



ANDRITZ GROUP

BIOMASS PELLETING SAFETY

PREVENTING, DETECTING, AND MANAGING SELF-HEATING INCIDENTS

3 SEP. 2025
BY LARS T. BLOCH

ANDRITZ
ENGINEERED SUCCESS

Ørsted



FutureMetrics™ LLC
The Leading Consultancy in the Wood Pellet Sector

WOOD PELLET
ASSOCIATION OF CANADA
Biomass. Bioenergy. Biofuel.



KEY FINANCIAL FIGURES 2024



ORDER INTAKE
8.3 billion EUR

(2023: 8.6 billion EUR / -3%)

REVENUE
8.3 billion EUR

(2023: 8.7 billion EUR / -4%)

ORDER BACKLOG
9.7 billion EUR

(2023: 9.9 billion EUR / -1%)

EBITA
713 MEUR

(2023: 742 MEUR / -4%)

EBITA MARGIN
8.6%

(2023: 8.6%)

NET INCOME
(incl. non-controlling interests)
497 MEUR

(2023: 504 MEUR / -2%)

AROUND **50,000**
EMPLOYEES WORLDWIDE

OVER **200**
LOCATIONS

OVER **80**
COUNTRIES

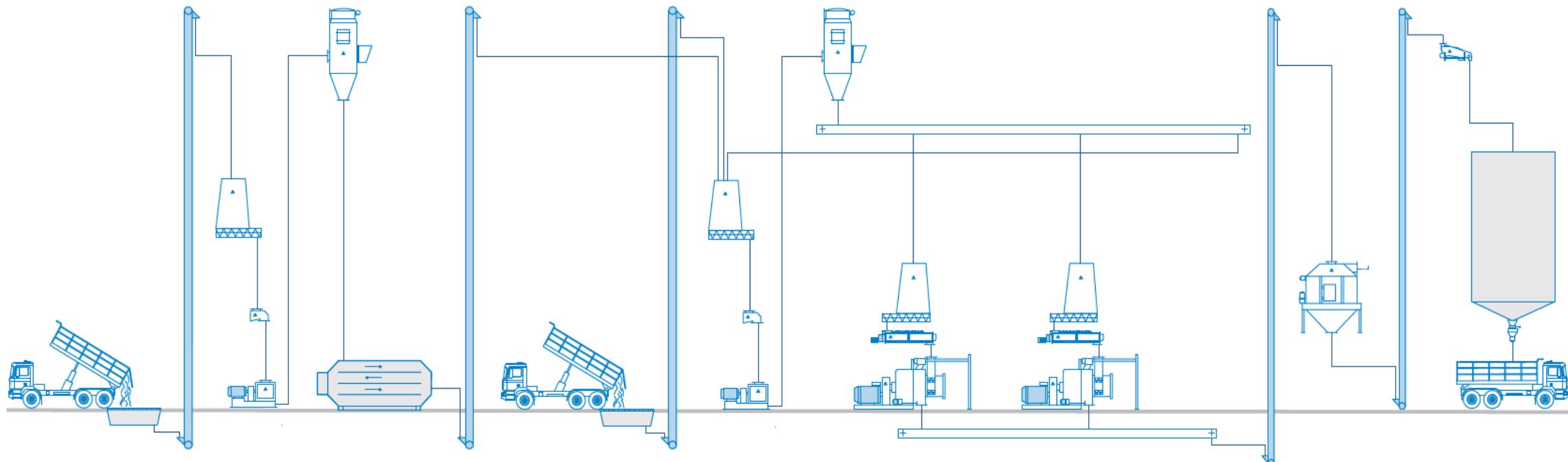
Headlines

-  Definition of Fire and Explosion
-  Mitigation Methods
 - Fire Mitigation
 - Explosion Mitigation
 - Potential precautions to consider
-  Examples from the Pelleting Process
-  **Why Uniform Moisture Content Matters**
 - Self-Heating of Wood Pellets during Storage
-  **Importance of Pellet Cooling / Screening**
-  **Monitoring of Pellet Storages**
-  Examples for Shipping, Storage, and End-User Handling

BIOMASS PELLETING - SAFETY



Wood Pelleting Process line



CHIP INTAKE

CHIP
GRINDING

DRYING

SAWDUST INTAKE

FINE GRINDING

PELLETING

COOLING

SILO /
OUTLOADING

BIOMASS PELLETING - SAFETY



Why Uniform Moisture Content Matters

Particle size matters on Dryer Behavior

- Fine particles dry too fast, may overheat → increased risk of ignition inside the dryer.
- Coarse particles remain under-dried → contain moisture pockets carry excess moisture into pelletizing.

Residual moisture is a known driver for:

- Microbial activity (generating heat).
- Exothermic oxidation reactions.

These mechanisms can lead to self-heating and off-gassing in pellet storages and silos.



Conclusion:

Uniform particle size enhances drying efficiency and reduces the risk of spontaneous ignition in pellet storage.

Self-Heating of Wood Pellets during Storage

Self-heating of biomass can occur either by chemical oxidation reactions and/or microbiological decay.

The fresher the biomass and the higher the moisture content the greater is the risk for self-heating and potential self-ignition. Self-heating of biomass is a serious problem and has been cause of several incidents.

Source: Danish Technological Institute

Conclusion:
Water is an enemy !



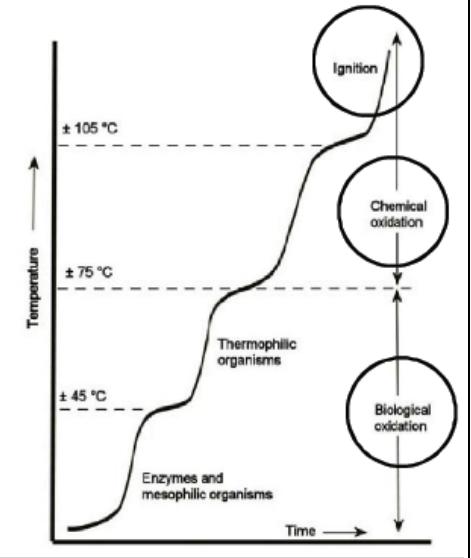
Decomposition mechanism

Biological Oxidation (respiration)

- Reaction extent was determined by the accessibility of micro-organisms to the nutrition and the moisture (Meijer, 2004).
- Leads to deterioration in pellets quality, substance losses, and health hazards.
- Releases gases, mainly CO, CO₂, CH₄ (Kuang, 2008).
- Generate heat and moisture

Chemical Oxidation

- At higher temperature, chemical process dominates over the biological process.
- Generate more heat and gas

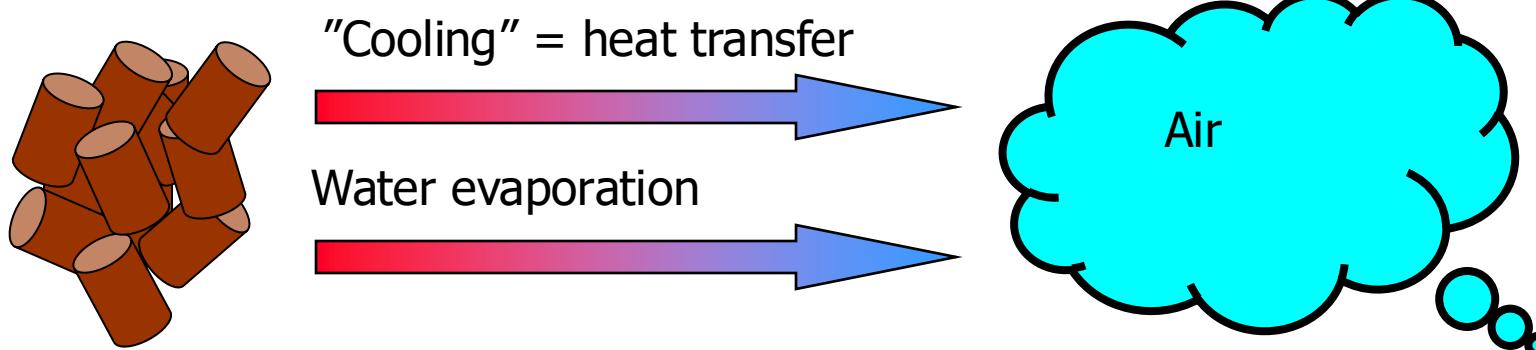


Source: The University of British Columbia

BIOMASS PELLETING - SAFETY



Importance of Pellet Cooling / Screening



Safety Guidelines

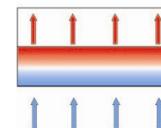
- Pellets < 50°C before storage
- Fines < 1% to minimize heat buildup
- Uniform drying prevents condensation and hot spots

COOLING

Cooler scenarios (Counter flow cooling)

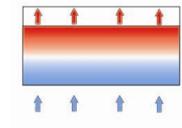
Normal distribution and level:

- Temperature product out is not more than 5-8 deg. C higher than cooling air coming into the cooler.
- No risk of "over"cooling



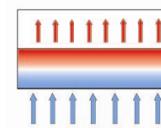
Longer retention time:

- More evaporation
- Higher pressure drop
- Normally better cooling



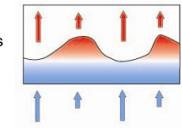
More air:

- More cooling by heat transfer
- Less cooling by evaporation
- Higher pressure drop
- Risk of sucking pellets into exhaust



Uneven distribution:

- More air volume in lower parts
- More retention time in higher parts



BIOMASS PELLETING - SAFETY



Importance of Pellet Cooling / Screening

This step removes fines from pellets after the pelleting and cooling stages, ensuring clean material enters storage.

- Fines are usually recycled, ideally via the hammermill, for effective regrinding and blending.
- In certain cases, oversized materials must also be removed.

Safety Guidelines

- Pellets < 50°C before storage
- Fines < 1% to minimize heat buildup
- Uniform drying prevents condensation and hot spots



BIOMASS PELLETING - SAFETY

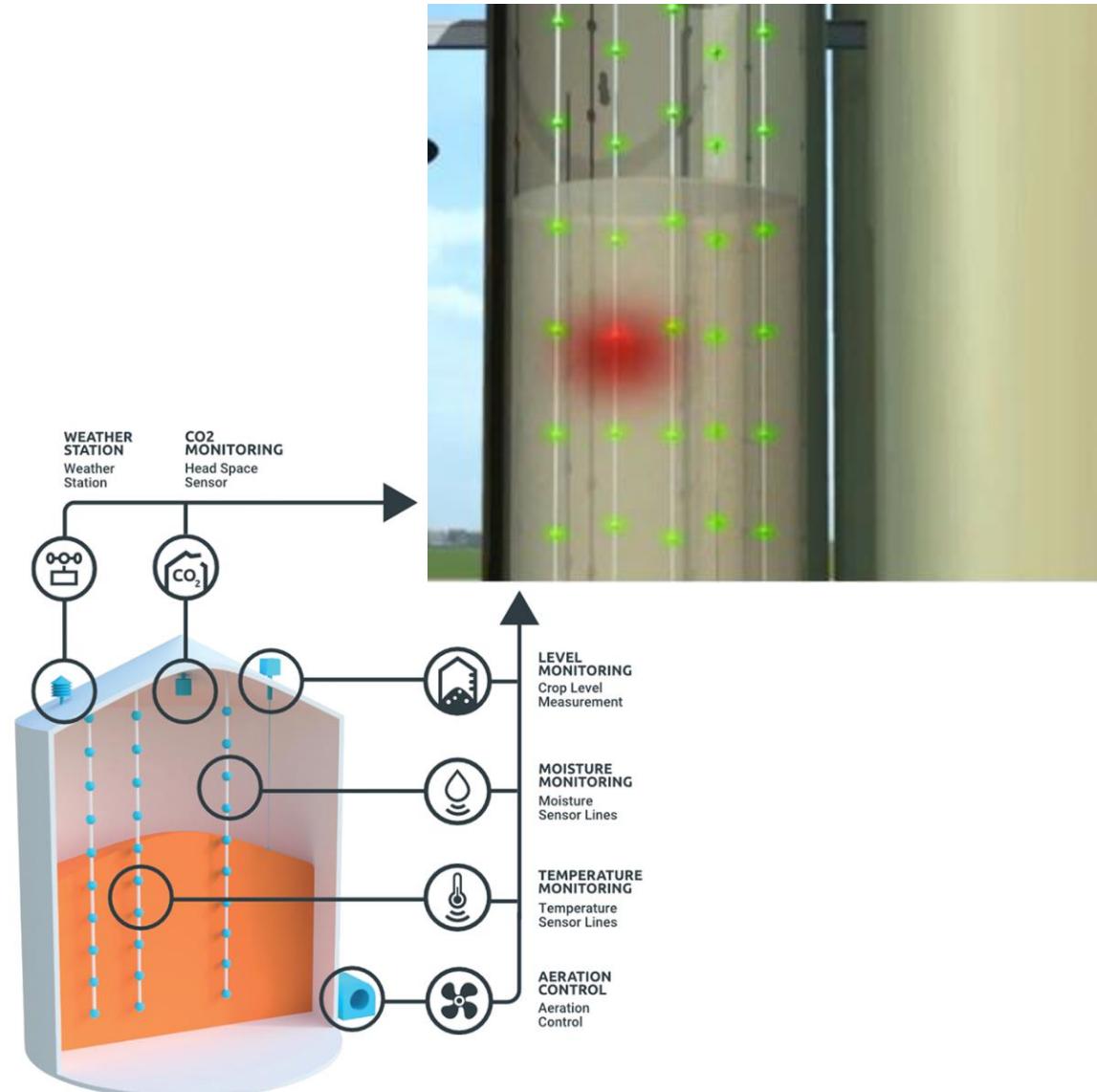


Monitoring of Pellet Storages

Online temperature monitored by means of several sensors which are fitted in carrying cables.

Additional options:

- CO2 monitoring
- Moisture monitoring
- Level monitoring
- Weather station
- Aspiration
- Data collection system





LEGAL DISCLAIMER



© ANDRITZ AG 2025

This presentation contains valuable, proprietary property belonging to ANDRITZ AG or its affiliates ("the ANDRITZ Group"), and no licenses or other intellectual property rights are granted herein, nor shall the contents of this presentation form part of any sales contracts which may be concluded between the ANDRITZ Group companies and purchasers of any equipment and/or systems referenced herein. Please be aware that the ANDRITZ Group actively and aggressively enforces its intellectual property rights to the fullest extent of applicable law. Any information contained herein (other than publicly available information) shall not be disclosed or reproduced, in whole or in part, electronically or in hard copy, to third parties. No information contained herein shall be used in any way either commercially or for any purpose other than internal viewing, reading, or evaluation of its contents by recipient and the ANDRITZ Group disclaims all liability arising from recipient's use or reliance upon such information. Title in and to all intellectual property rights embodied in this presentation, and all information contained therein, is and shall remain with the ANDRITZ Group. None of the information contained herein shall be construed as legal, tax, or investment advice, and private counsel, accountants, or other professional advisers should be consulted and relied upon for any such advice.

All copyrightable text and graphics, the selection, arrangement, and presentation of all materials, and the overall design of this presentation are © ANDRITZ Group 2025. All rights reserved. No part of this information or materials may be reproduced, retransmitted, displayed, distributed, or modified without the prior written approval of Owner. All trademarks and other names, logos, and icons identifying Owner's goods and services are proprietary marks belonging to the ANDRITZ Group. If recipient is in doubt whether permission is needed for any type of use of the contents of this presentation, please contact the ANDRITZ Group at welcome@andritz.com.