

# MDF-Turpentine: startup of production

PCA 2026 International Conference, Lisbon

September 14<sup>th</sup>, 2026

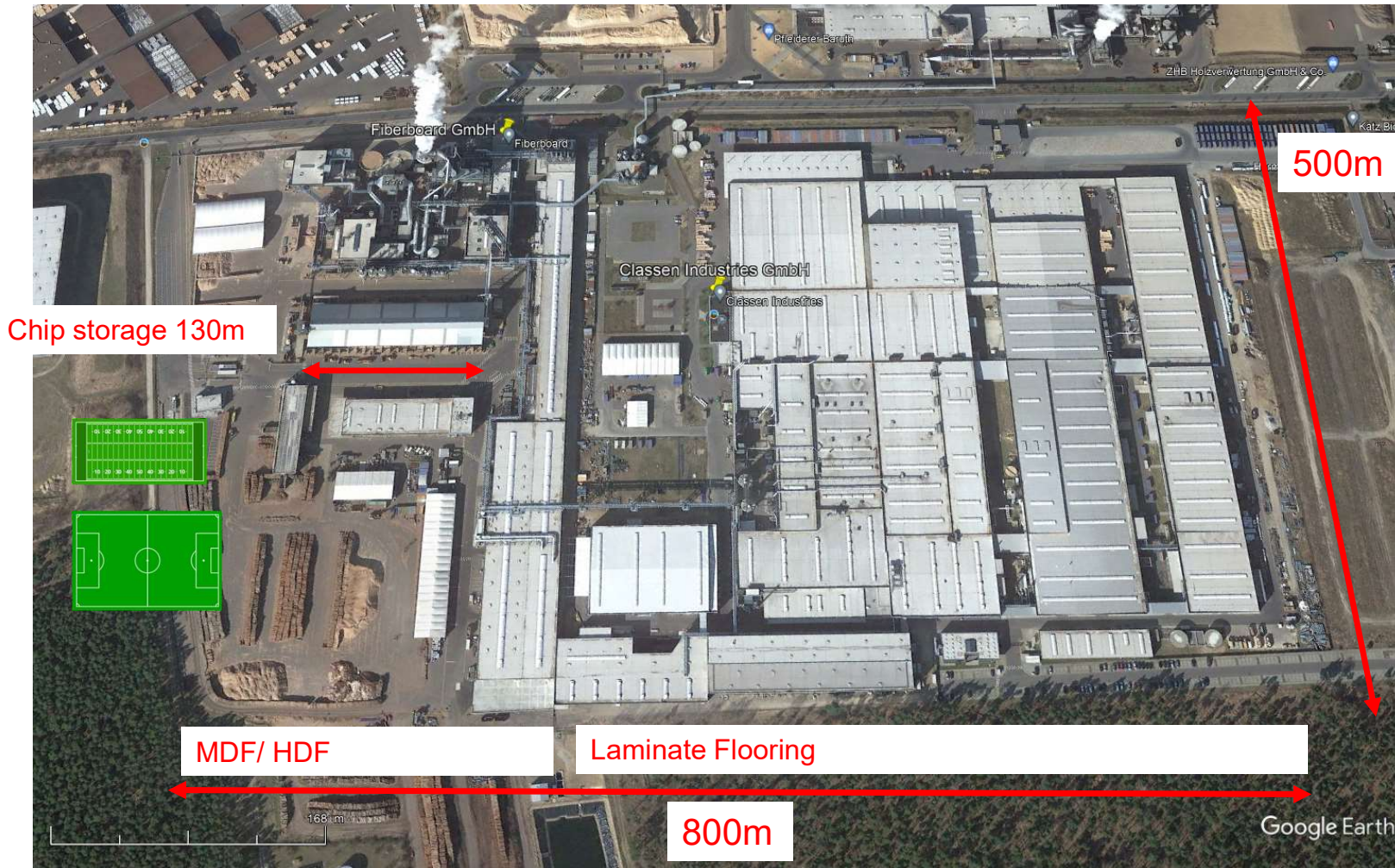
**CLASSEN Group**

Floors For A Better Tomorrow.

[www.classengroup.com](http://www.classengroup.com)

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 m<sup>3</sup>**
- **Capacity wood 400 000 t**
- **Capacity Laminate:**  
**80 million m<sup>2</sup>,**  
**of which 25 million m<sup>2</sup> 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)

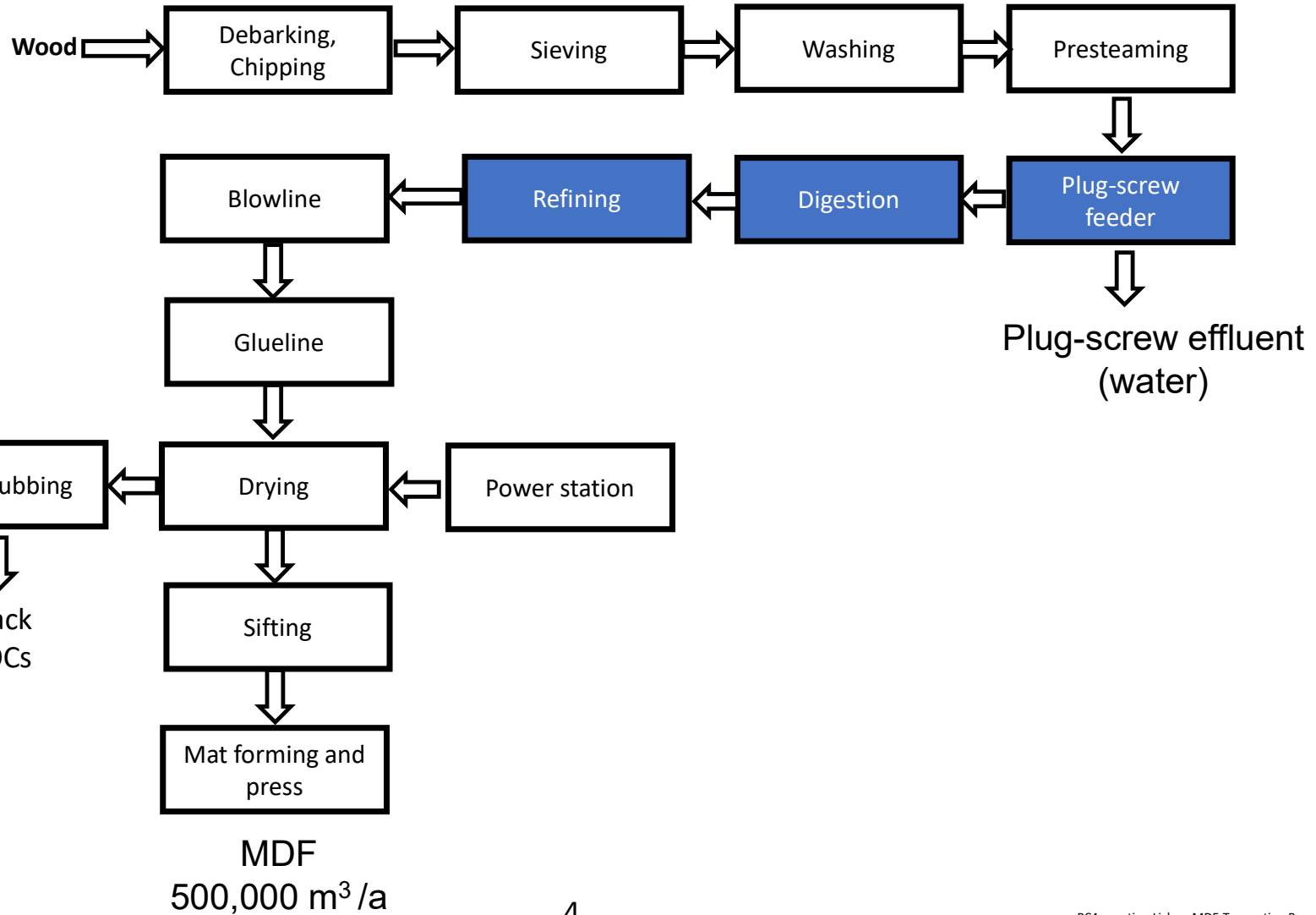
Wood Turpentine

Crude Sulfate Turpentine (CST)

**MDF-Turpentine (MDF-T)** (vapour method)  
**„MDF-Turpentine“** (liquid method)

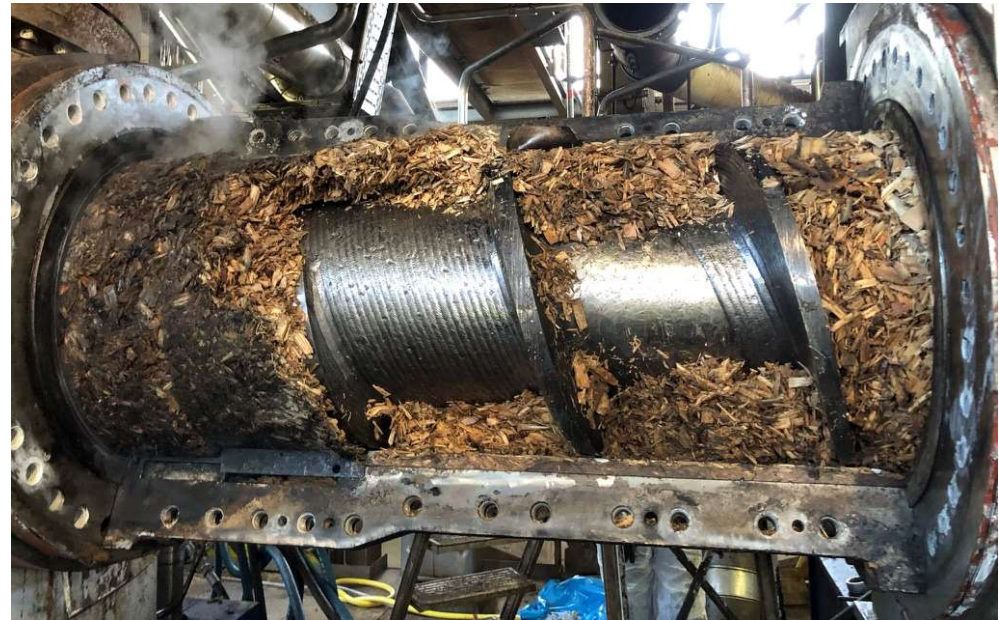
# MDF Process

400,000 tonnes  
(dry) per year

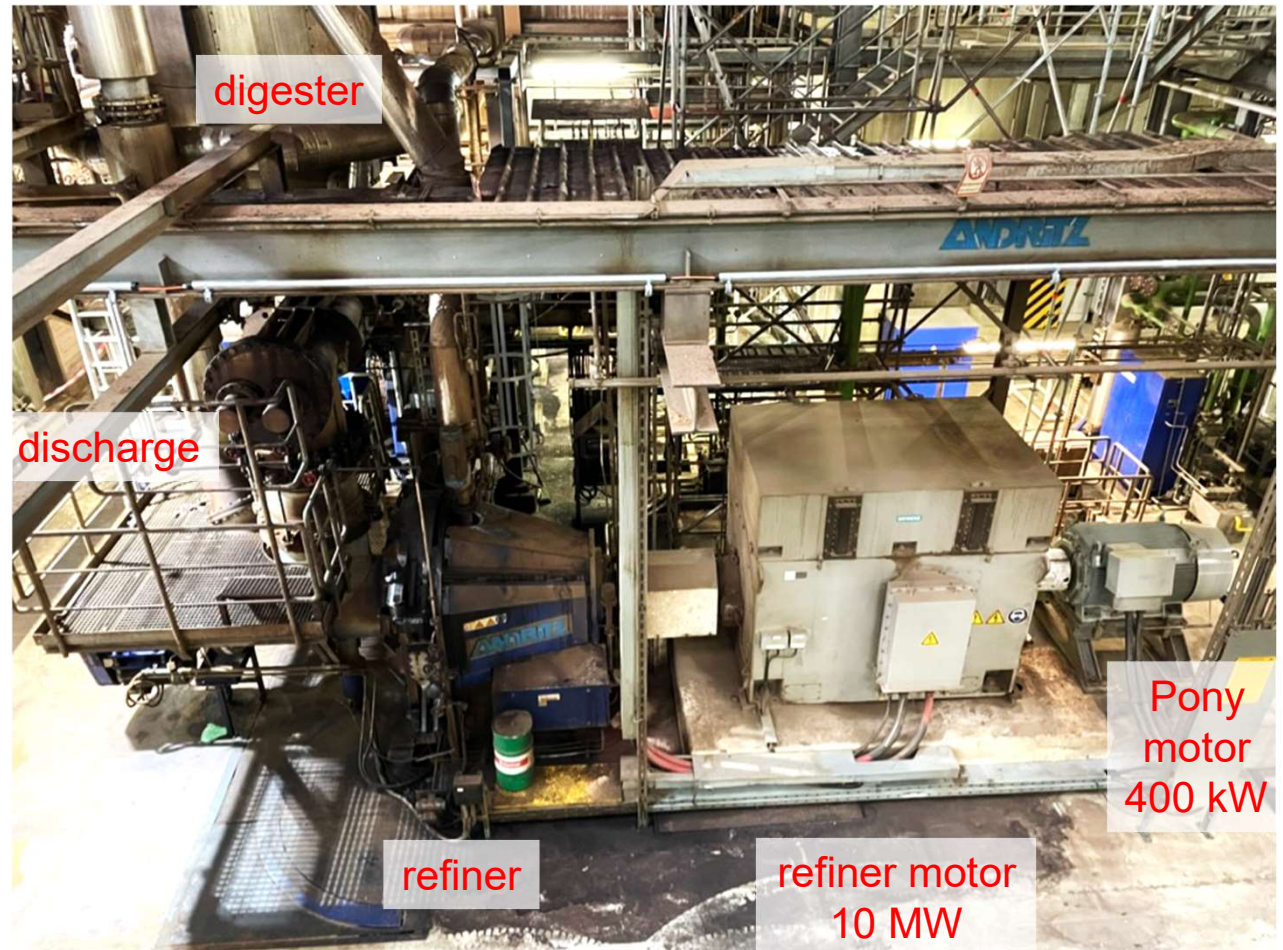
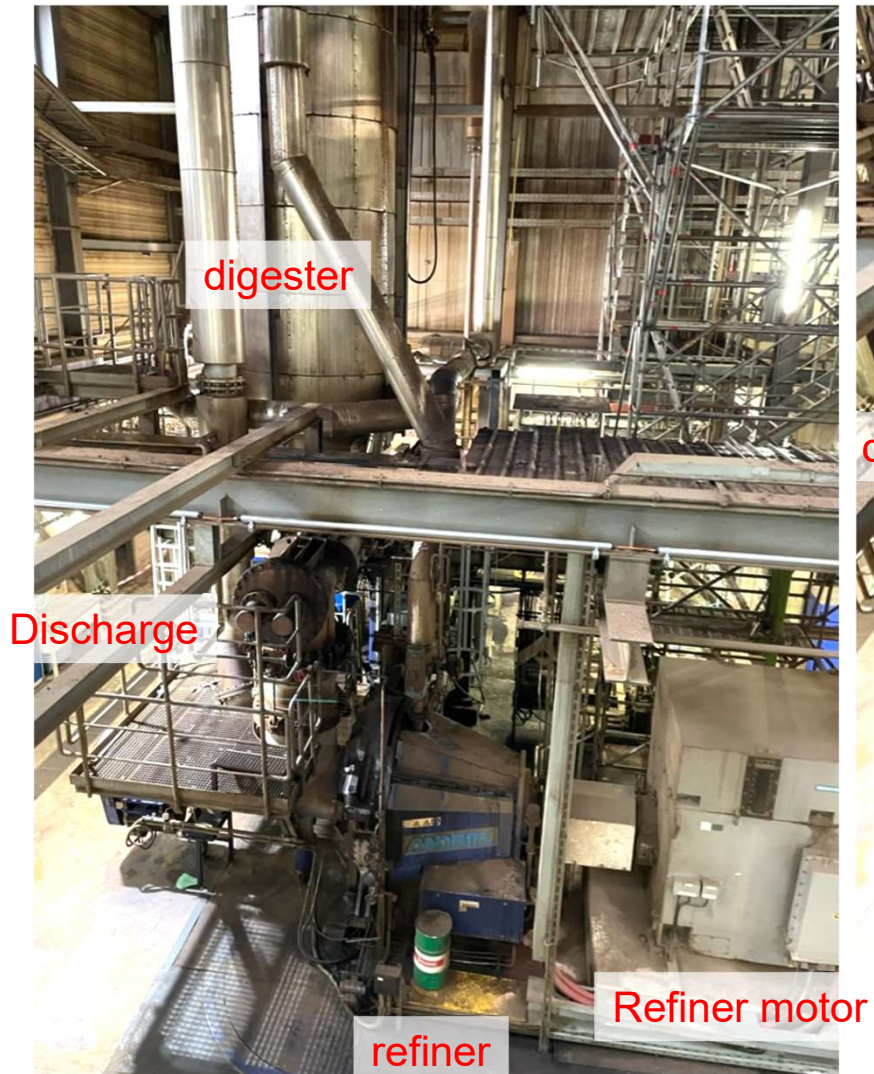


## Plug-Screw Feeder from presteamer to digester (cooker)

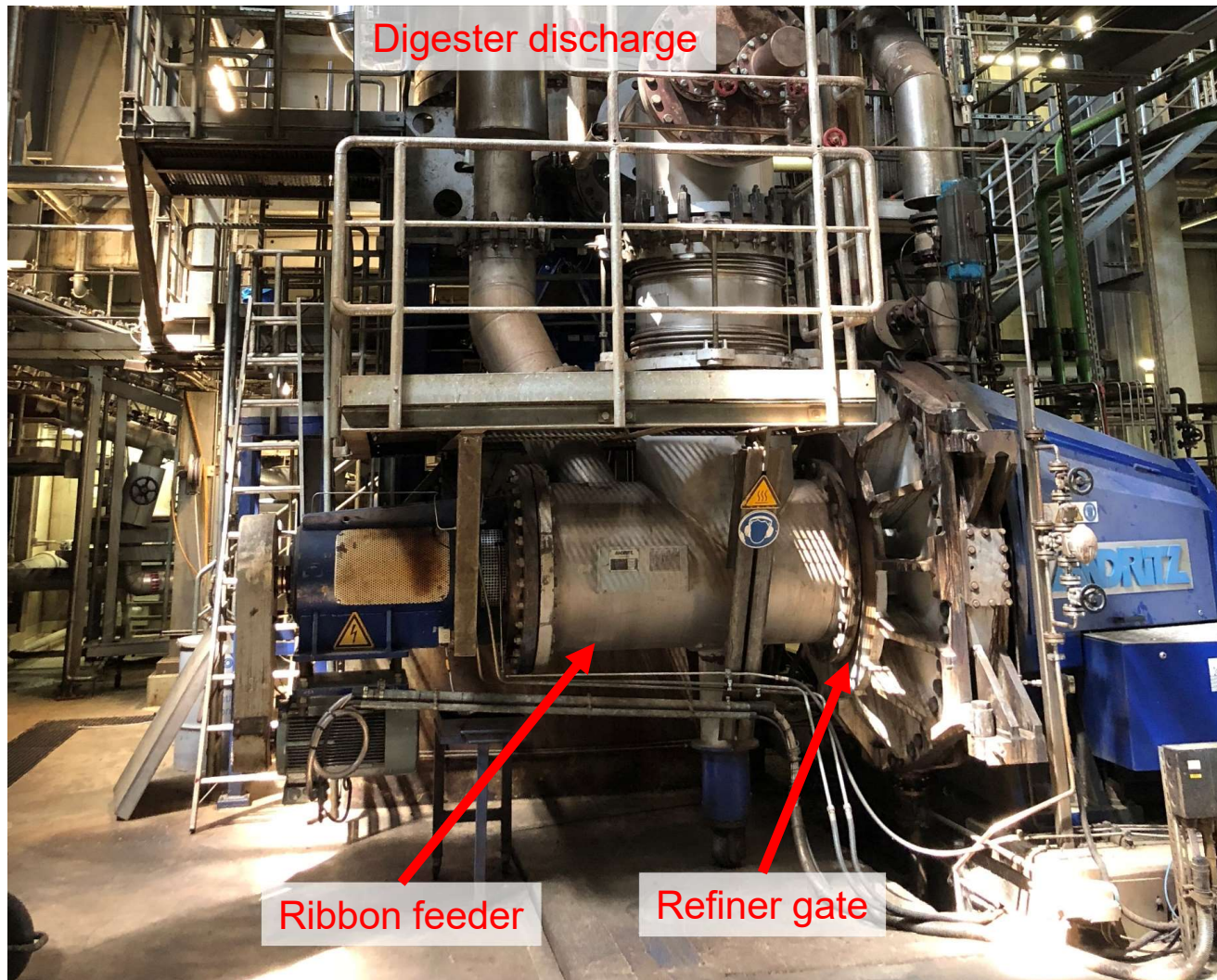
(sealing the feed of 52 t/h (dry = 100 t/h wet) from 1 bar to 10 bar! And dewatering at the same time ...)



# Digester and Refiner



## Refiner feed

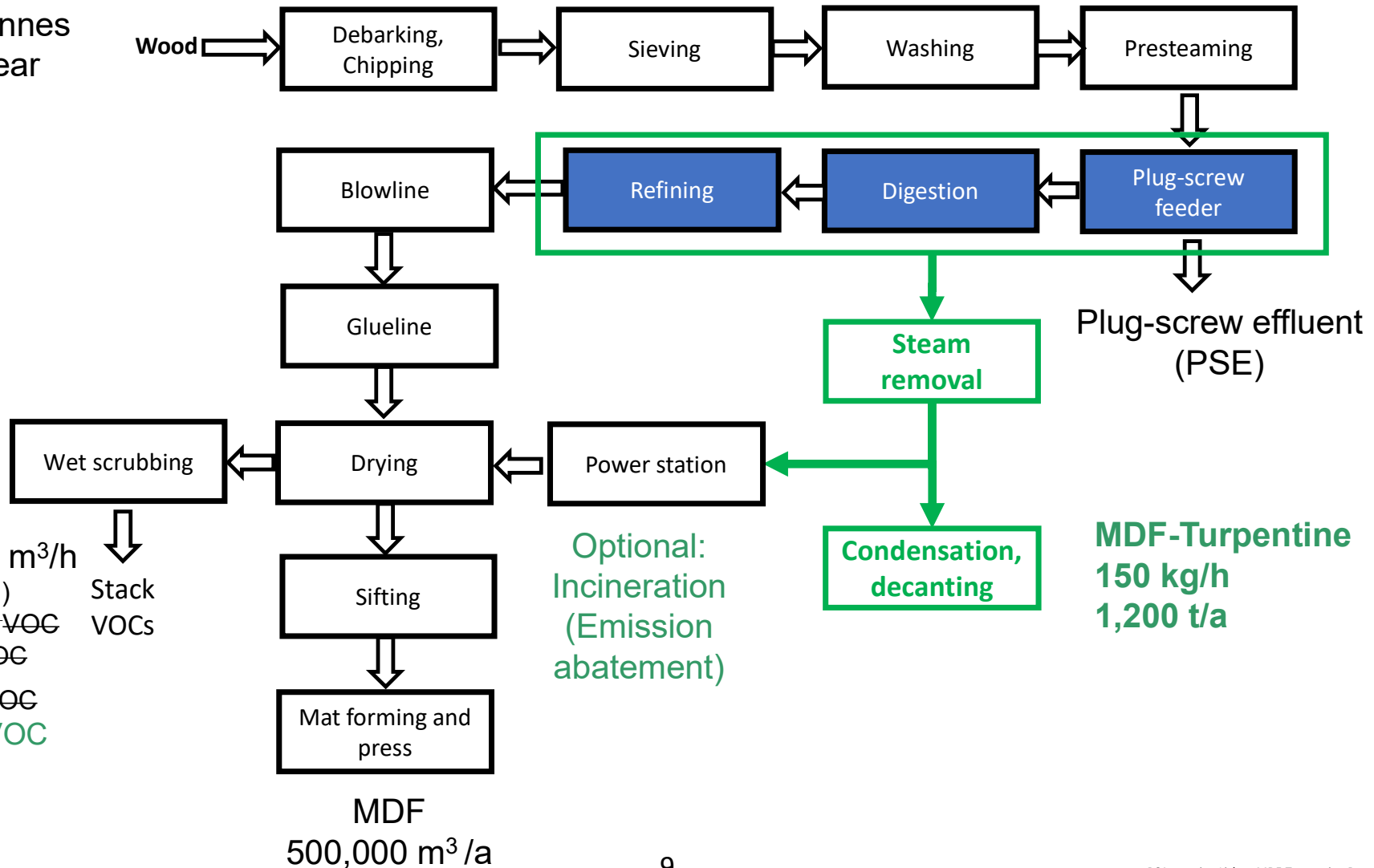


## Refiner (rotor-stator mill)



# MDF Process, MDF-Turpentine production

400,000 tonnes  
(dry) per year



Pilot production

Phase separator (oil-separator)

turpentine receiver





Bernd Bungert



# MDF-Quality assurance by Gas Chromatography



Product specification: **MDF-Turpentine** 

**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**

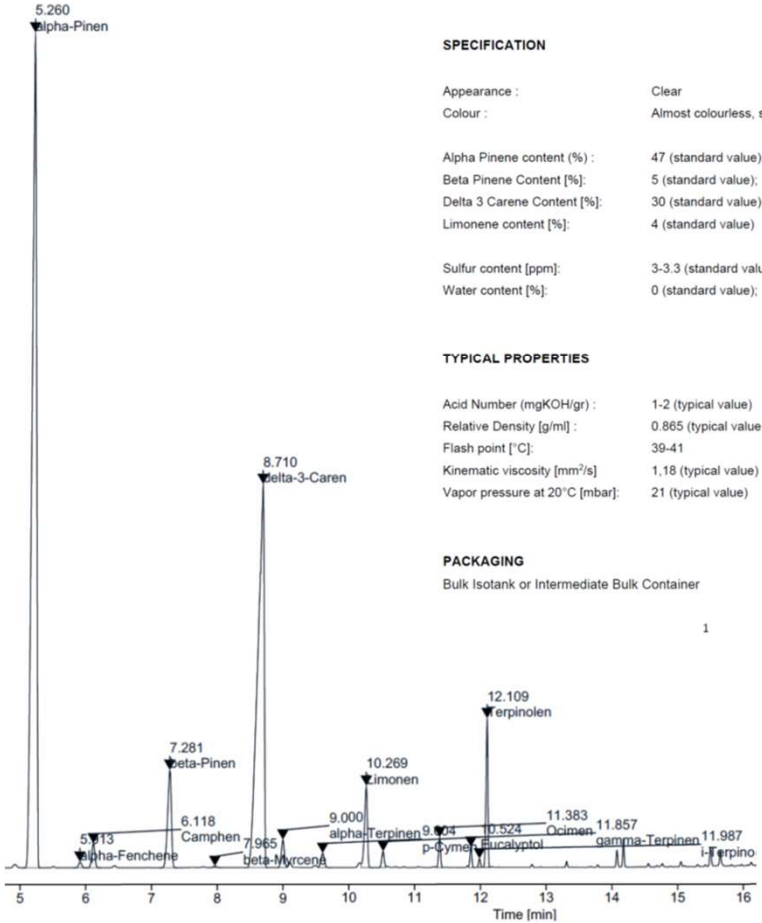
|                             |                                    |
|-----------------------------|------------------------------------|
| Appearance :                | Clear                              |
| Colour :                    | Almost colourless, slightly yellow |
| Alpha Pinene content (%) :  | 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



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

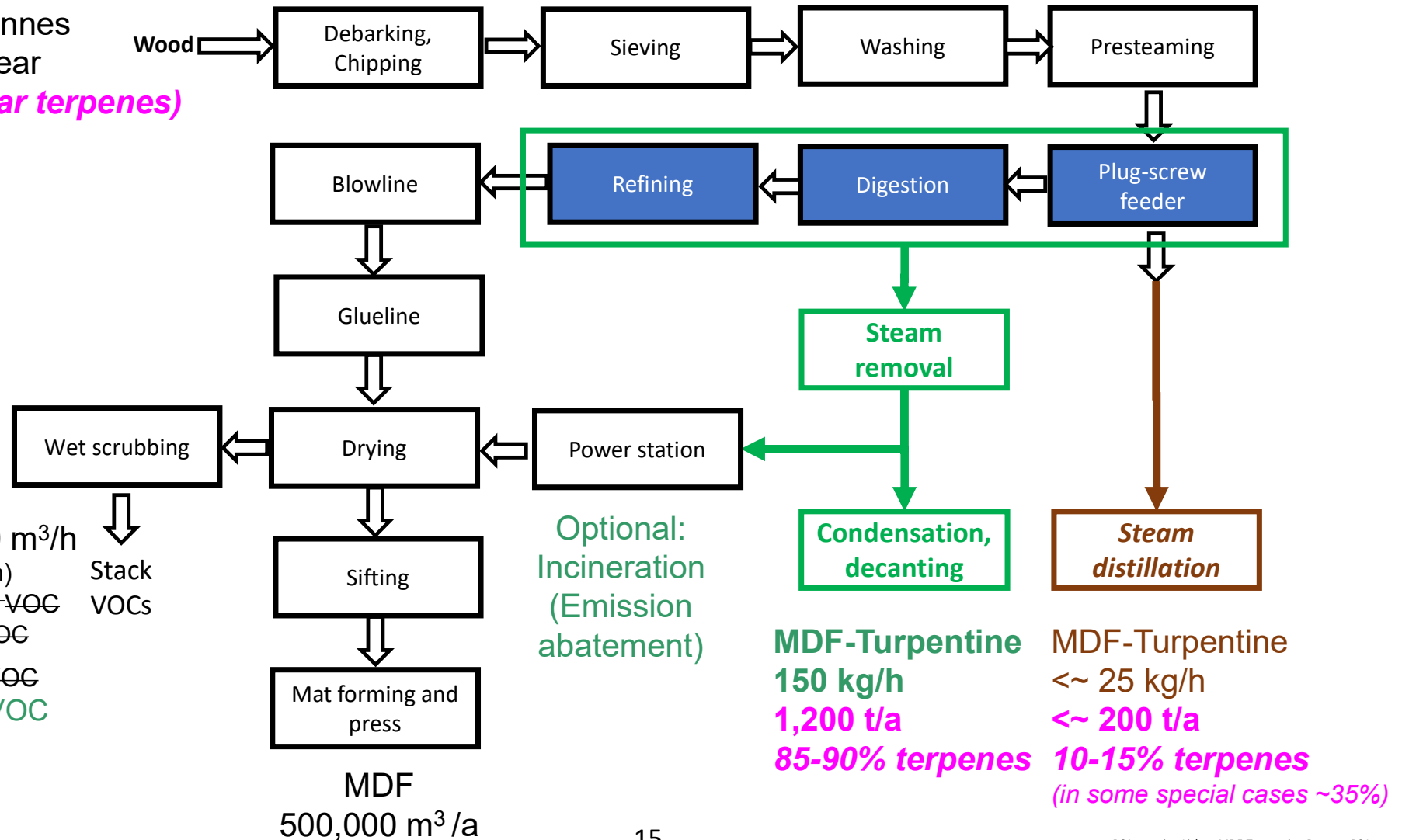
## MDF-T: Quality and possible byproducts

- 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 m<sup>3</sup> scale confirm the commercial quality**
- **Technology can be applied worldwide**

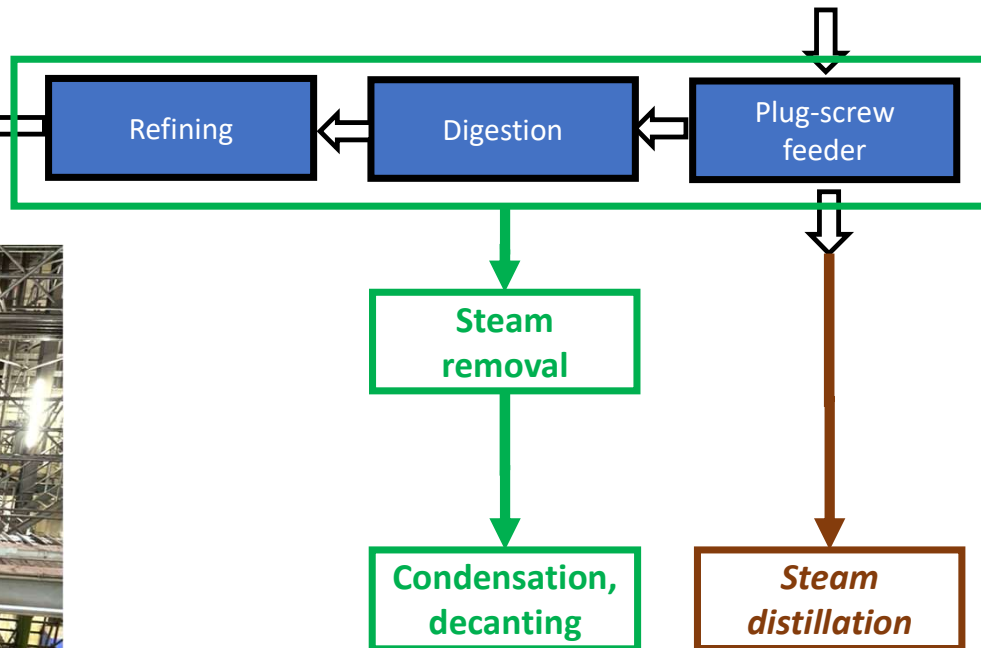
# MDF Process, **MDF-Turpentine production**, *process alternatives*

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**

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*B27N 1/00* (2006.01)

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

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

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

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(84) Bestimmungsstaaten (soweit nicht anders angegeben, für jede verfügbare regionale Schutzrechtsart): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), eurasisches (AM, AZ, BY, KG, KZ, RU, TJ, TM), europäisches (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

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

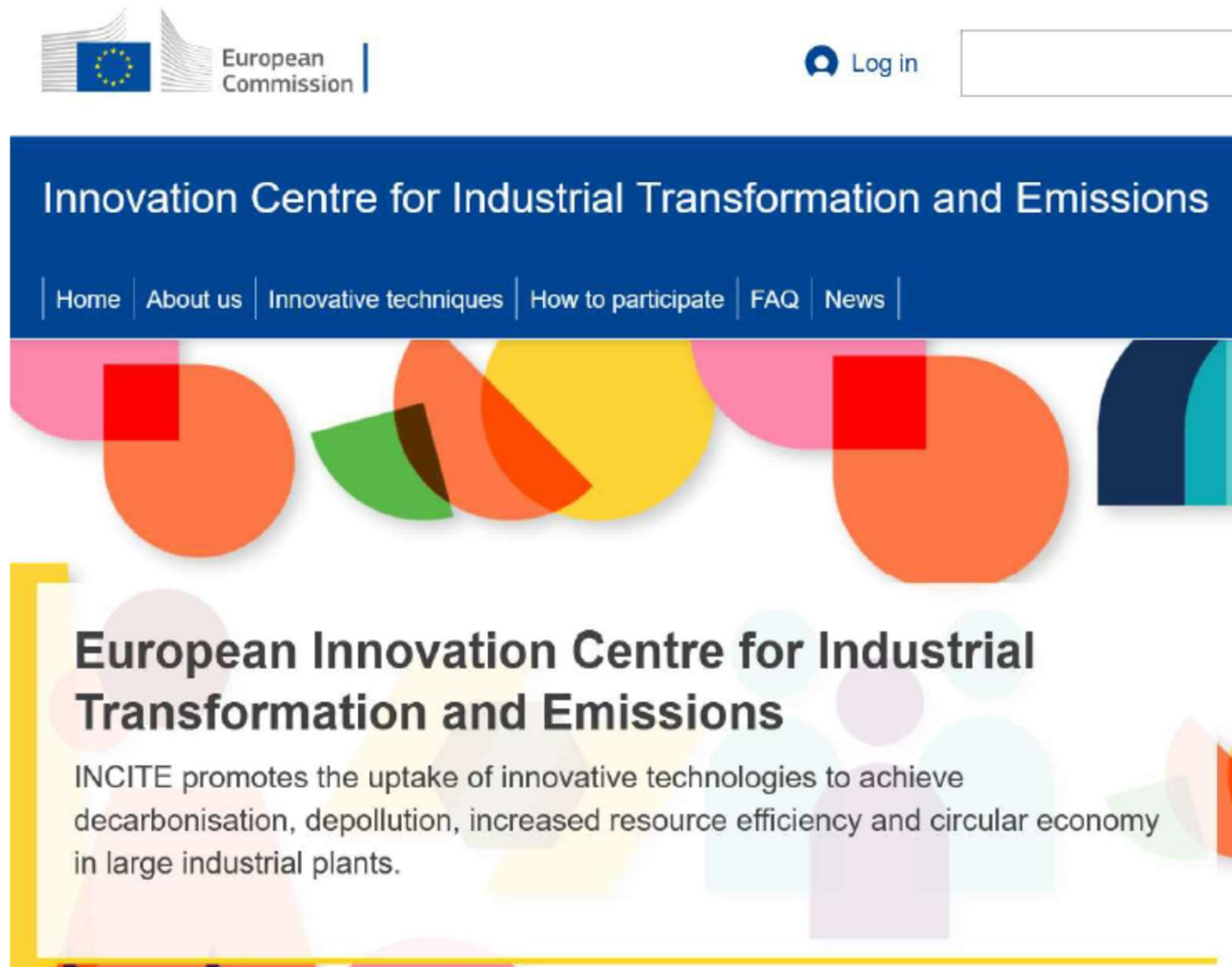
(54) Title: PROCESS FOR MANUFACTURING FIBER BOARDS WITH REDUCED VOC EMISSIONS

(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 IPP
  - Classen gives its licensees maximum security in terms of technology, reliability, competitiveness
- MFD-T has a strong IP position**

# INCITE, EU legislations



INCITE

DateiBearbeitenAnsichtChronikLesezeichenProfileExtrasHilfe

Innovative techniques | INCITE

innovation-centre-for-industrial-transformation.ec.europa.eu/innovative-techniques?emerging\_technique\_name=&emerging\_technique\_env\_purpose=&emerging\_tech...

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System tray showing date and time: 14:48, 05.09.2026

DateiBearbeitenAnsichtChronikLesezeichenProfileExtrasHilfe

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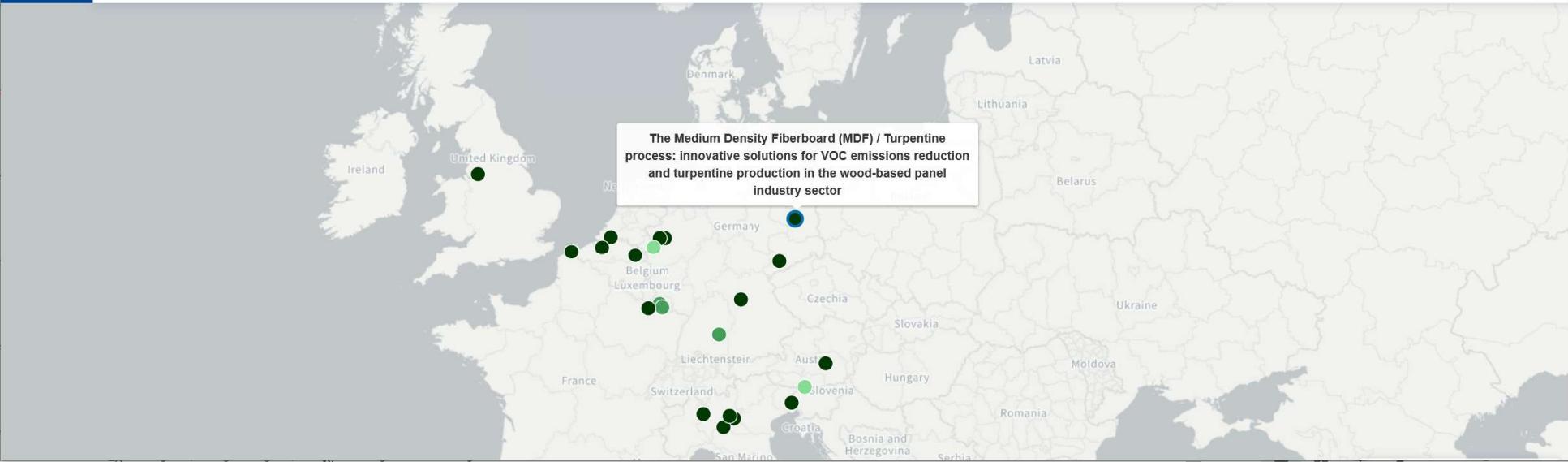
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Bernd B



14:49

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The Medium Density Fiberboard (MDF) / Turpentine Process: Innovative Solutions For VOC Emissions Reduction and Turpentine Production In The Wood-based Panel Industry Sector

### The Medium Density Fiberboard (MDF) / Turpentine process: innovative solutions for VOC emissions reduction and turpentine production in the wood-based panel industry sector

[Inquire about this technique](#)

The MDF/Turpentine process is an innovative approach developed to reduce volatile organic compound (VOC) emissions - principally terpenes - from the dryer off-gases in medium-density fiberboard (MDF) production facilities using pine as raw material, while simultaneously enabling the recovery of turpentine as a marketable product. This process has been developed by Fiberboard GmbH (Classen Group) in Baruth (Germany) where turpentine is produced based on steam processing of wood chips.

In the new MDF-turpentine process, developed by Fiberboard GmbH (part of the Classen Group) in Baruth (Germany), turpentine is produced based on steam processing of wood chips obtained principally from scots pine (Waldkiefer, Pinus Sylvestris). Essentially, VOC emissions from the digestion / refining section of the plant are recovered using a dedicated steam removal process. At this stage, VOC emissions can be either led to the power station for incineration or preferably led to a dedicated condensation step in which turpentine can be produced and sold off to third parties as a valuable product. In this case, VOC emissions are substantially reduced (by more than 50%) compared to the current VOC emission limit values specified in the Best Available Techniques

OPERATIONAL

Achieved TRL 9+

Date of development of the technique

| Start date      | End date          |
|-----------------|-------------------|
| 1 February 2020 | 30 September 2023 |

Environmental purpose of the innovative technique

Circular economy (e.g. recovery/reuse/recycling of residues, industrial symbiosis)

Reduction of emissions to air (including noise and odour)

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!**

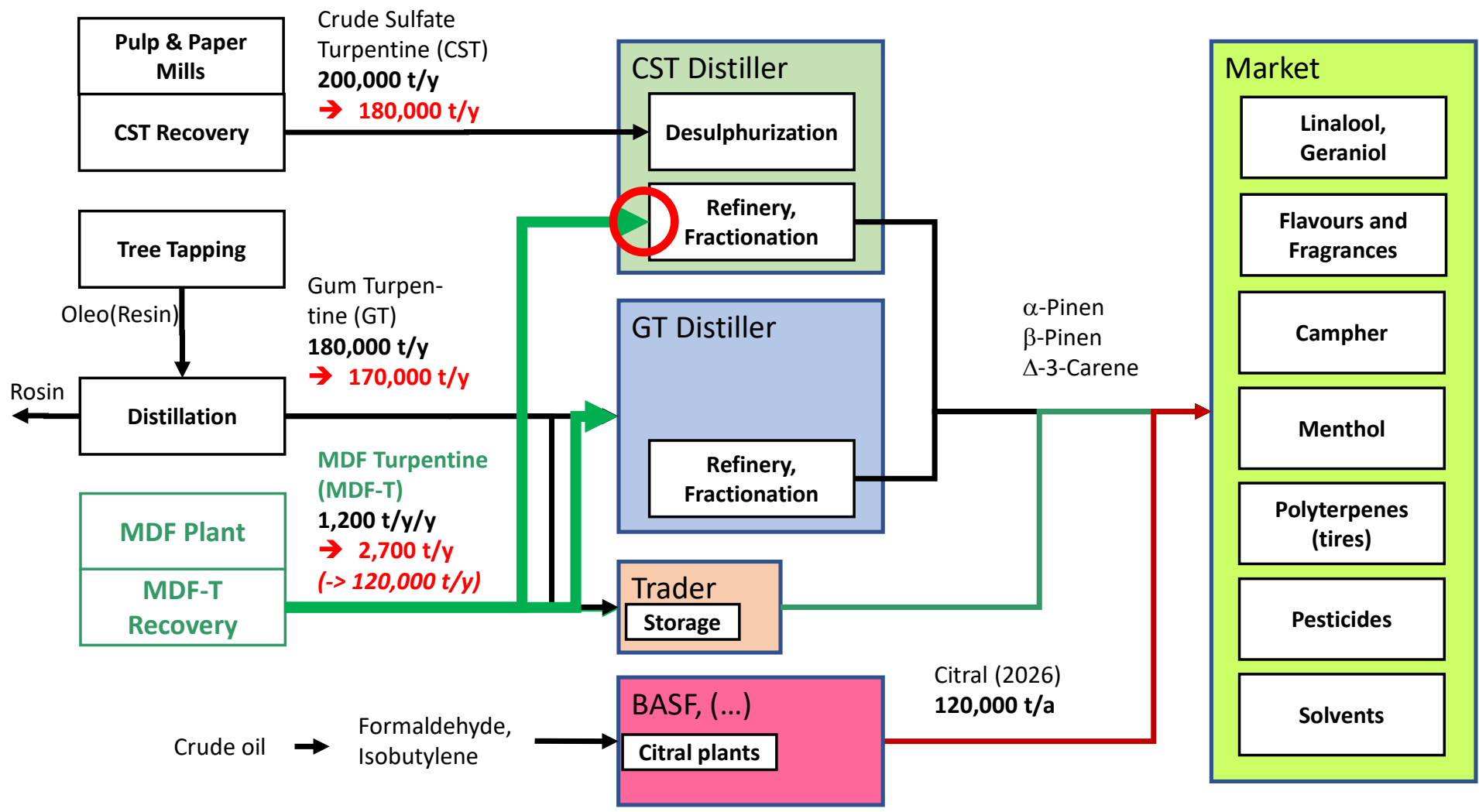
# Project development (together with equipment manufacturer/ contractor and possibly buyer)

- 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 ( $\alpha$ -pinene/ $\beta$ -pinene// tonnes per year)

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

# 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:  
Title:  
Date:  
Author:  
Revision:

MDF-VOC  
MDF producers worldwide  
30.07.2026  
Bungert, Heinrich  
R27



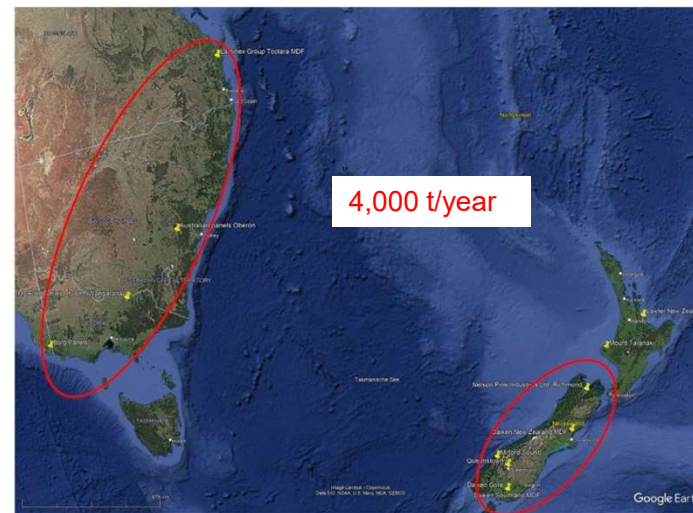
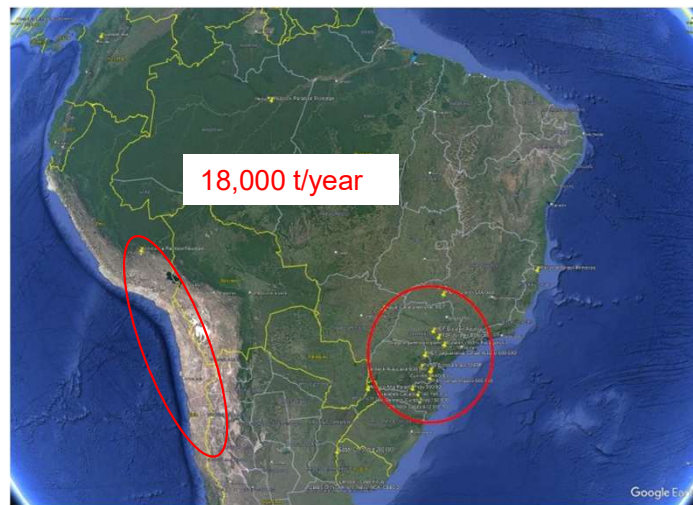
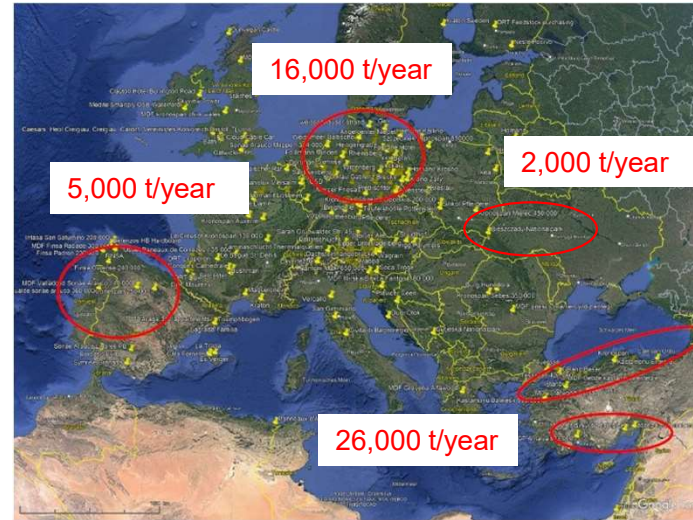
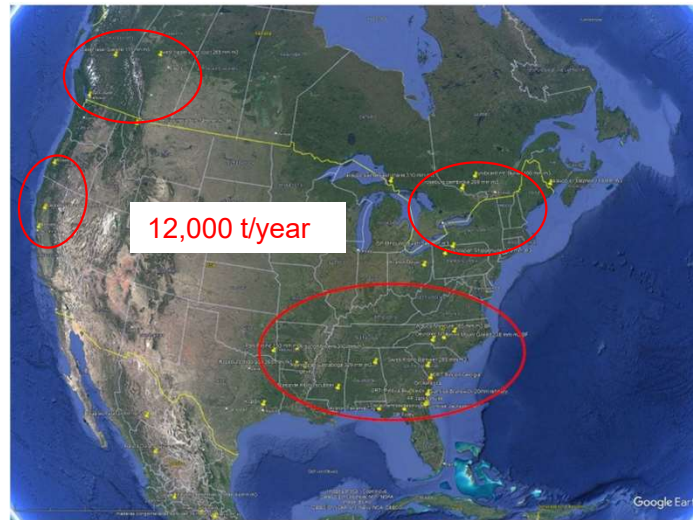
| Company | Country | Site | Region | State | Capacity [m3/a] |
|---------|---------|------|--------|-------|-----------------|
|---------|---------|------|--------|-------|-----------------|

| 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      |

| 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      |

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

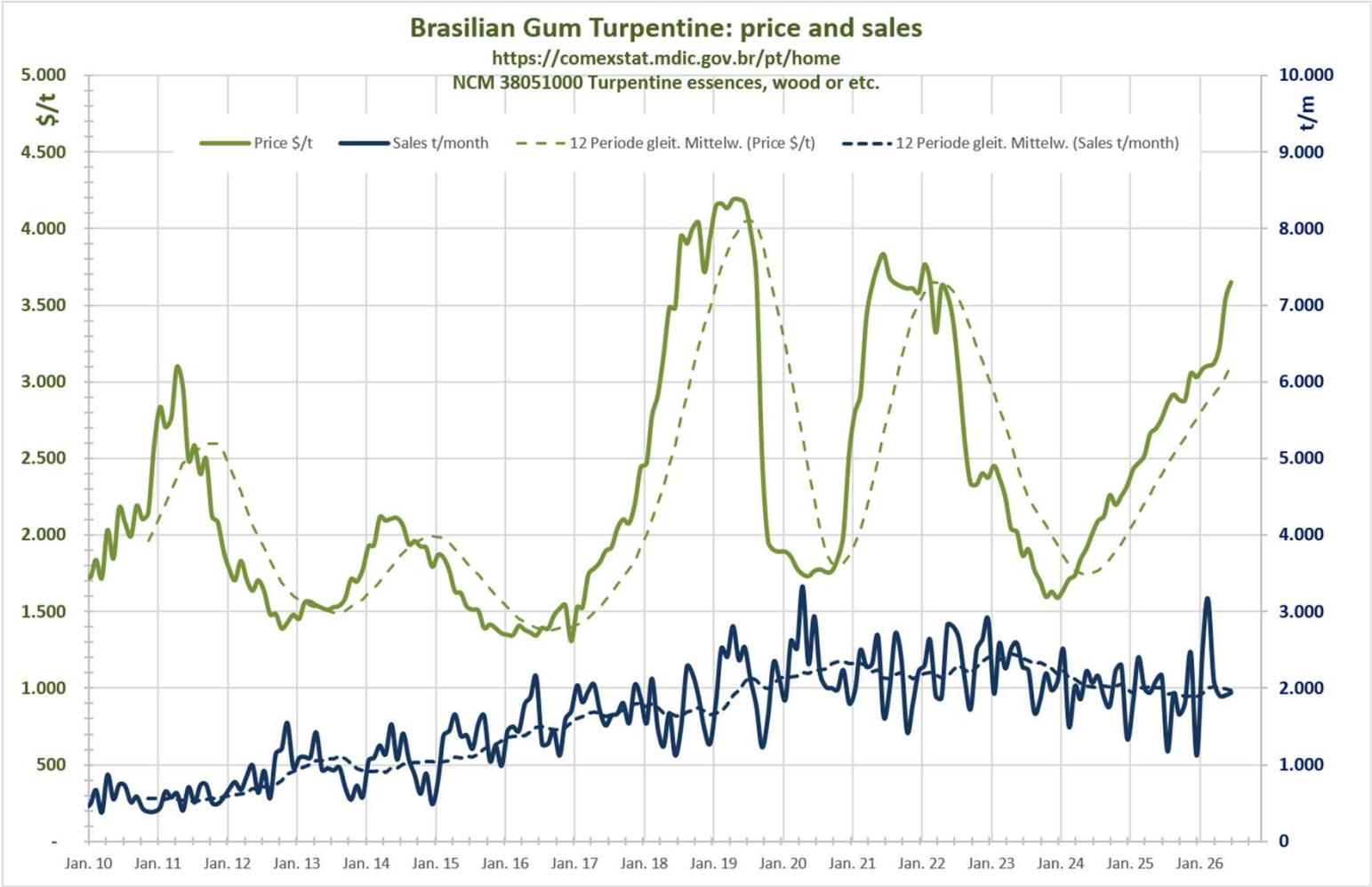
w/o China, Europe East: 81 000 t/year



## Market development: Sales goals

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

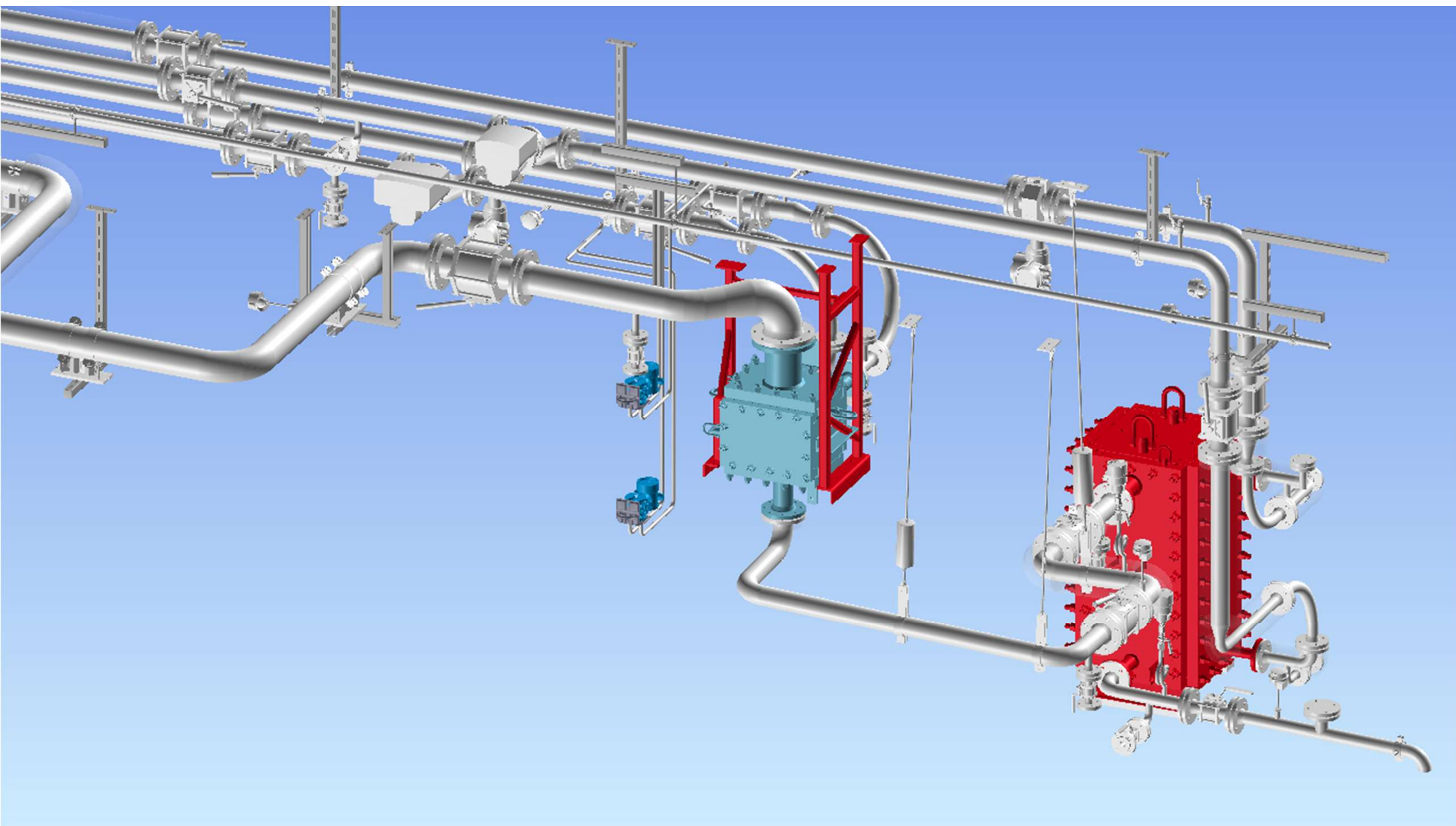
# Market development: pricing, BGT index

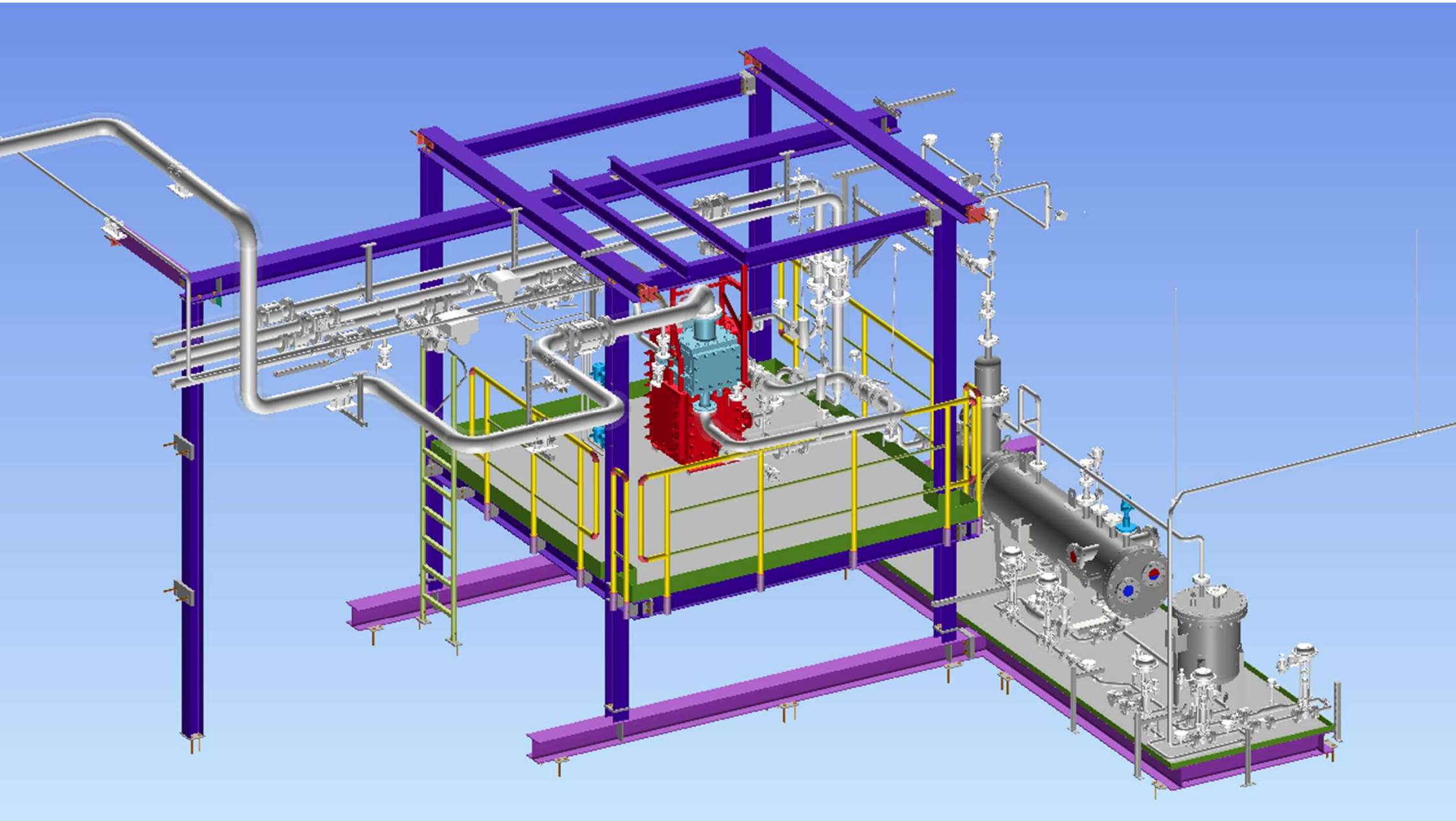


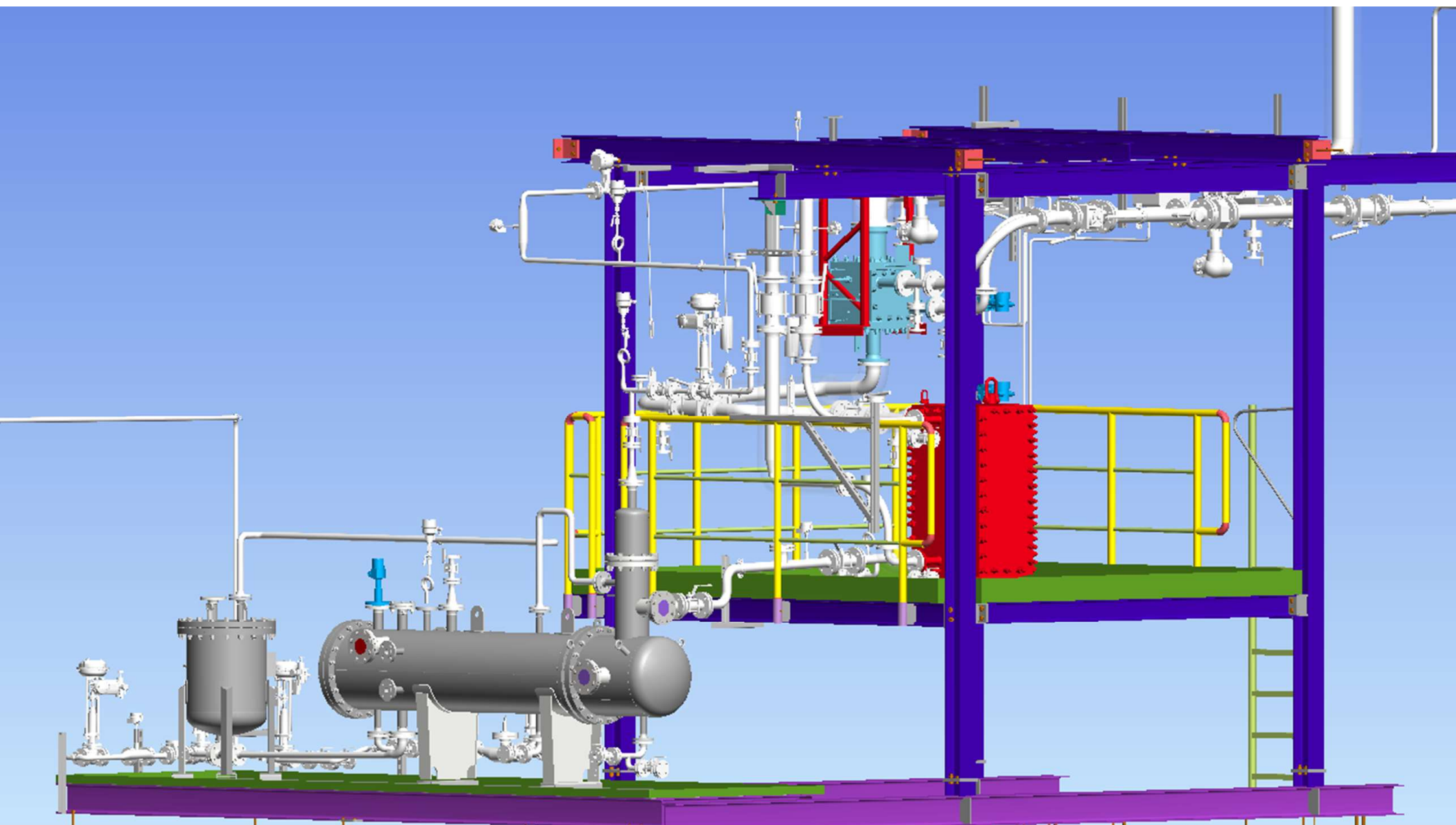
Source: <https://comexstat.mdic.gov.br/pt/home>

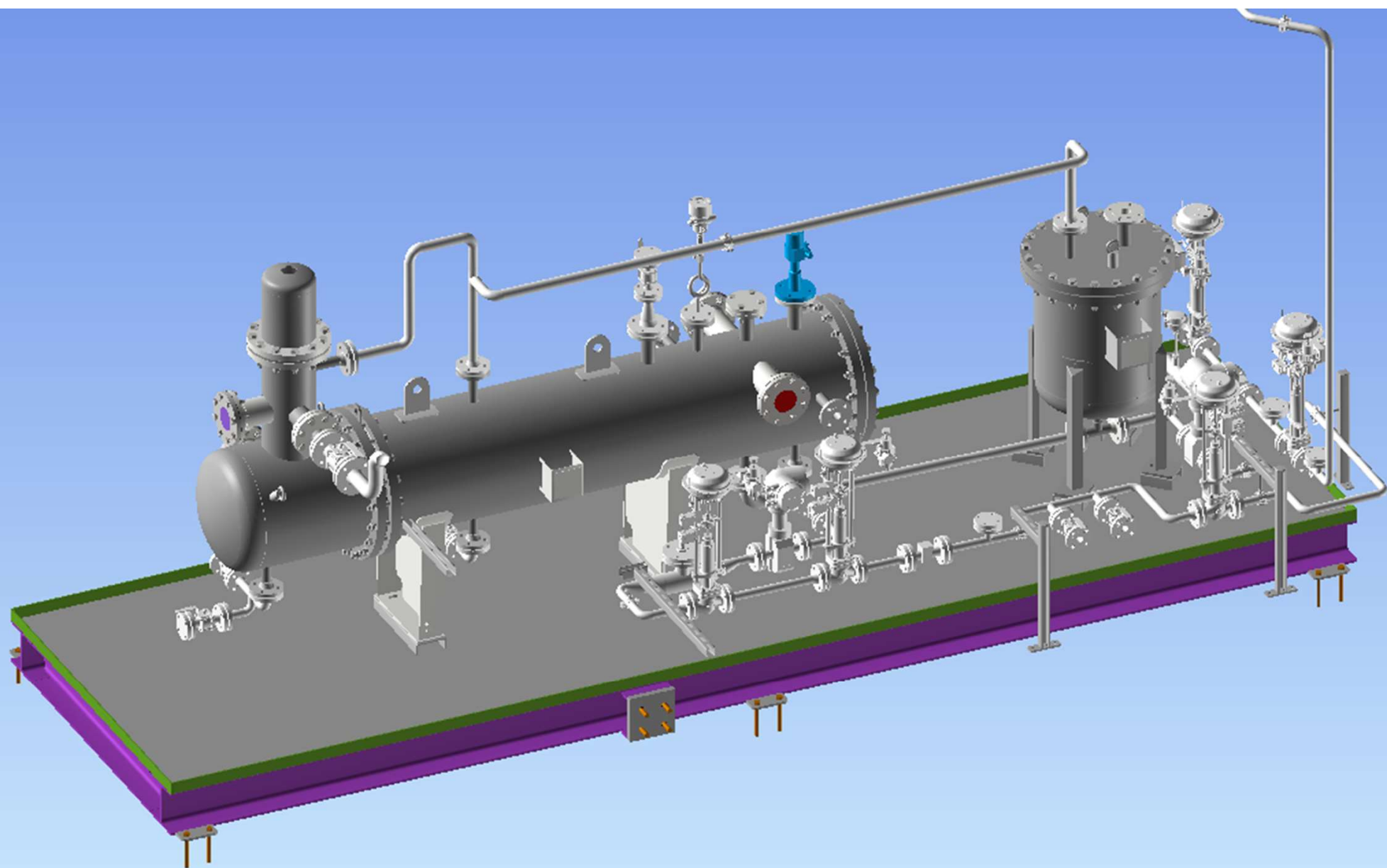
# Production plant

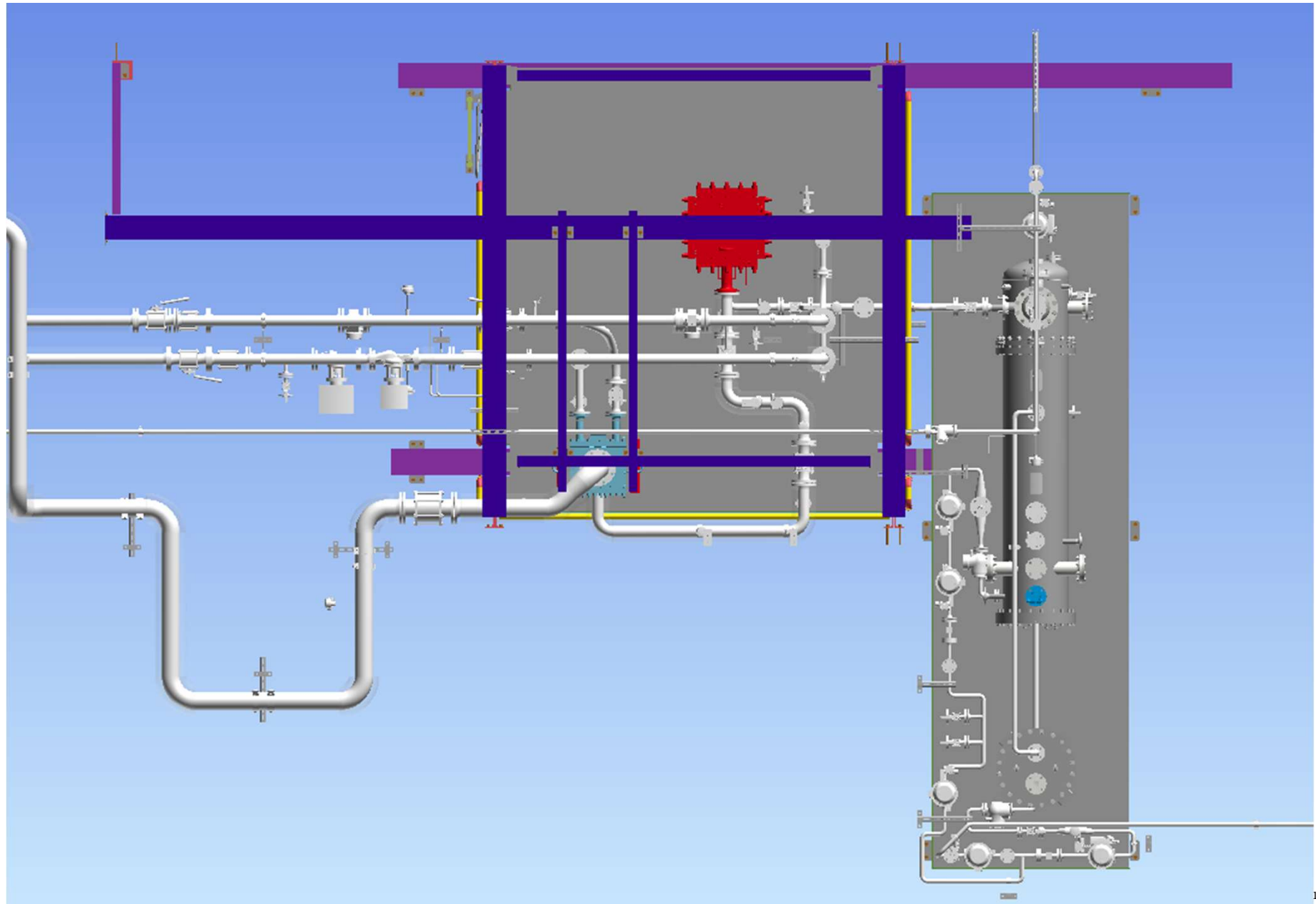
- Simple plant:
  - two-stage condensation, decanting, storage, tank-truck filling
  - Turpentine decanting at far below flash point (41°C, 95°F)
  - Residence time decanting under 5 minutes
- No Ex-Zones in your plant!
- Footprint less than 40m<sup>2</sup>
- Production readiness: December 2026

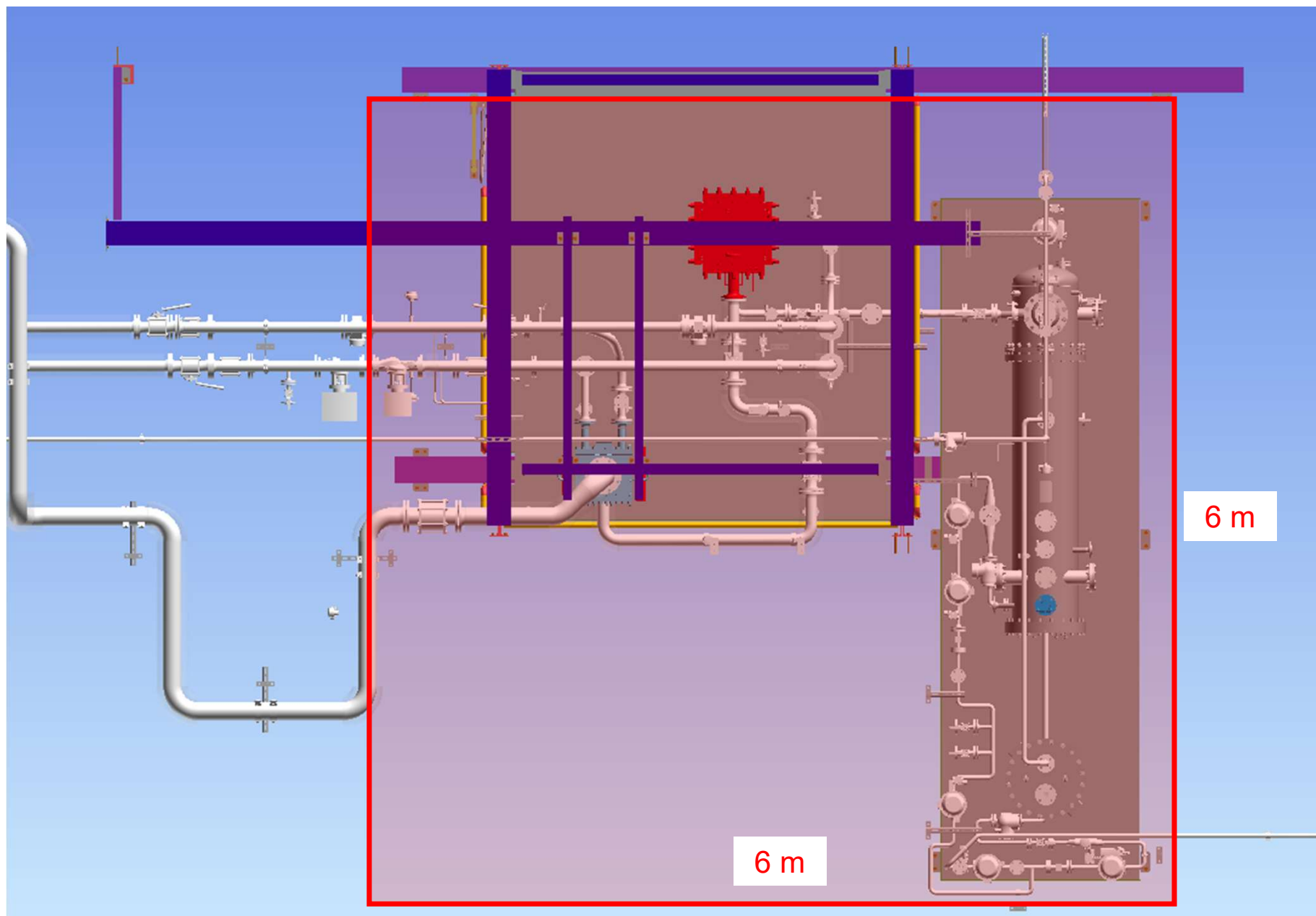






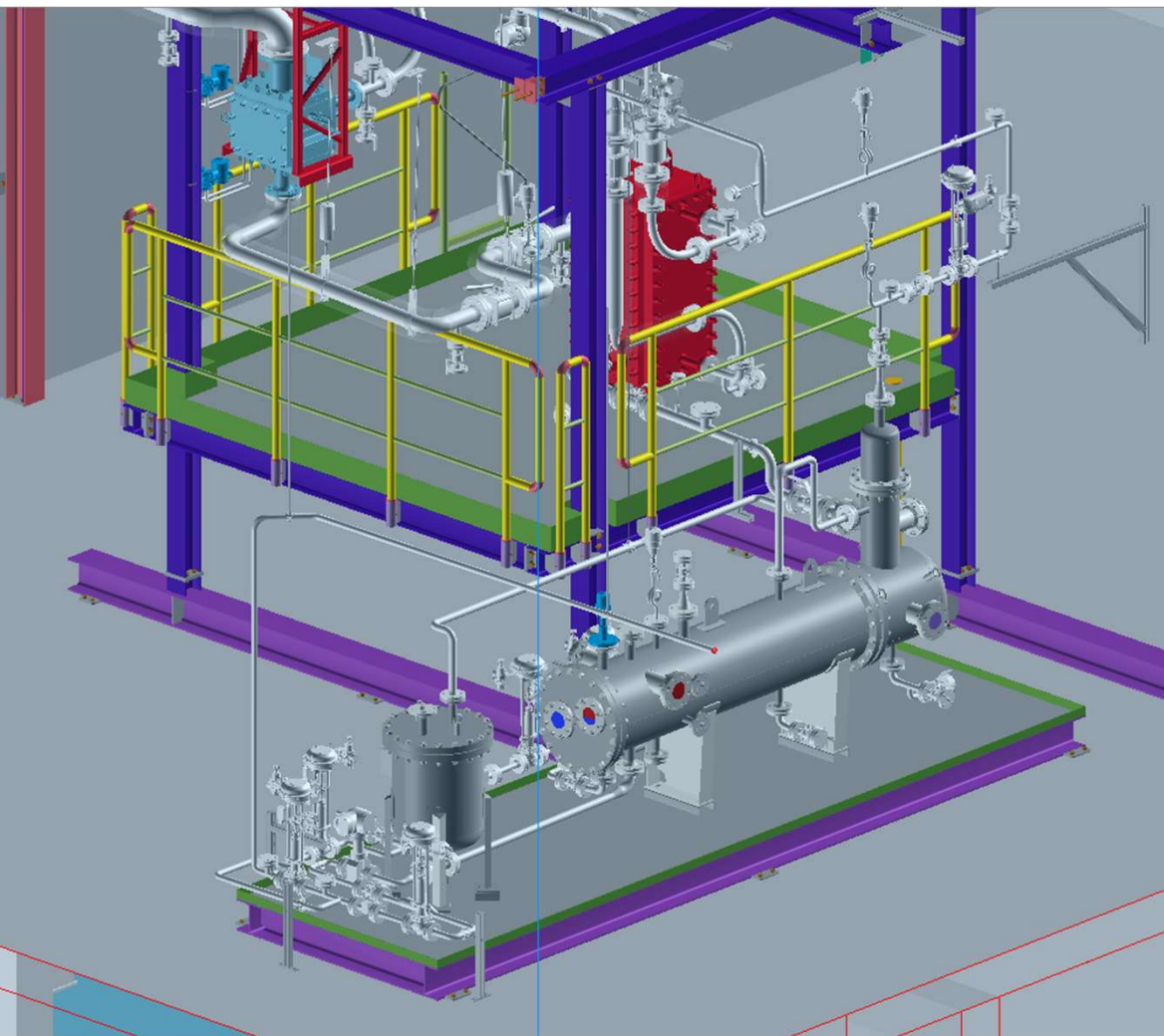


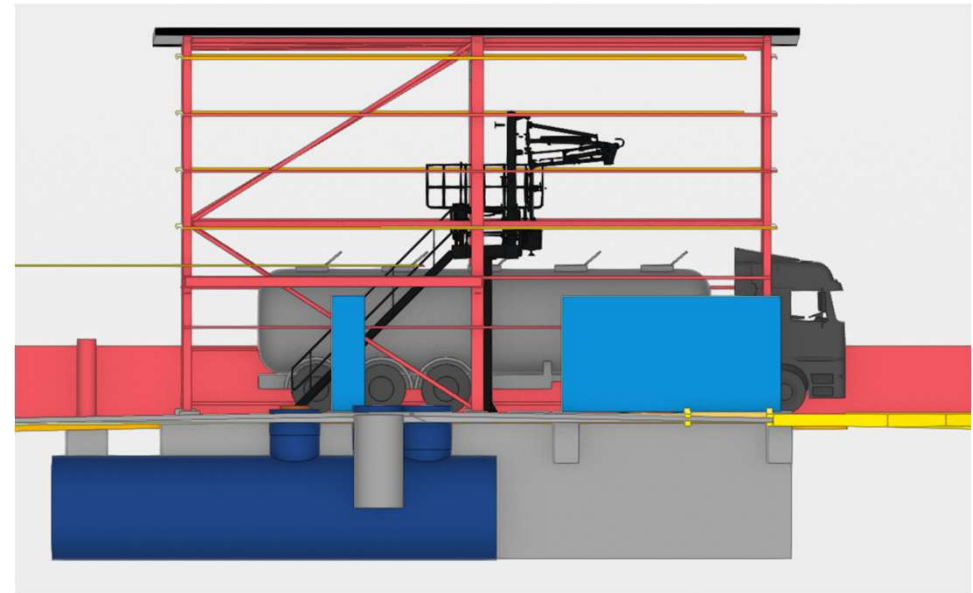
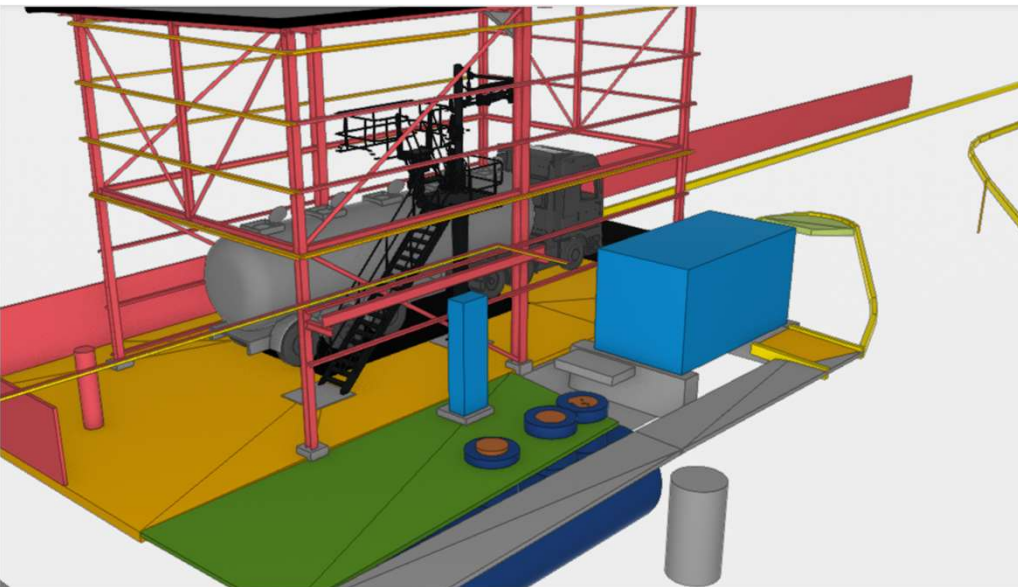
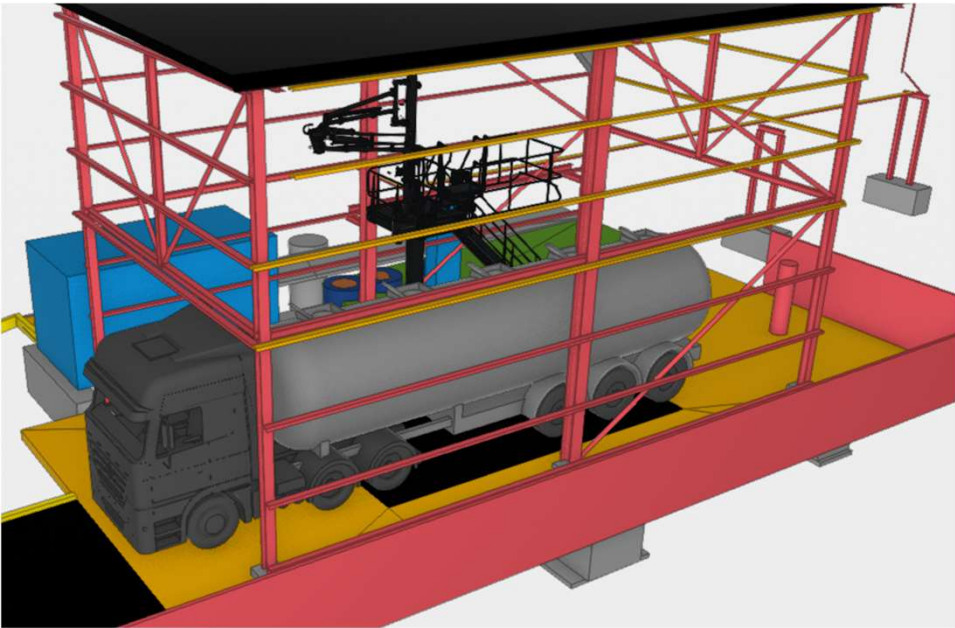
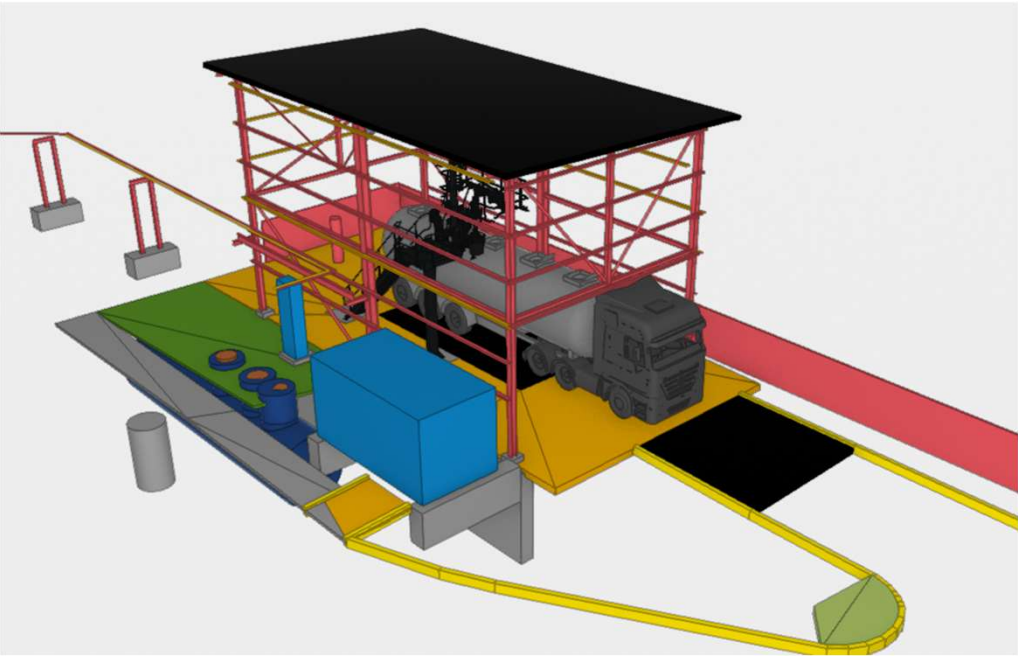




6 m

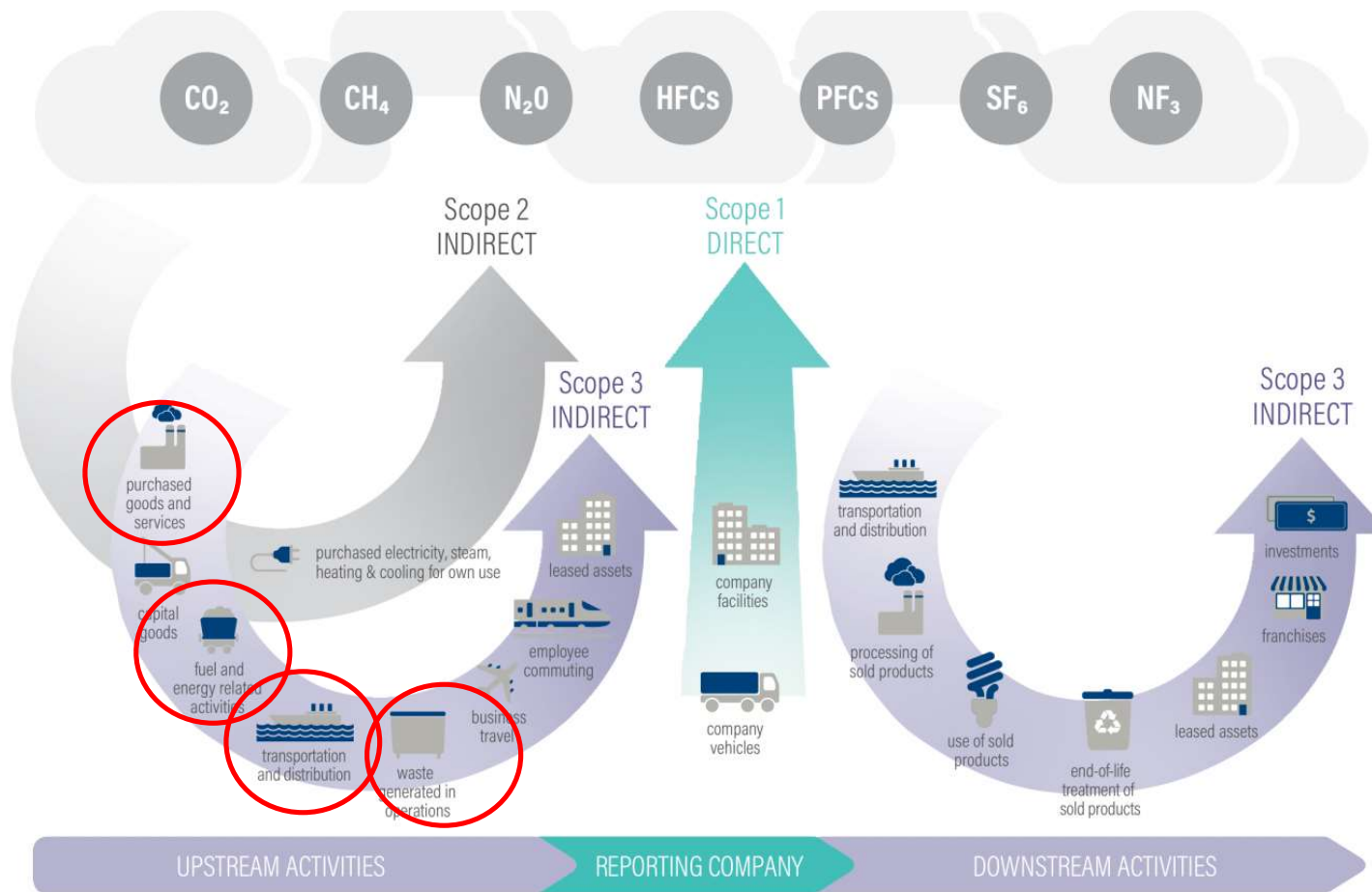
6 m





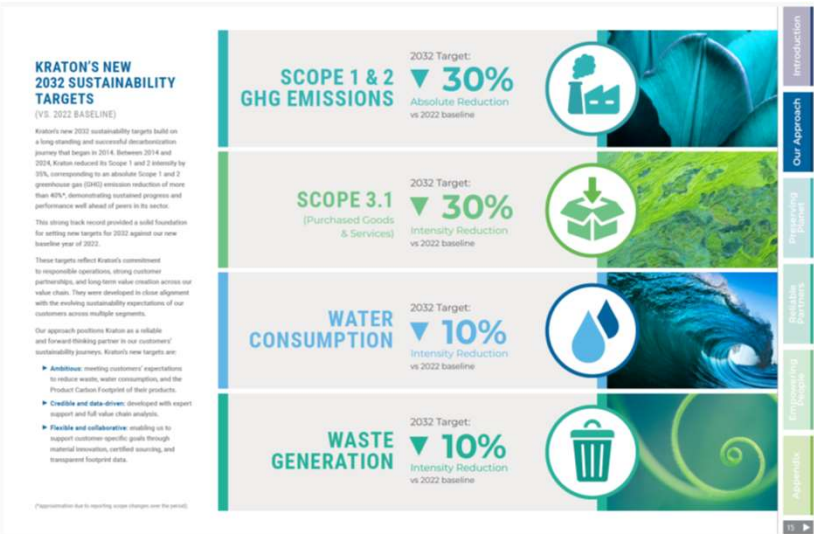


# Carbon footprint



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

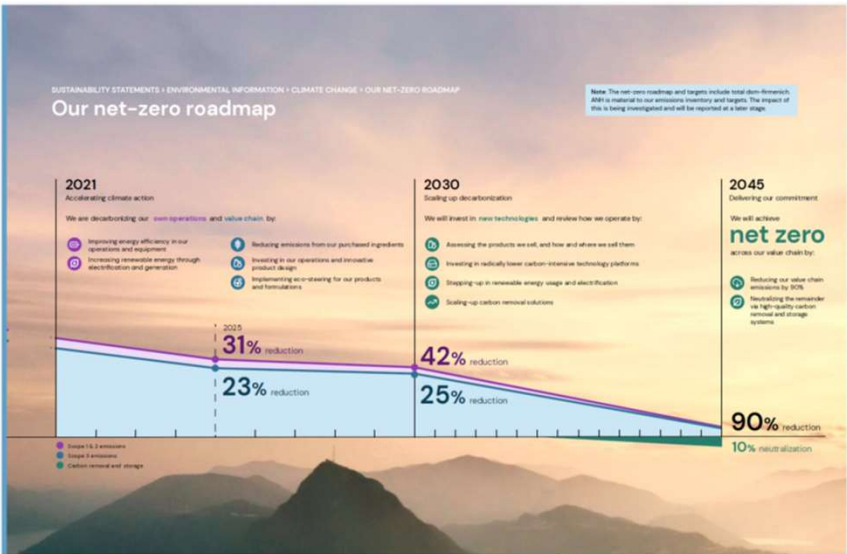
# Carbon footprint



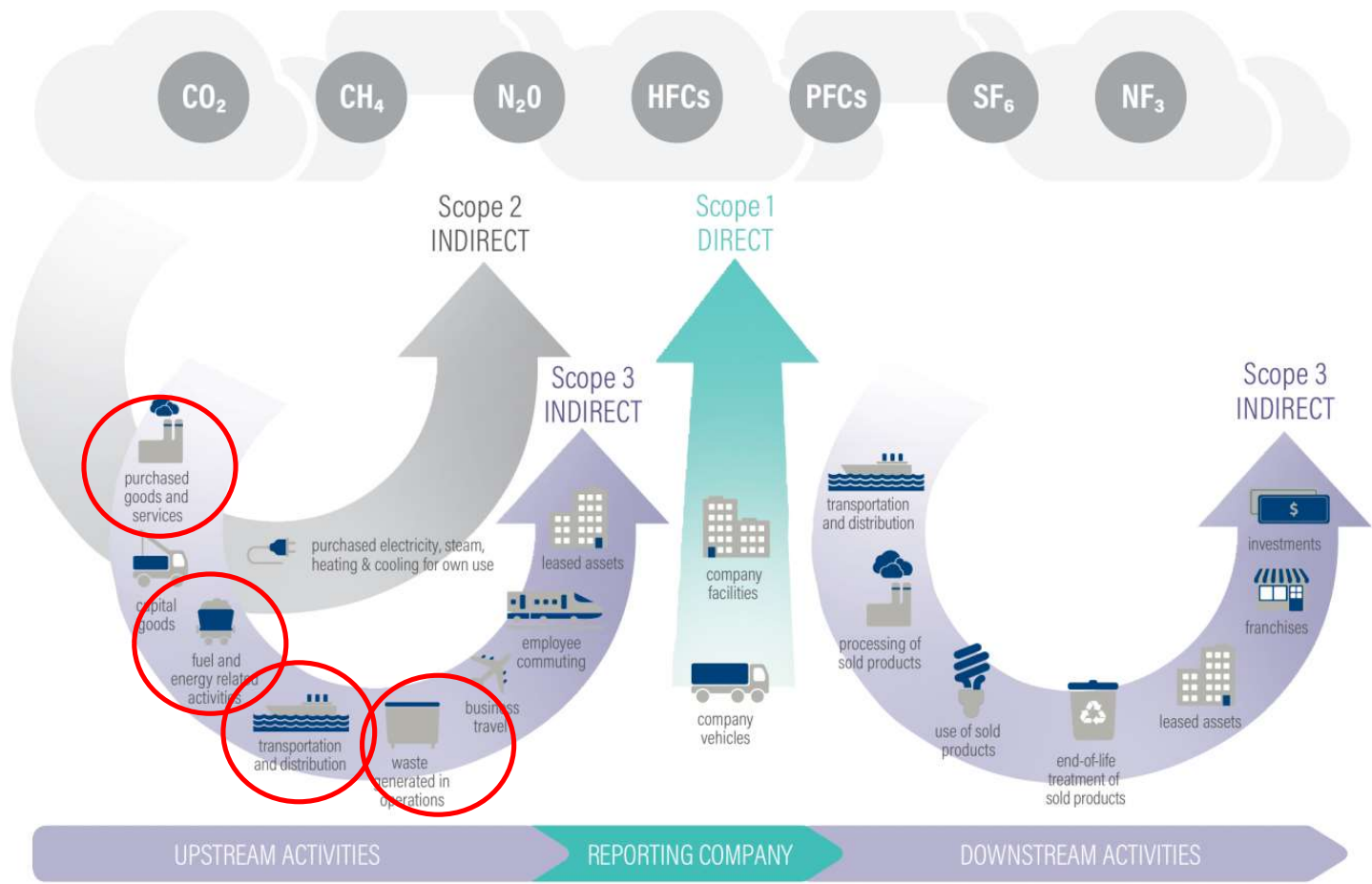
Sustainability Report 2025-26

## 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 <sub>2</sub> e Emission reduction through solar usage, fuel replacement and various energy conservation methods/initiatives. | 13 Climate Action |
|         | 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 <sub>2</sub> e.                                                                             | 13 Climate Action |
|         | 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 <sub>2</sub> e/MT)                                                     | 13 Climate Action |
|         | 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 Climate Action |



# 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!**

# Contact

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GERMANY

# Further information

## Presentations:

PCA meeting Dublin 2023

[https://prof.bht-berlin.de/fileadmin/labor/mvt/SHK/PCA\\_Bungert\\_MDF-T\\_2023-09-19.pdf](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](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](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](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](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](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](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](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!