

# Meeting the goals of the NEC directive, reducing carbon footprint and earning money on top?

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## New 2019 emission limits

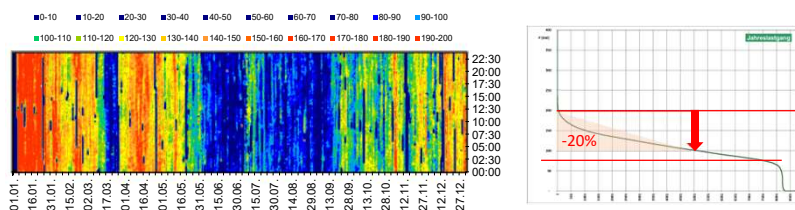
- Valid since 24.11.2019
- New reference state: dry instead of wet
- MDF: Reduction from 300mg/m<sup>3</sup> to 120mg/m<sup>3</sup>
- (101 mg/m<sup>3</sup> on new dry basis, 55°C off-gas temp.)
- Particle board 300 -> 200 (123, basis 75°C)
- OSB 400 -> 400 (246, basis 75°C)

## VOCs, Terpenes and Ozone

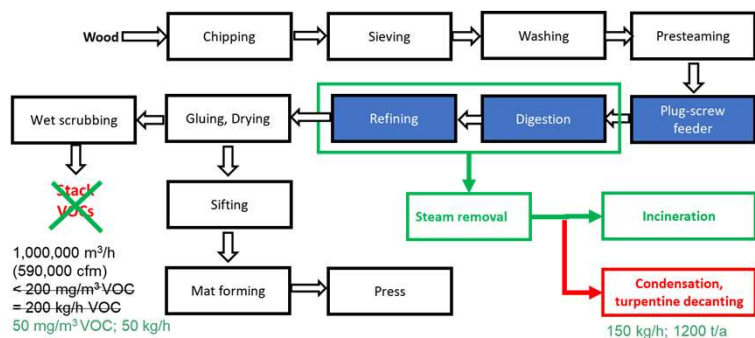
- Terpenes = essential oils ( $\alpha$ -Pinene,  $\beta$ -Pinene,  $\Delta$ -3-Carene, Limonene, ...)
- Composition and amount depends on pine species
- Mixture of terpenes is called turpentine („genuine turpentine“)
- Terpenes react with NO<sub>x</sub> to form extremely harmful Ozone

## Emissions in 2017

- VOC Emissions (online measurement) (90% plant utilization, 70% pine)
- Blue: attain limits; green, yellow, orange, red: exceed limits
- Solution: reduce production by 20% or installation of new process

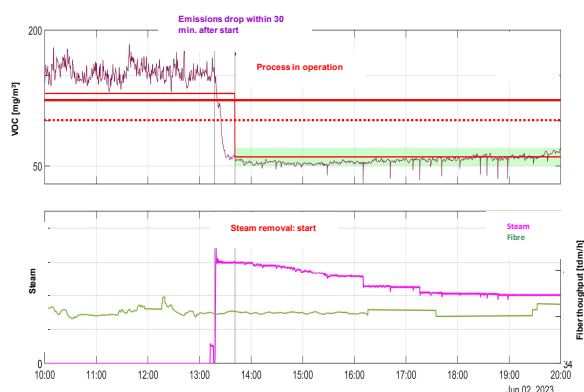


## New Process



## Compliance since 2023

- Reliable attainment of emission limits
- Proven in industrial Operation
- Emission value is controlled and can be set to much lower concentrations



## Save operating costs for RTO (regenerative thermal oxidization)

- Economical analysis (detailed study for 2 sites in USA comparing RTO with Bioscrubbing + MDF-VOC)
- Savings of € 10 / m<sup>3</sup> MDF
- No CO<sub>2</sub> emissions from burning of natural gas, therefore, carbon footprint (scope 1+2) dramatically reduced
- System is essentially energy neutral

## Contribution to NEC directive

- NEC-guideline („National Emission Ceilings Directive“) demands reduction requirement for VOCs and NMVOC (non-methane VOC)
- Reduction at FBB by 1.200 t/a equals 0,1% of all German VOC emissions.
- A detailed market study has revealed the turpentine production potential and thus the potential to reduce VOCs
- Europe turpentine (VOC) potential = 20.000 t/a
- Worldwide turpentine (VOC) potential = 120.000 t/a

## Revenue from Terpene Production

- Price depends on composition ( $\alpha$ -Pinene,  $\beta$ -Pinene content)
- Turpentine is a sought after renewable raw material for the Flavour and fragrance industry, Chemical industry: tires, adhesives, ink, Sustainable Aviation Fuel (SAF)
- Turpentine recovery system (MDF-T) in Baruth will come onstream in 2025 to give 1200 tonnes per year of turpentine
- Amortization time well under 2 years
- Revenue: € 3...8/m<sup>3</sup> MDF (depending on pine species)

## Application for Particle Board and OSB

- Concept: additional predryer can remove essentially all the terpenes. Size is 5-10% of main dryer
- Development on pilot-plant scale (20 kg/h) successfully demonstrated
- VOC emissions reduced drastically
- Additional benefit: reduction of interior emission of terpenes, organic acids and their decomposition products (e.g. hexanoic acid, hexanal)
- Partner for industrial development wanted

## IED, INCITE: derogation /exception from emission limits

- The European Innovation Centre for Industrial Transformation and Emissions (INCITE) evaluates and lists Emerging Techniques
- Companies using emerging techniques receive derogations (exceptions) from IED permit conditions for 30 months
- Frontrunners will be allowed and additional 2 years

## A new Standard for the MDF Industry

- The turpentine pays the environmental bill and generates a substantial profit
- Amortization time well under two years
- The new process is on the way to become a European standard
- Licensing in accordance with FRAND (Fair, Reasonable And Non Discriminatory) is available

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