



มหาวิทยาลัยราชภัฏนครปฐม

9673204

Drying and Storage

Course Description

Theory of drying, sun drying, principles of air flow, drying of agricultural products by heated air, moisture content determination, relationship of moisture and temperature, equilibrium moisture content, design of dryers storage

Professional Interest Statement:

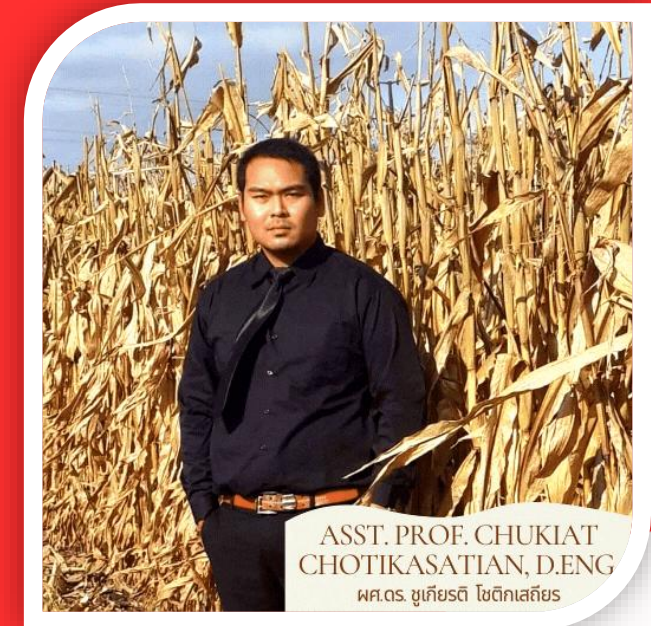
- Monitoring CO₂/O₂ concentrations to assess biological activity and reduce post-harvest losses
- Establishing verification criteria for unacceptable insect infestation levels
- Supporting fumigation and grain storage management decisions
- Developing agricultural product drying and intelligent drying systems



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NPRU 2



Lecture 10.1 – Chilled Aeration (Bonus!!!)

Study Questions – Lecture 10.1

- 1. Why cooling stored grain matters?*
- 2. What is chilled aeration?*
- 3. When is chilled aeration especially useful?*





Lecture 10.1 – Chilled Aeration (Bonus!!!)

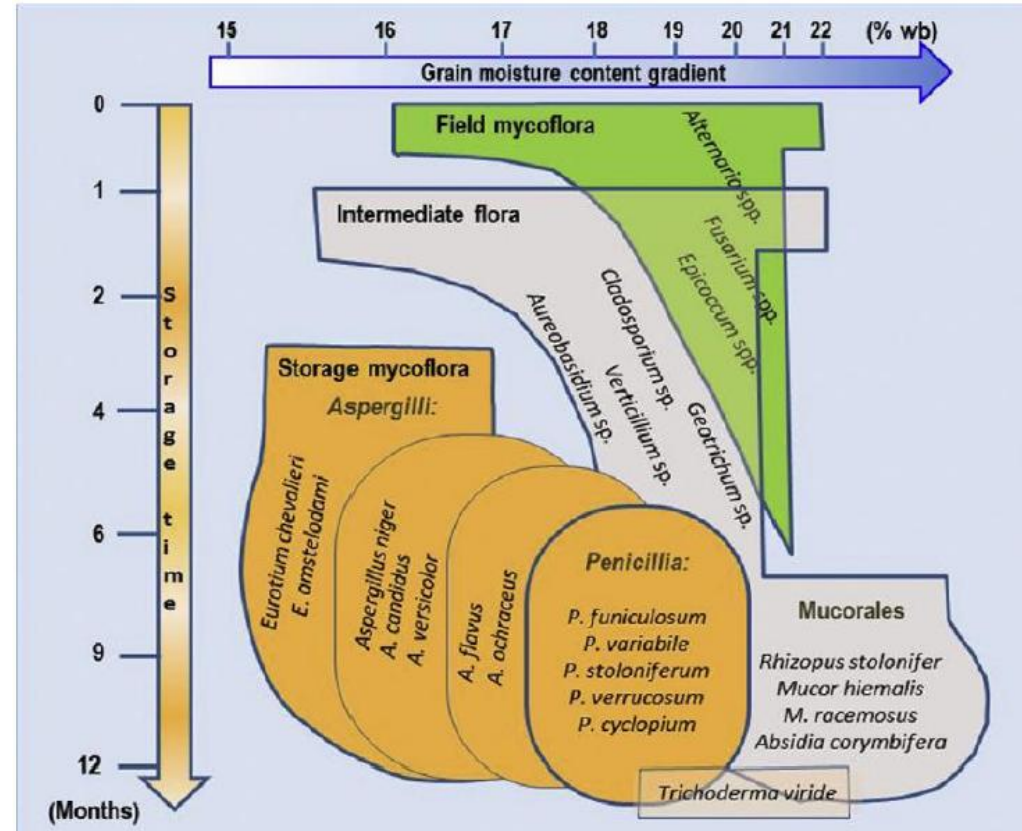
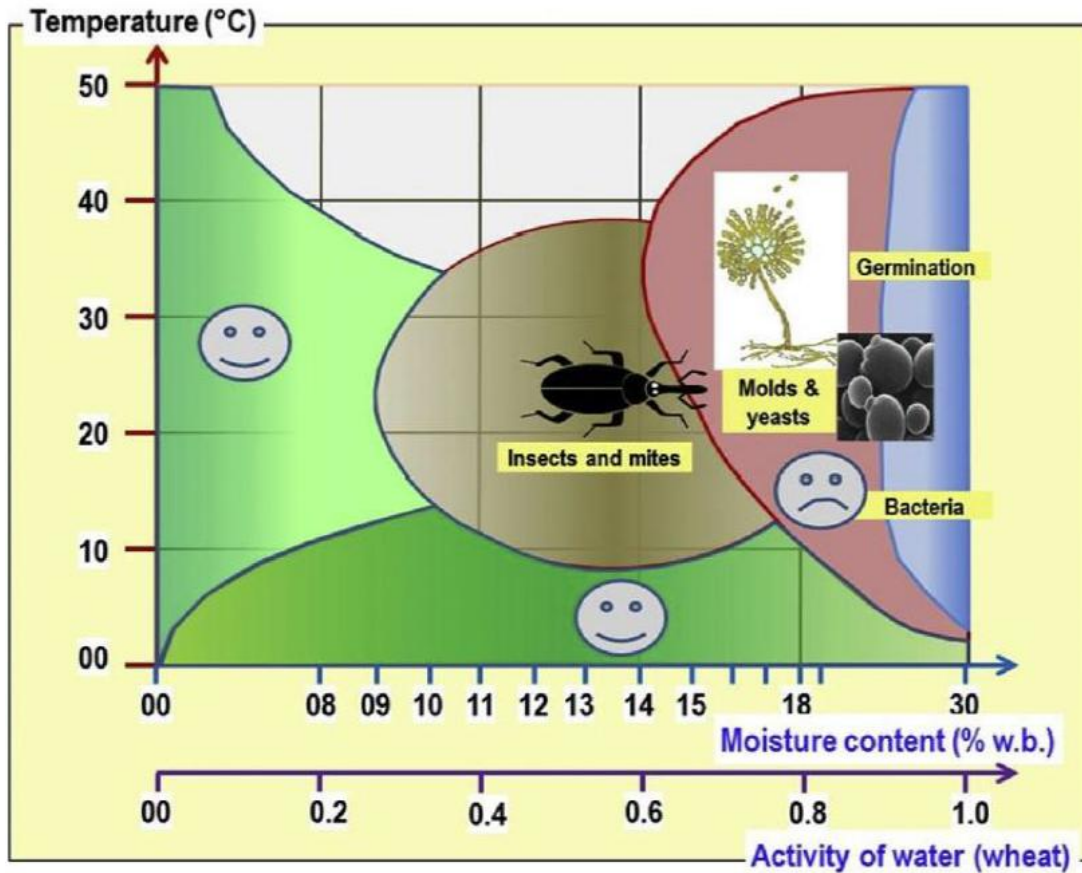
Outline – Lecture 10.1

1. *Grain Stored Under Different Temperature and Moisture Conditions*
2. *Chilled Aeration in Grain Storage*
3. *Benefits and Limitations of Chilled Aeration*



Biological Characteristics of Grain Stored Under Different Temperature and Moisture Conditions

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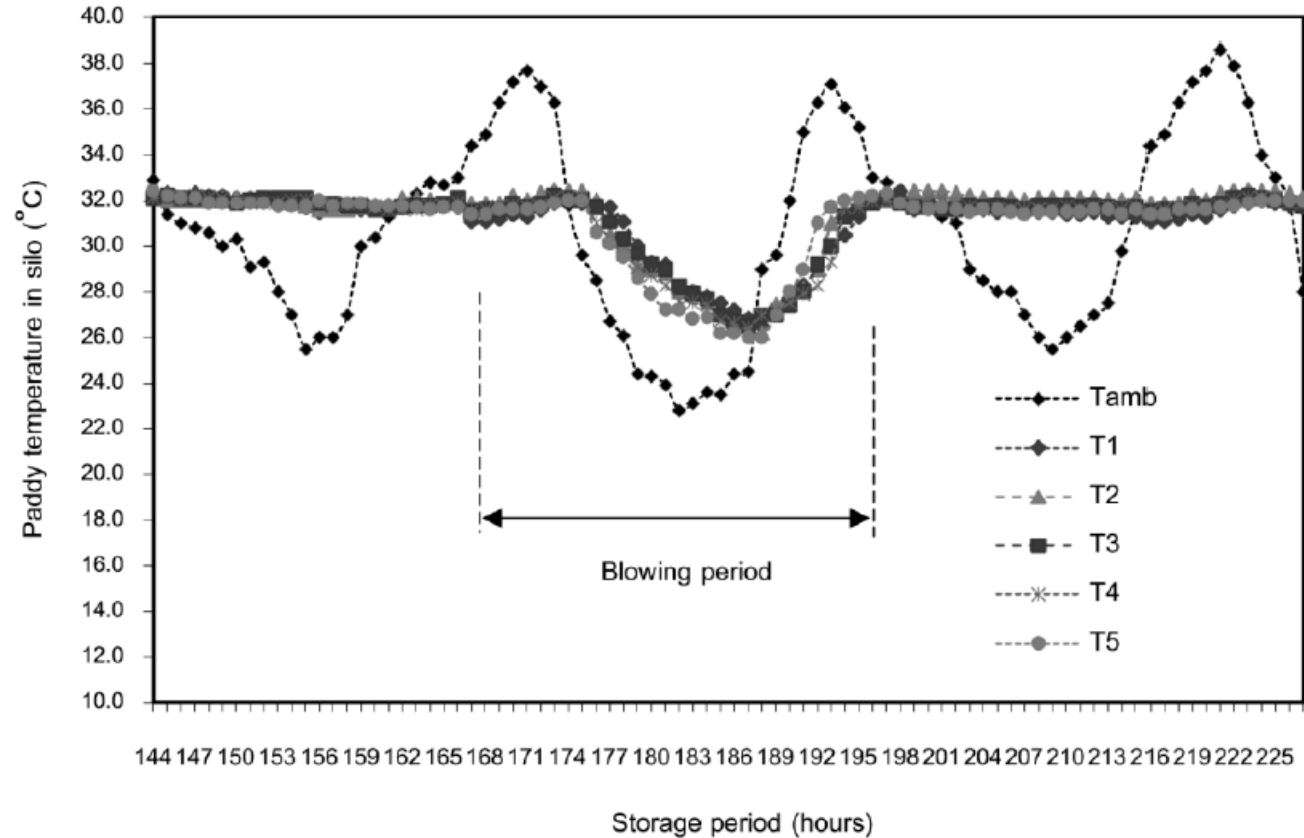
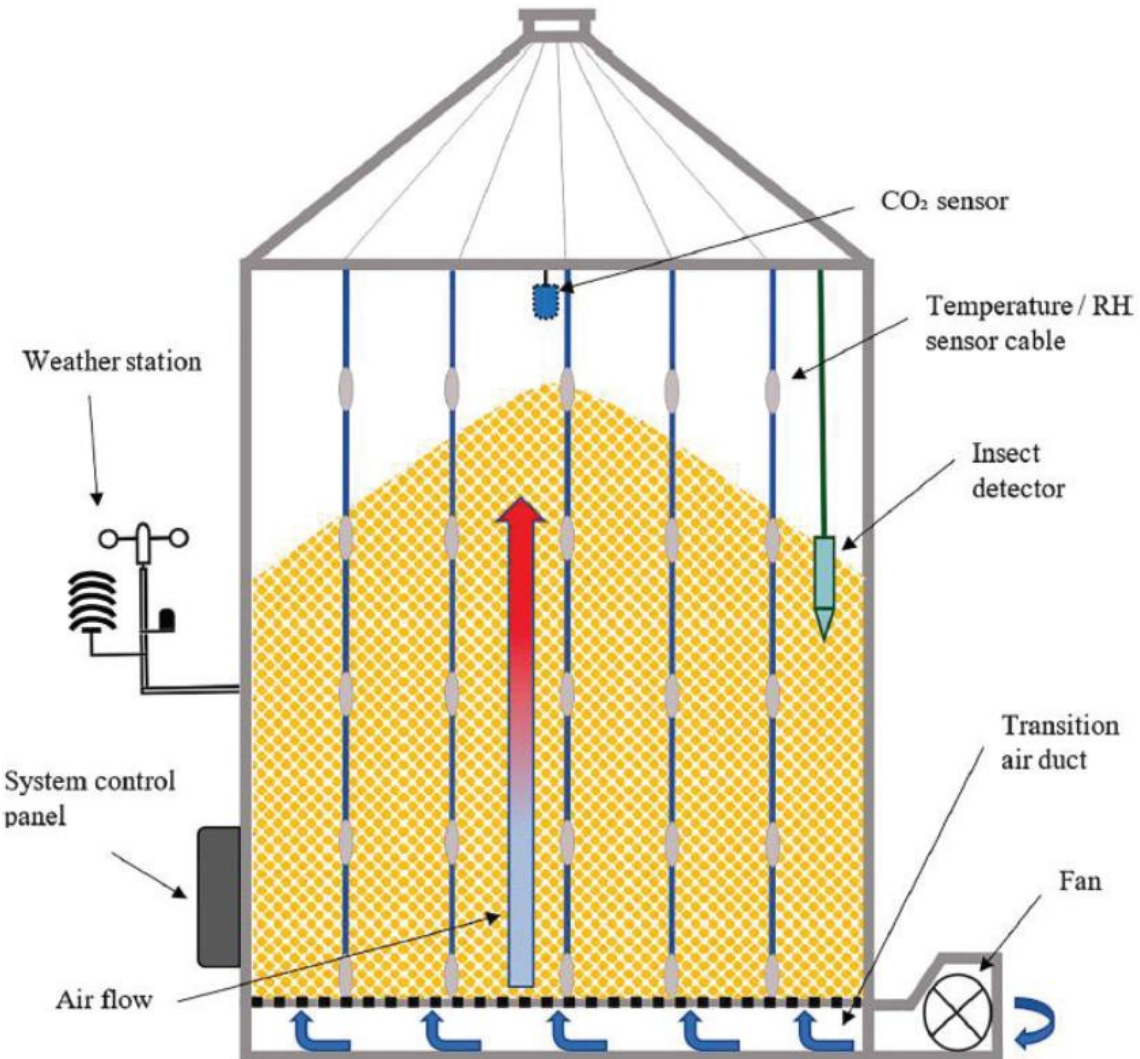
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Reference: Fleurat-Lessard, 2017, p. 24-27

Grain Aeration & Aeration Strategy

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Reference: Muenthong & Teeboonma, 2013, P.432

Why Cooling Stored Grain Matters?



THE CHALLENGES: WHY GRAIN COOLING MATTERS



INSECTS

Warmer grain speeds insect feeding, reproduction, and damage.



MOLDS

Hot spots and wet pockets promote fungal growth and spoilage.



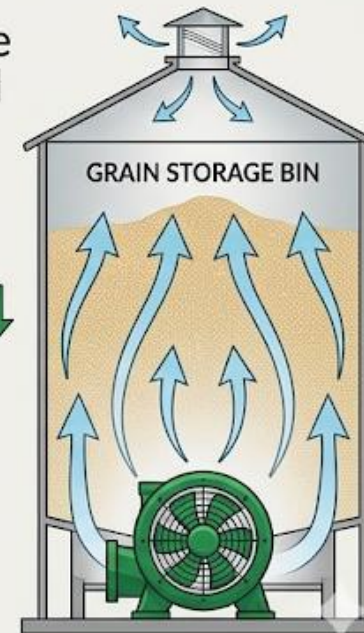
MOISTURE MIGRATION

Temperature differences move moisture within the bin and can cause condensation.

THE SOLUTIONS: THE ROLE OF AERATION

AERATION keeps the grain mass **COOL** and **UNIFORM**, directly reducing...

- ✓ Reduced Mold Development
- ✓ Reduced Insect Activity
- ✓ Prevented Moisture Migration



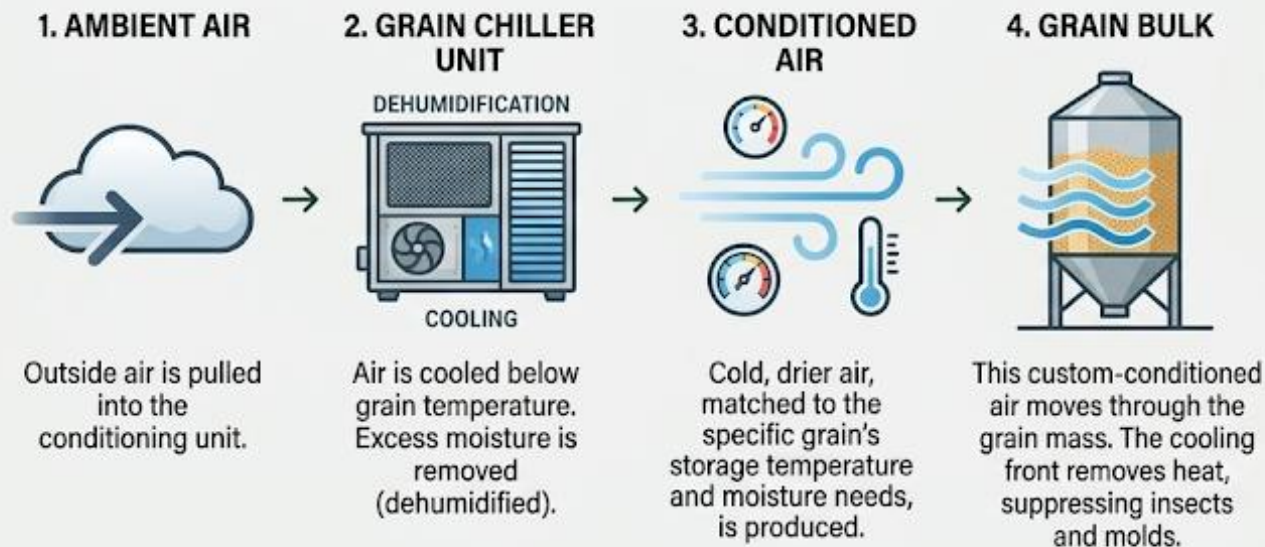
What is Chilled Aeration?

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What is Chilled Aeration?

Chilled aeration uses a refrigeration unit to supply cool, conditioned air to the grain mass.



**Key idea: the system conditions air *before* it enters the grain.
It does not rely solely on natural, cool night air.**



FACTORY PRODUCTION: Multiple Grain Chiller units in assembly. Note: Workers and the 'ZAMIN' logo on some units.

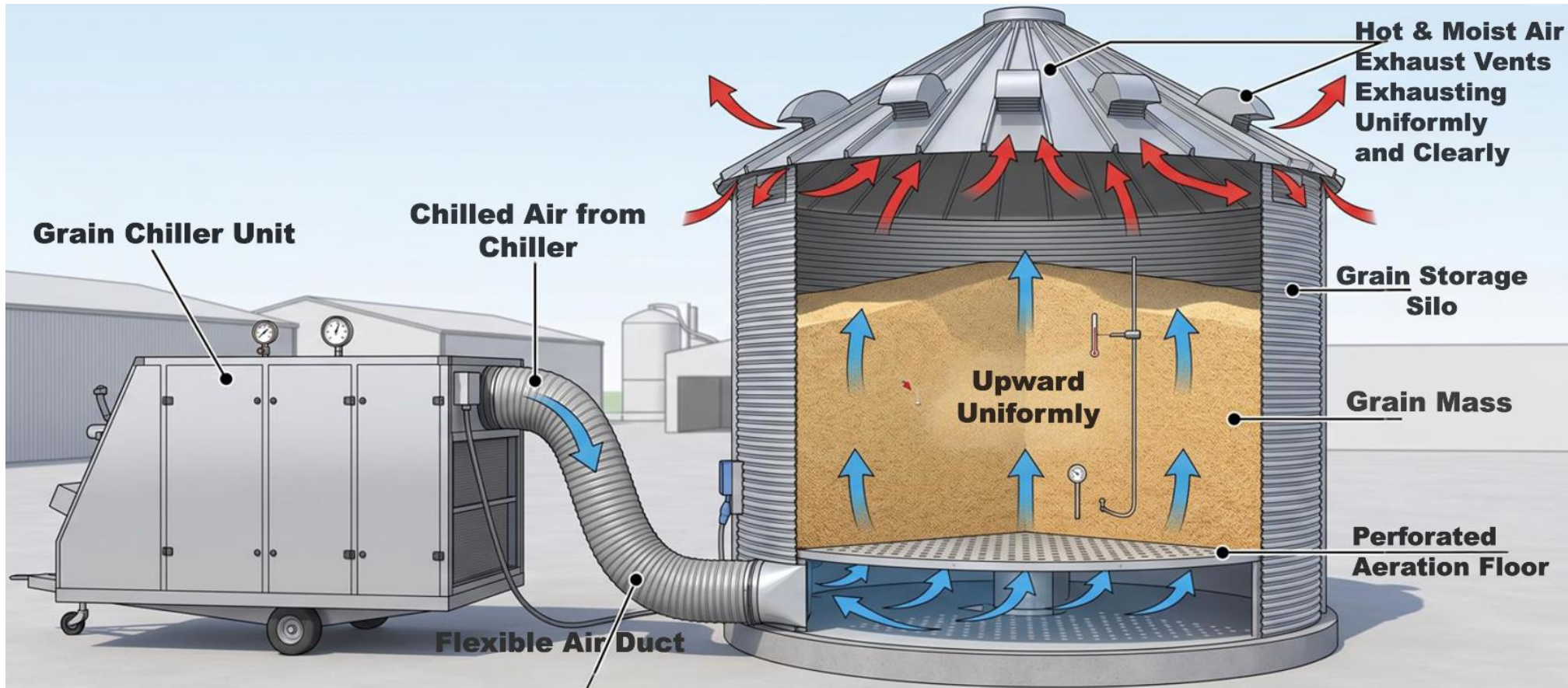


INSTALLED UNIT: Site conditioning for a silo. Note: The 'GRANIFRIGOR' brand and external ducting.



Chilled Aeration in Grain Storage

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Benefits and Limitations of Chilled Aeration

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Benefits

- More reliable cooling when outdoor weather is unsuitable
- Lower insect and mold activity because grain stays cooler
- Reduced moisture migration by keeping the grain mass more uniform
- Useful for seed and other quality-sensitive products
- May reduce dependence on chemical protection

Limitations / cautions

- Higher capital cost and energy use than fan-only aeration
- Still requires safe grain moisture; cooling cannot rescue badly wet grain
- Needs good airflow distribution through the storage structure
- Requires monitoring and operator understanding
- Economic benefit depends on crop value, climate, and storage duration

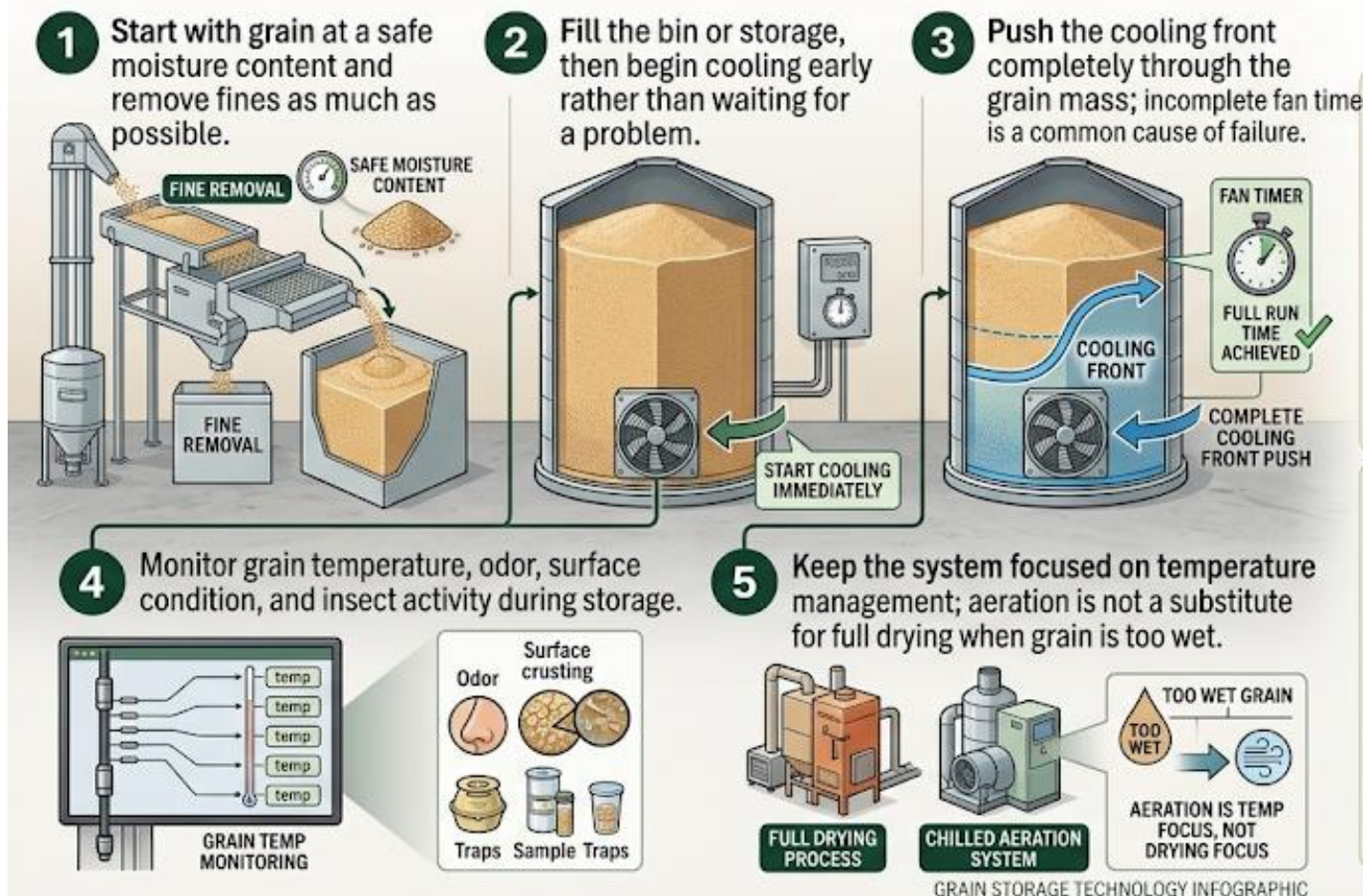


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How to Operate a Chilled Aeration System?

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Rule-of-thumb reminders

- ☒ • Aeration changes grain temperature; it is not mainly a rapid drying system.
- ☒ • Lower and more uniform temperature = lower biological risk.
- ☒ • Monitoring is part of the process, not an extra step.



Typical monitoring items



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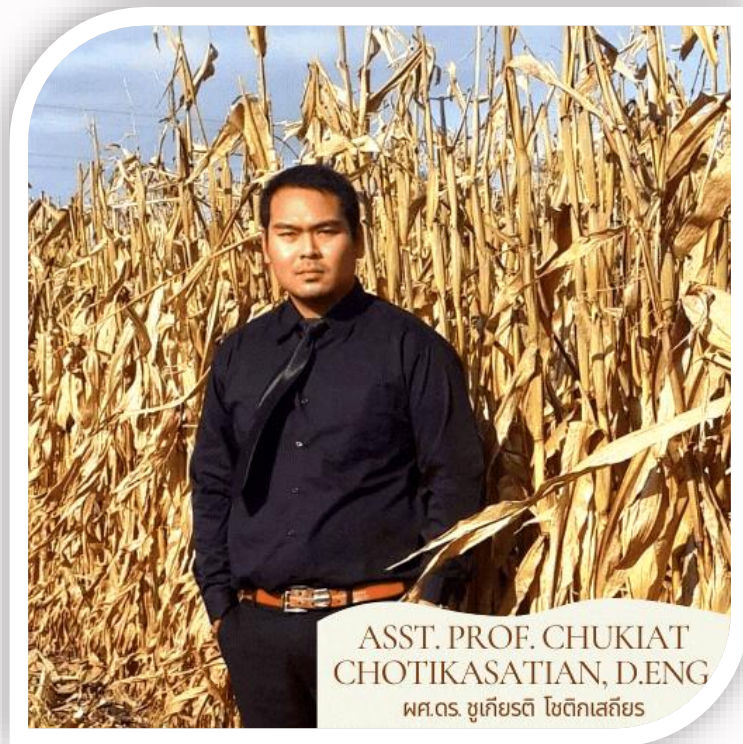
Summary

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1. Grain aeration is mainly a temperature-management tool
2. Cooling suppresses insects, molds, and moisture migration
3. Chilled aeration is useful when ambient air cannot deliver safe storage conditions
4. Good operation still depends on safe moisture, proper airflow, and monitoring





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Thank you very much for your kind attention.

Questions?

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References

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Acknowledgements

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