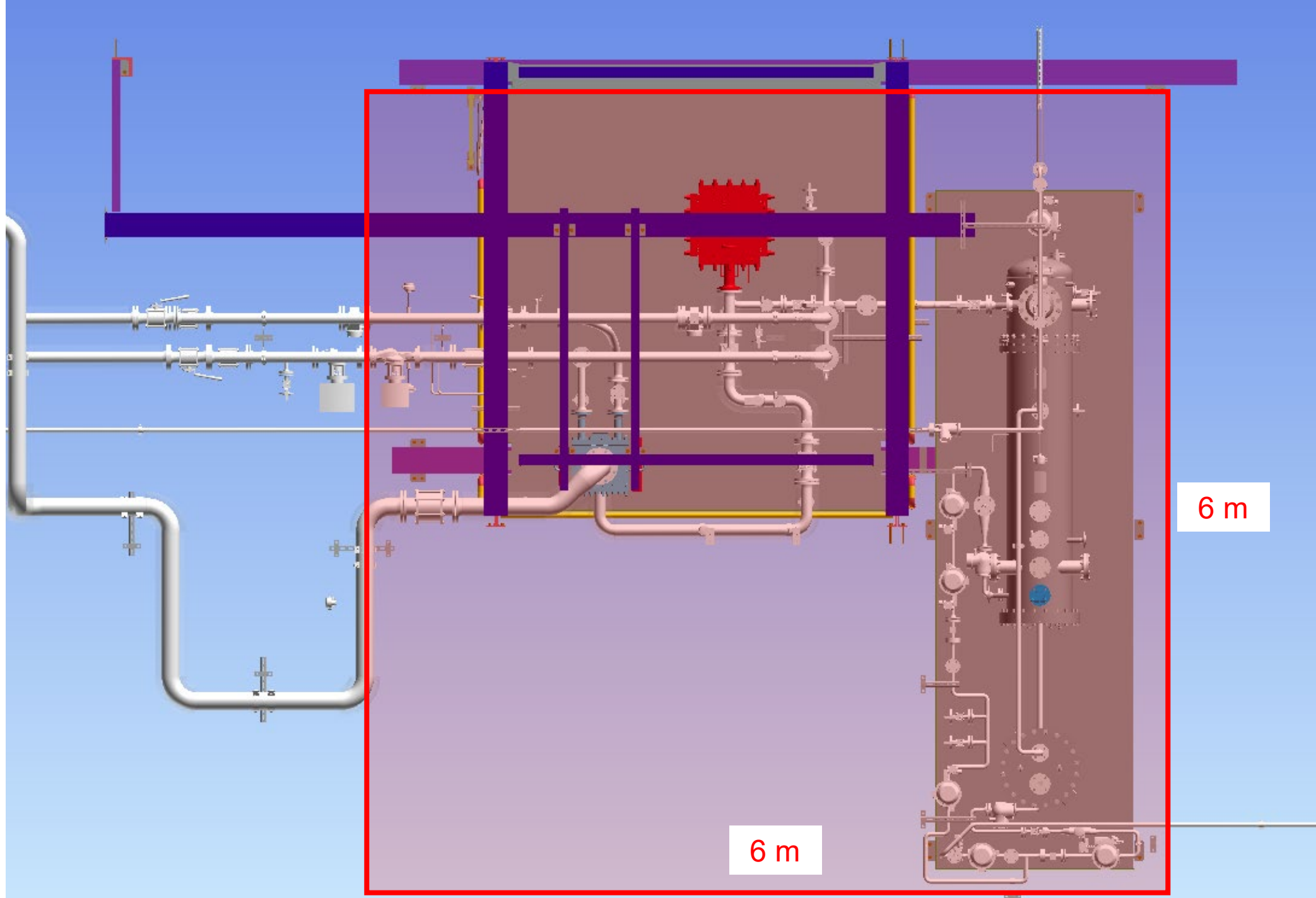






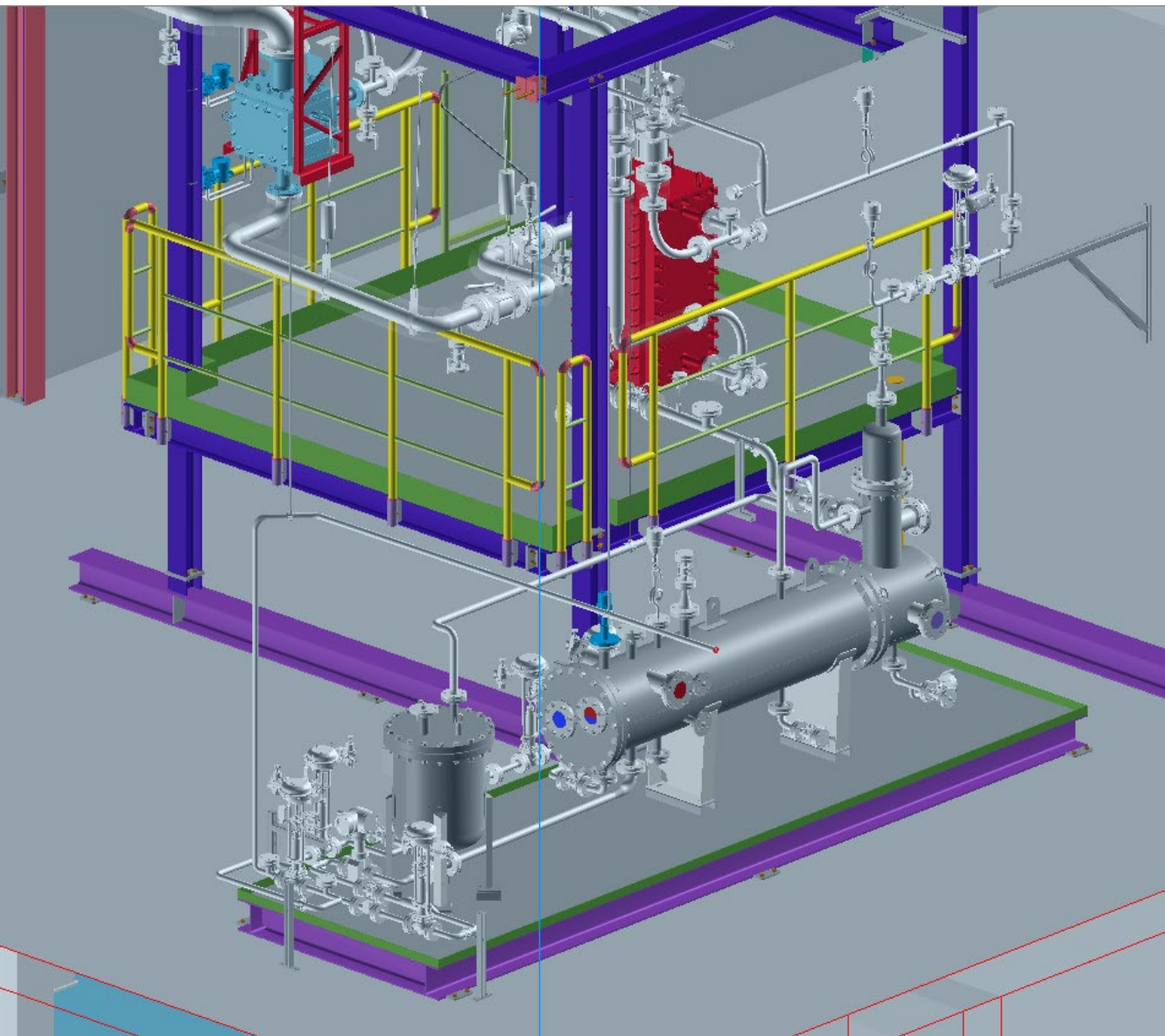


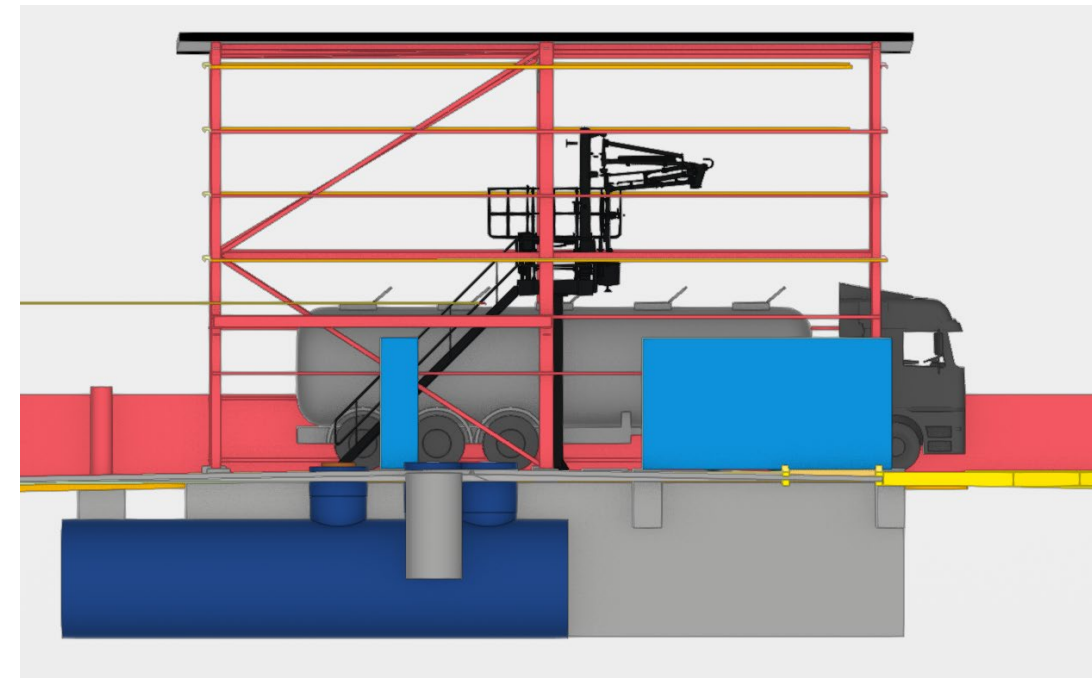
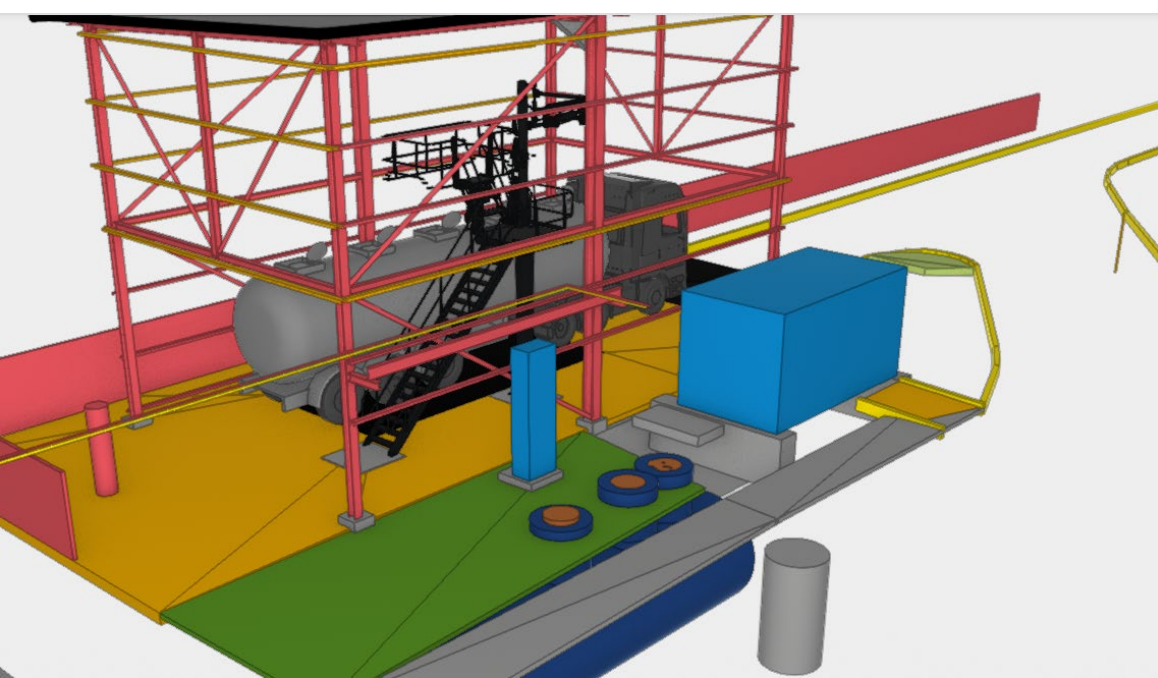
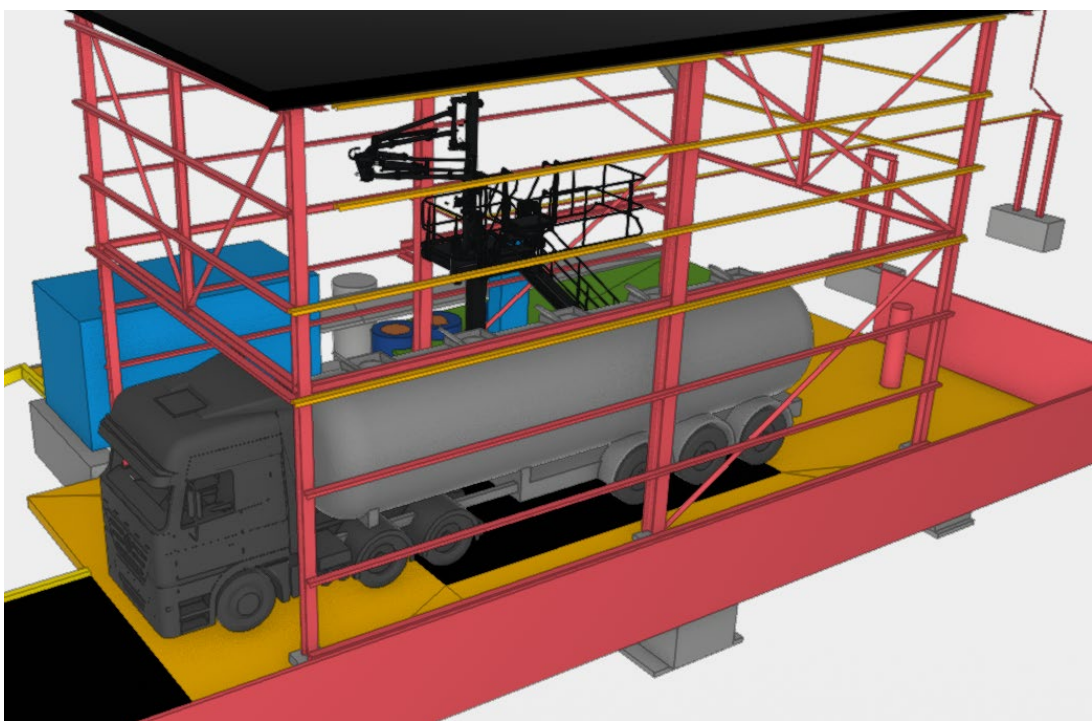
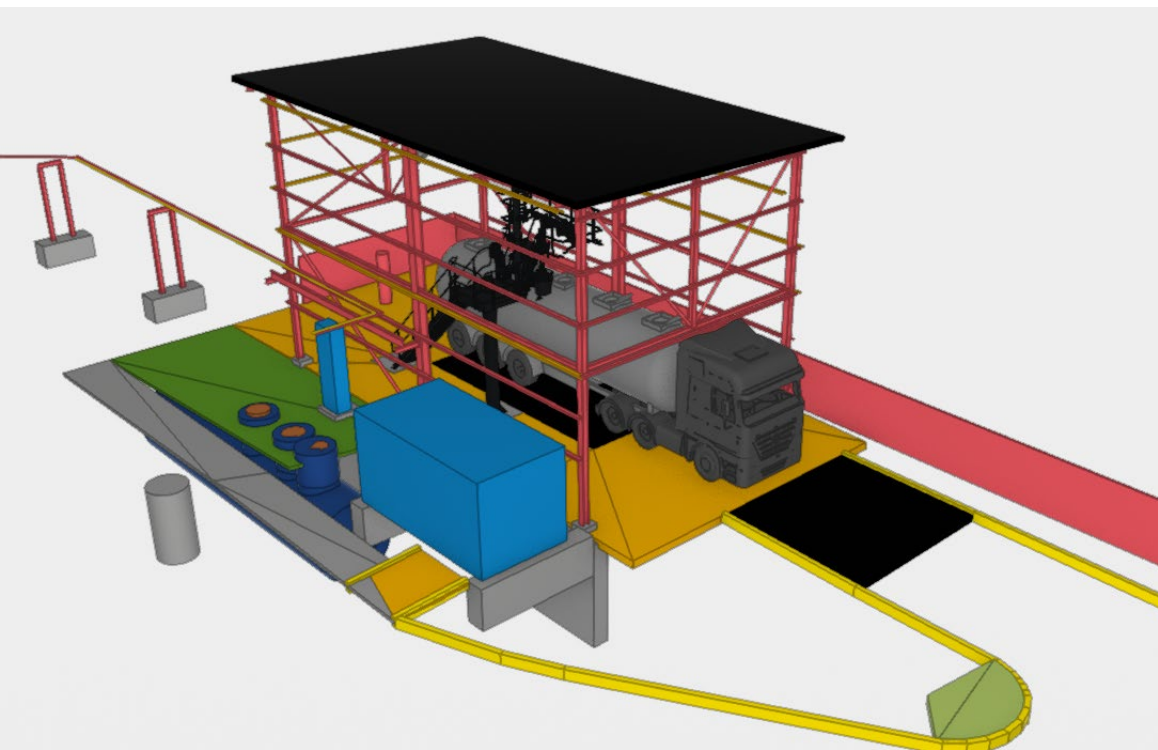




6 m

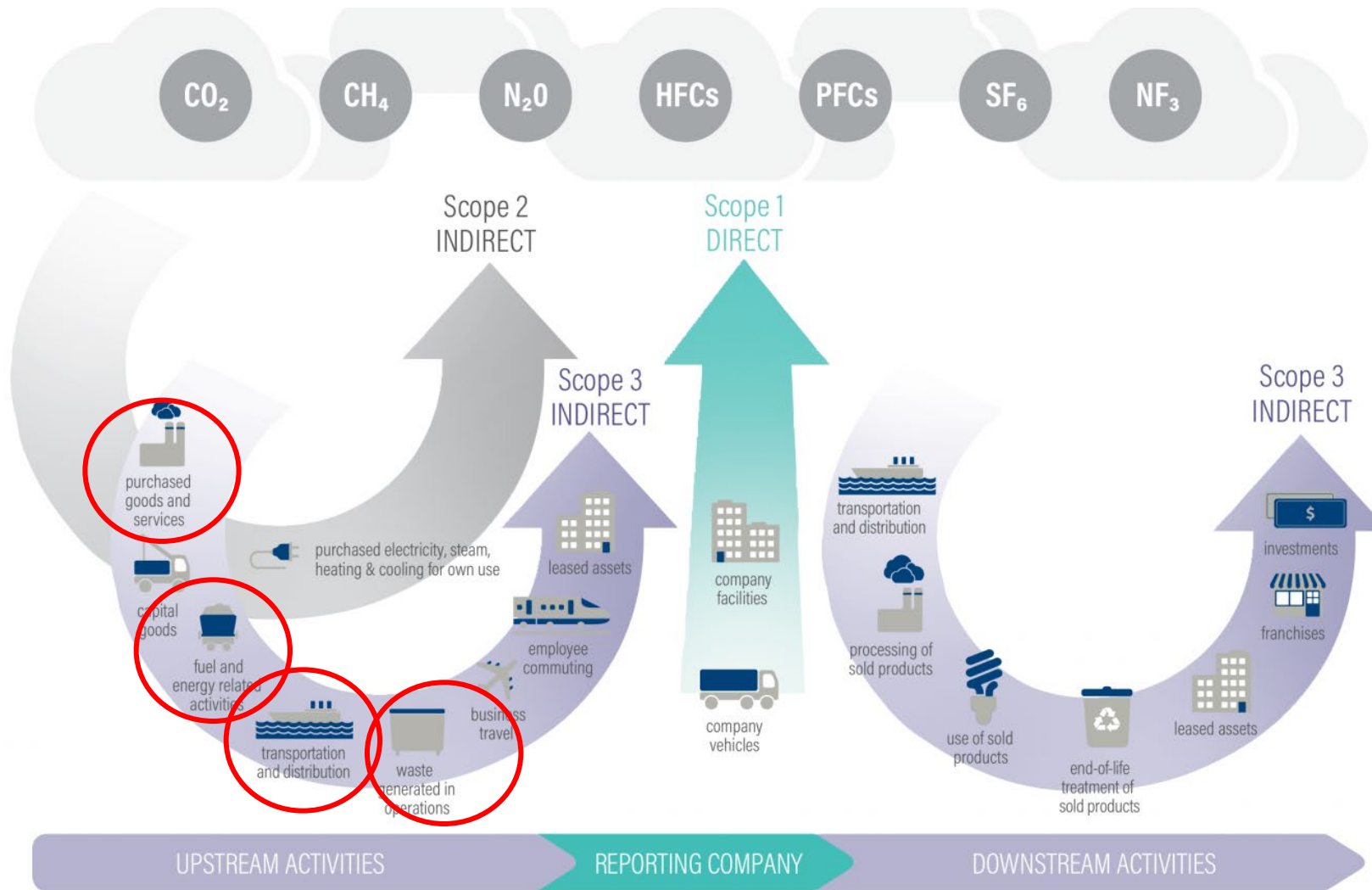
6 m





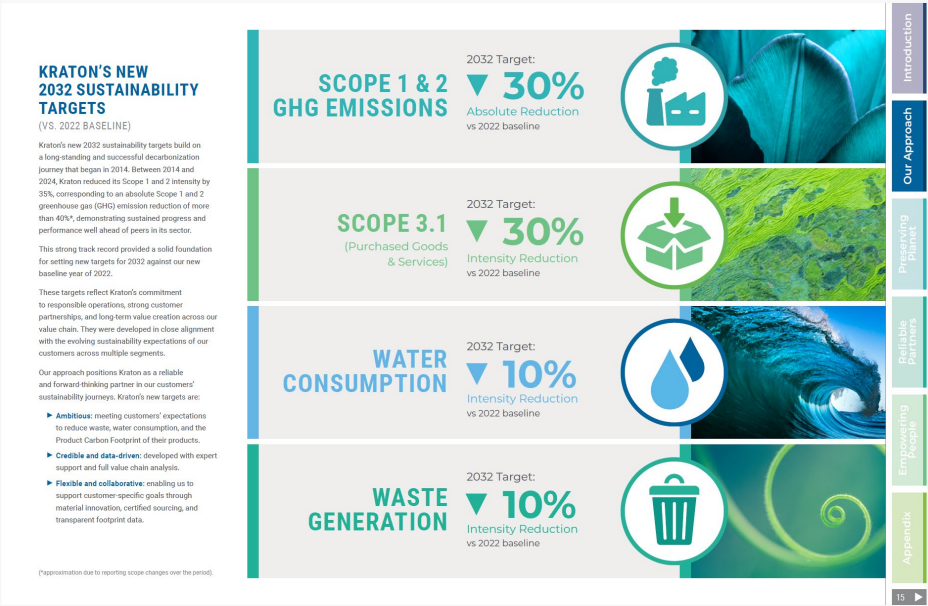


Carbon footprint



[WRI/WBCSD Corporate Value Chain \(Scope 3\) Accounting and Reporting Standard \(pdf\)](#)

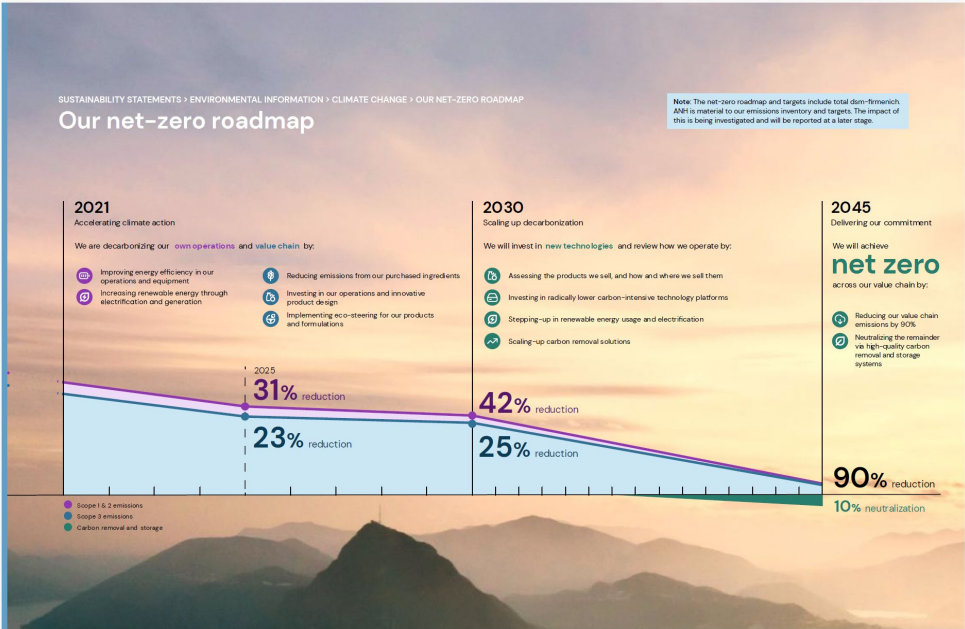
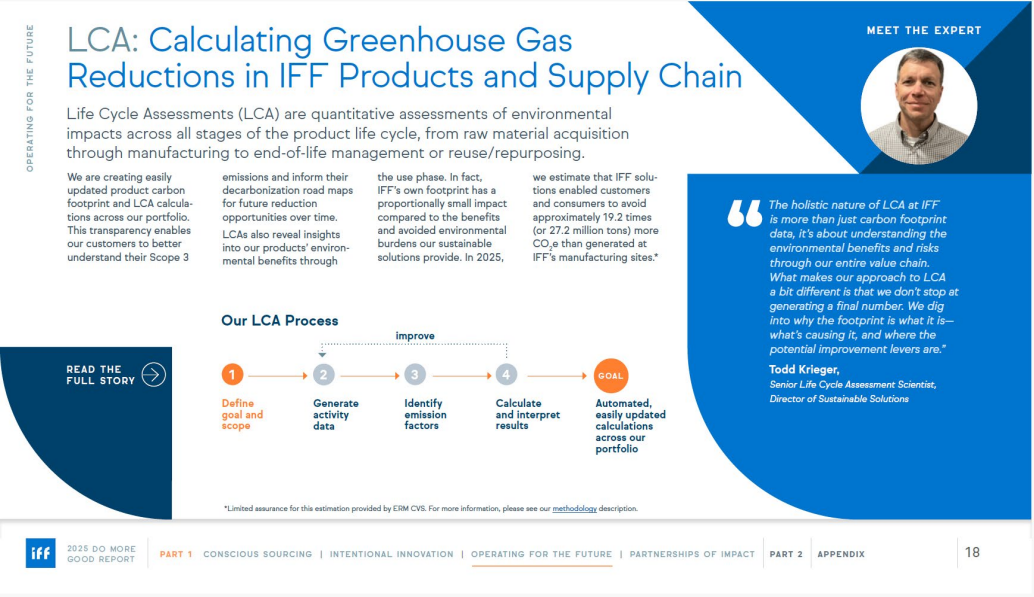
Carbon footprint



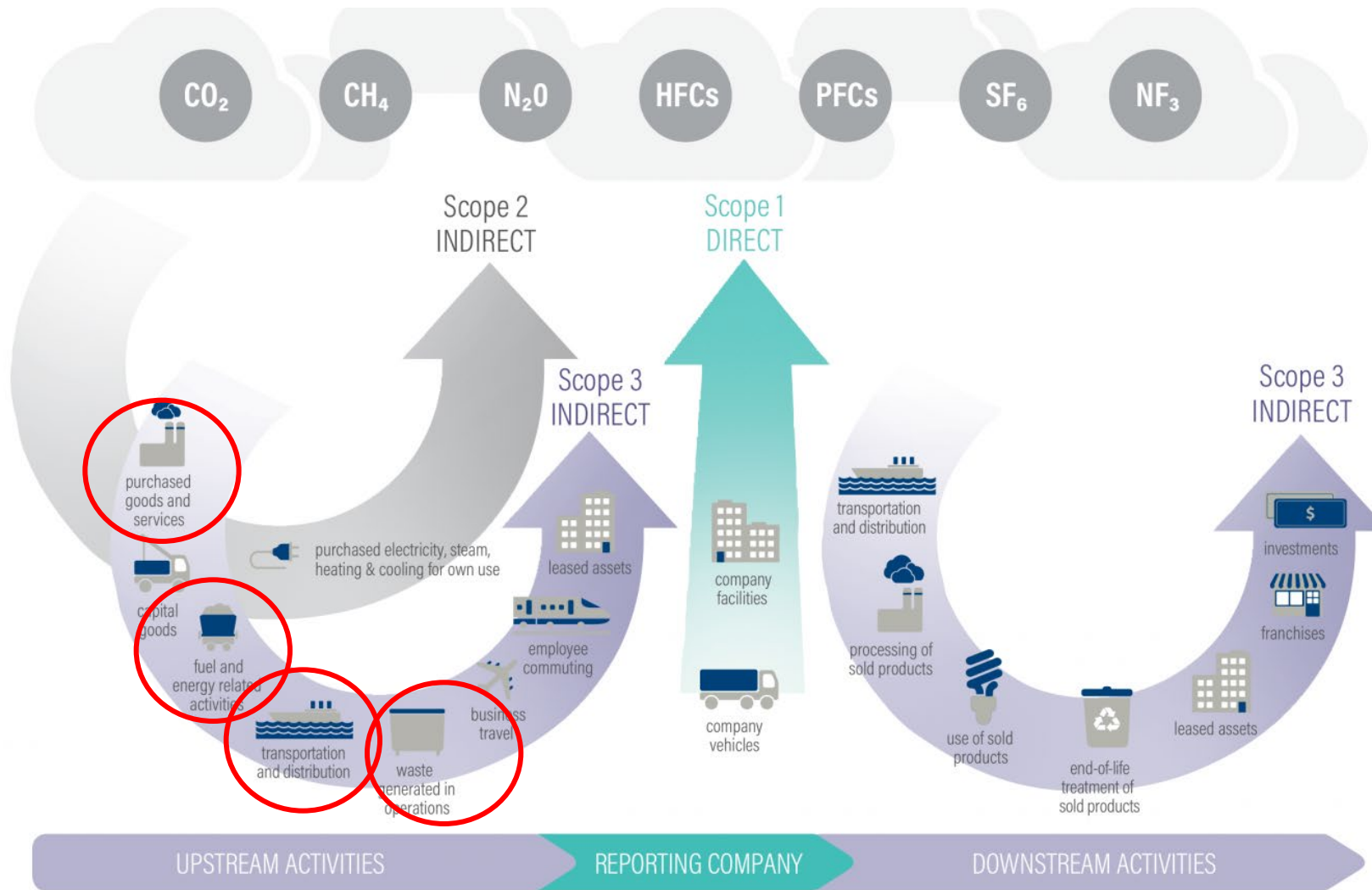
Sustainability Report 2025-26

Goals, Targets & Actions Taken by Privi

Topic	Strategic Sustainability Target	Action taken by Privi in FY 2024-25	UN SDG
Climate	Scope 1 and 2 Reduction of 50.4 % by 2032 comparing base year of 2022 (April 2021 to March 2022).	23,828 MTCO ₂ e Emission reduction through solar usage, fuel replacement and various energy conservation methods/initiatives.	13
	35 % reduction of Scope 3 GHG emissions by 2034 comparing base year of 2024 (April 2023 to March 2024).	Reduced Scope 3 GHG Emissions by 23,353 MTCO ₂ e.	13
	Reduce specific emission intensity by 30% by FY 2029-30 vs. FY 2022-23 baseline	Reduced energy intensity by 16.09% vs base year (7.12 → 5.97 MTCO ₂ e/MT)	13
	Product lifecycle assessment by 2026 – To perform Product Carbon footprint for 20 products contributing 70% of revenue	LCA completed for 23 products by third-party.	13



Carbon footprint



Carbon footprint of MDF-T is essentially zero (exw)

No waste generated like for CST desulfurization

Compared to CST, GT and „Liquid method“,

MDF-T has by far the lowest carbon footprint!

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For samples:

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Further information

Presentations:

PCA meeting Dublin 2023

https://prof.bht-berlin.de/fileadmin/labor/mvt/SHK/PCA_Bungert_MDF-T_2023-09-19.pdf

European Panel Federation Brussels 2024

https://prof.bht-berlin.de/fileadmin/labor/mvt/SHK/EPF_IED_working_group_Brussels_R01.pdf

Surfaces Eurasia Istanbul 2024

https://prof.bht-berlin.de/fileadmin/labor/mvt/SHK/Surfaces_Eurasia_2024-11-27_28_R01.pdf

PCA meeting San Diego

https://prof.bht-berlin.de/fileadmin/labor/mvt/SHK/PCA_meeting_San_Diego_Bungert_MDF-Turpentine_R01.pdf

Data sheets:

Product data sheet

https://prof.bht-berlin.de/fileadmin/labor/mvt/MDF-Terpentin/Classen_MDF-Turpentine_PDS_R04.pdf

Material Safety Data Sheet (German)

https://prof.bht-berlin.de/fileadmin/labor/mvt/MDF-Terpentin/sd17514_-_MDF-Terpentin_DE_DE_.pdf

Material Safety Data Sheet (Englisch)

https://prof.bht-berlin.de/fileadmin/labor/mvt/MDF-Terpentin/sd17514_-_MDF_Turpentine_EU_EN_.pdf

Material Safety Data Sheet (French)

https://prof.bht-berlin.de/fileadmin/labor/mvt/MDF-Terpentin/sd17514_-_Terebenthine_MDF_FR_FR_.pdf

INCITE/ European commission:

<https://innovation-centre-for-industrial-transformation.ec.europa.eu/innovative-techniques/medium-density-fiberboard-mdf-turpentine-process-innovative-solutions-voc>

Thank you for your attention!