



# **Clean Energy Demonstration Project**

## **Biomass Boiler Project**

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Oakland University  
Clean Energy Research Center

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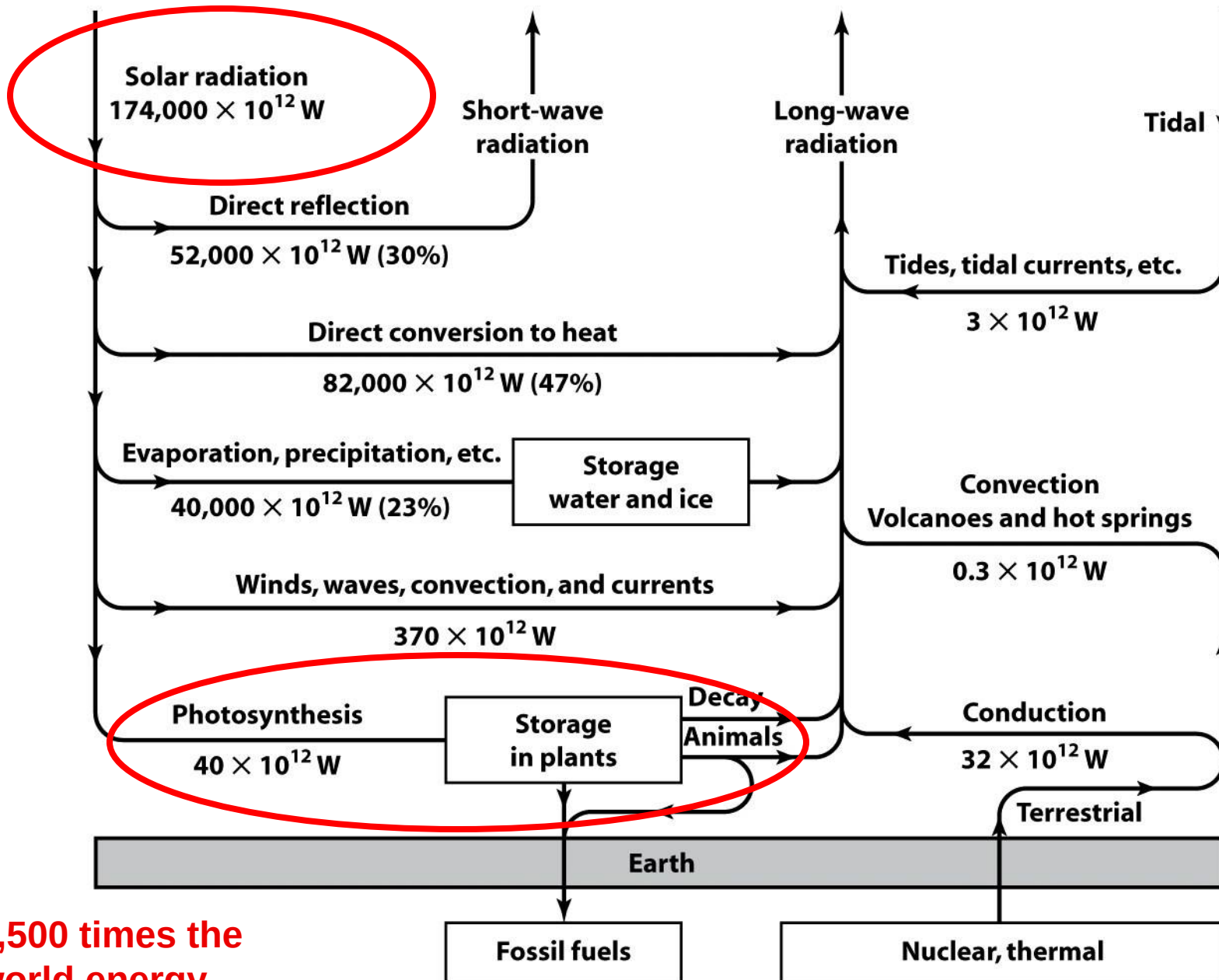
# Today's Presentation

- What is biomass energy?
- Overview of a biomass boiler system
- Examples of biomass boiler installations
- Biomass feasibility & boiler selection criteria
- Biomass boiler manufacturers
- Photos of Oakland project
- Biomass economics & the Oakland project



# What is biomass energy?

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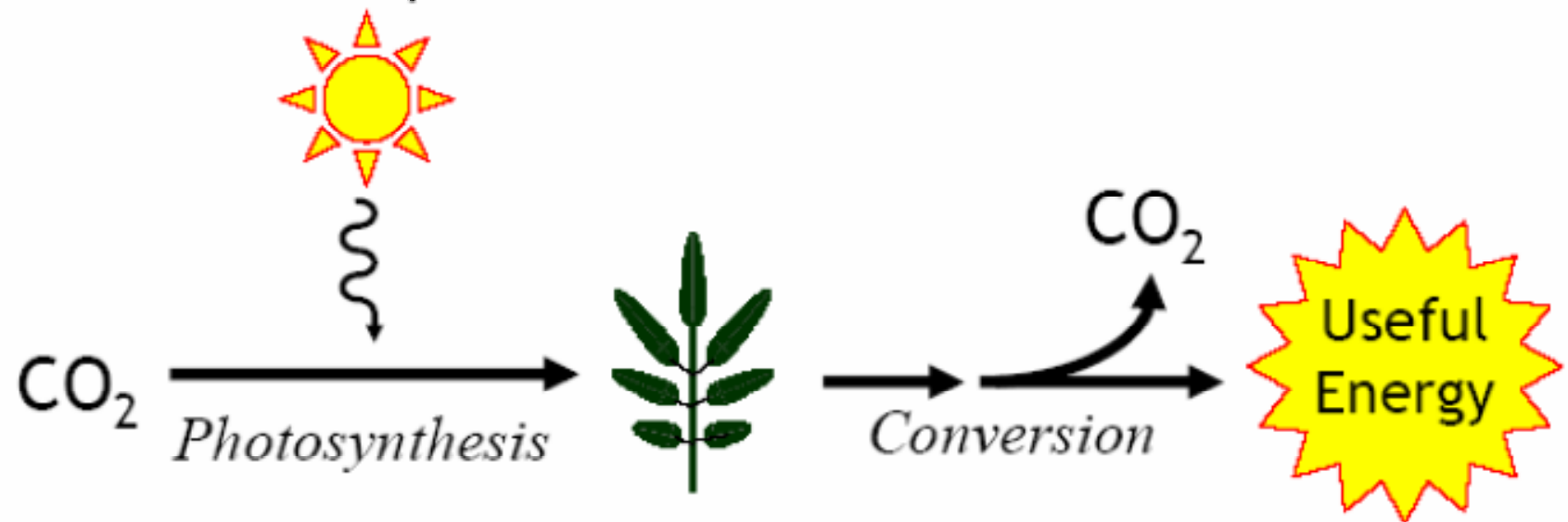


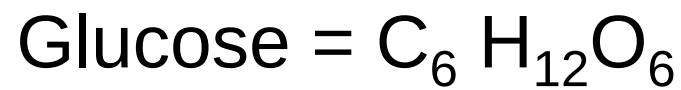
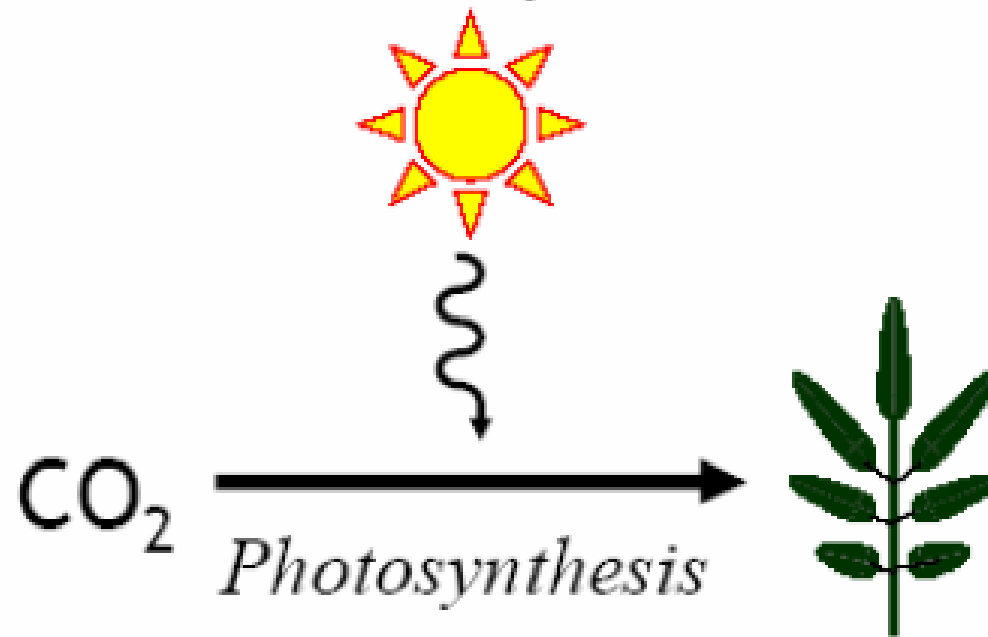
2,500 times the  
world energy  
consumption

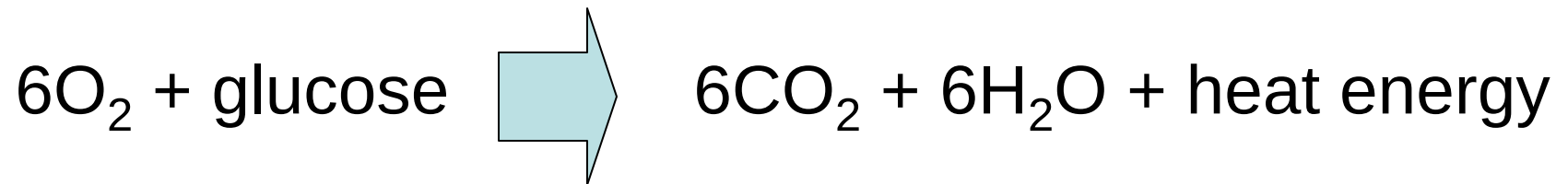
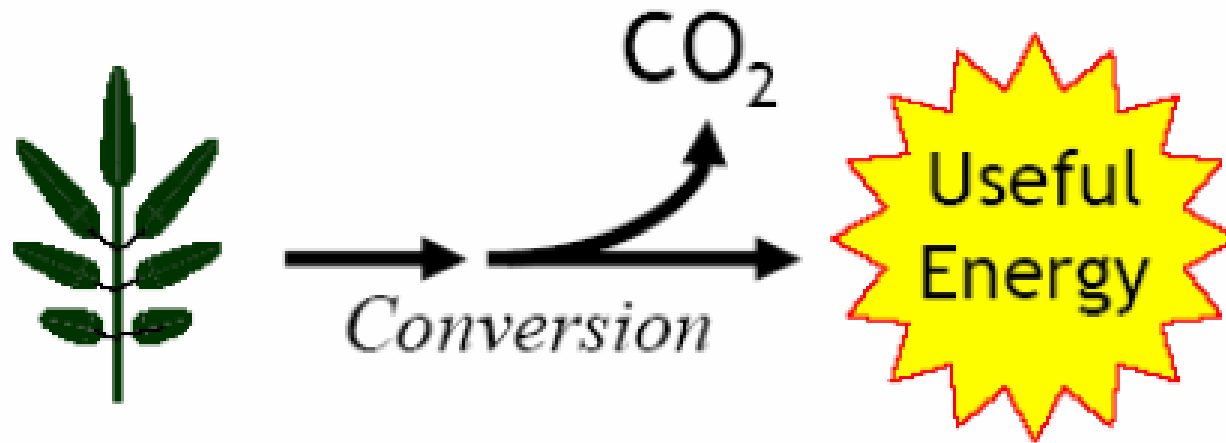
**Photosynthesis:** Nature has found a way to convert sunlight, CO<sub>2</sub>, water and nutrients into chemical energy



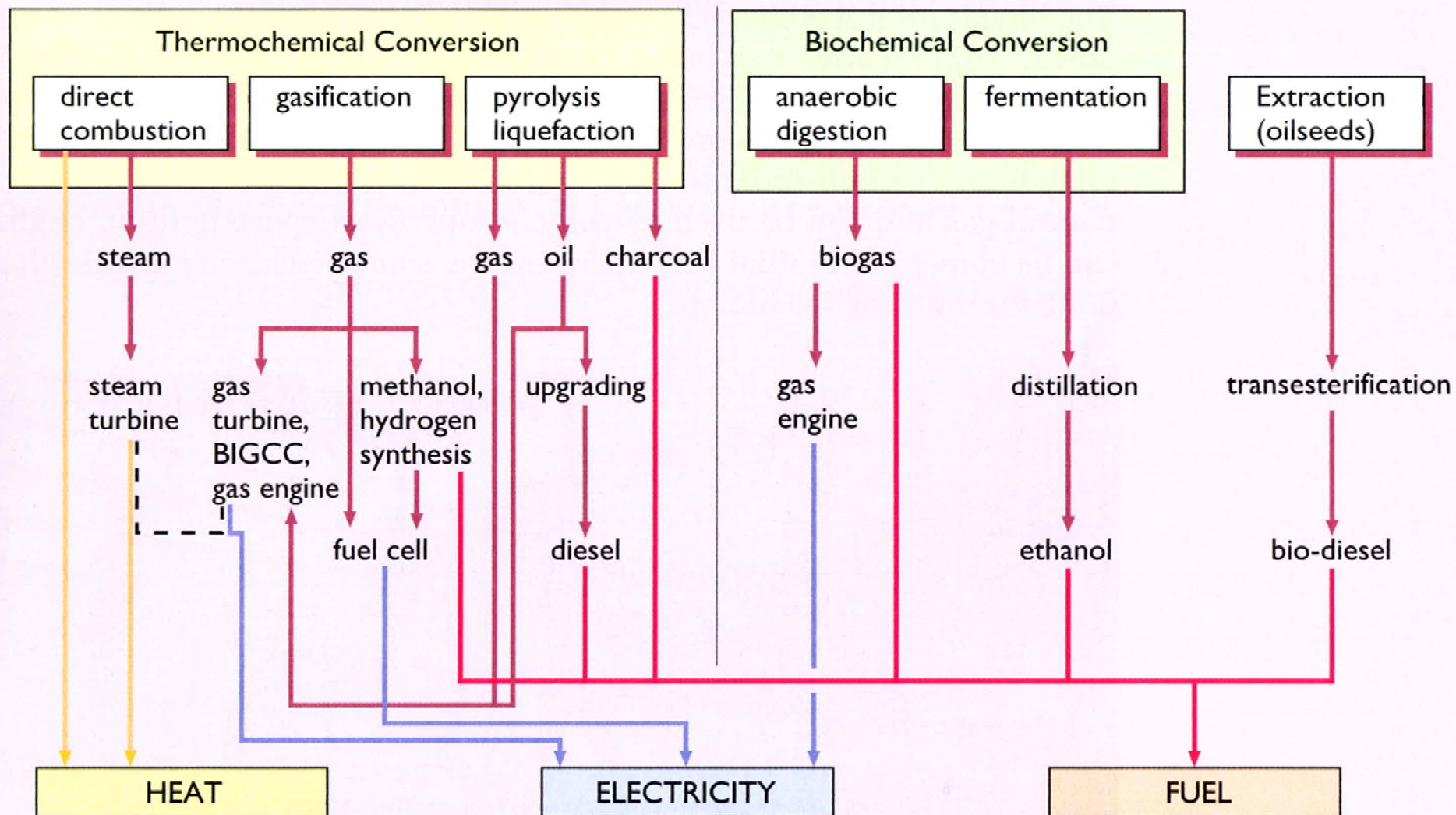
# Biomass Starts with Photosynthesis







... also called combustion, oxidation, biodegradation  
... chemical bonds in glucose are broken

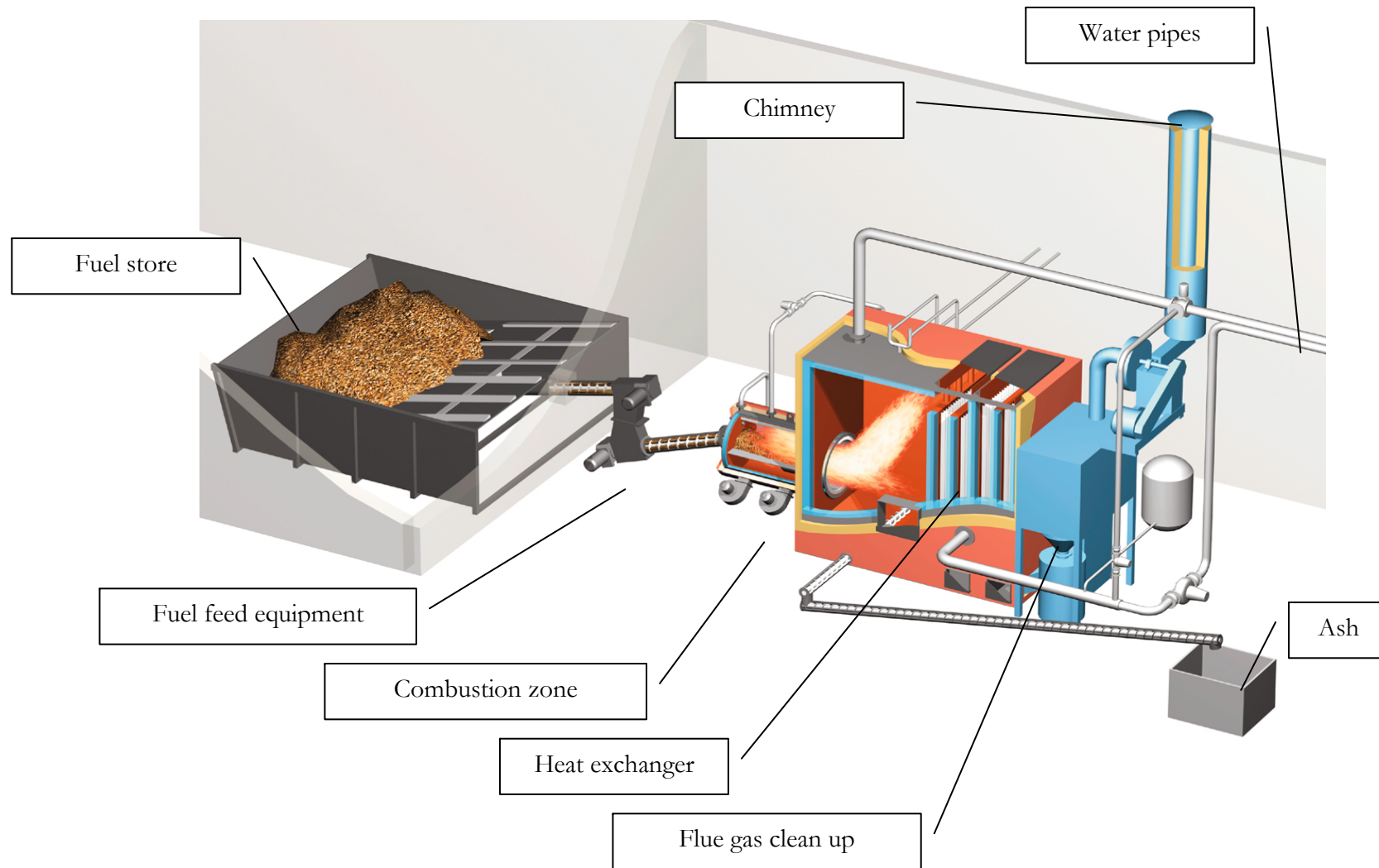




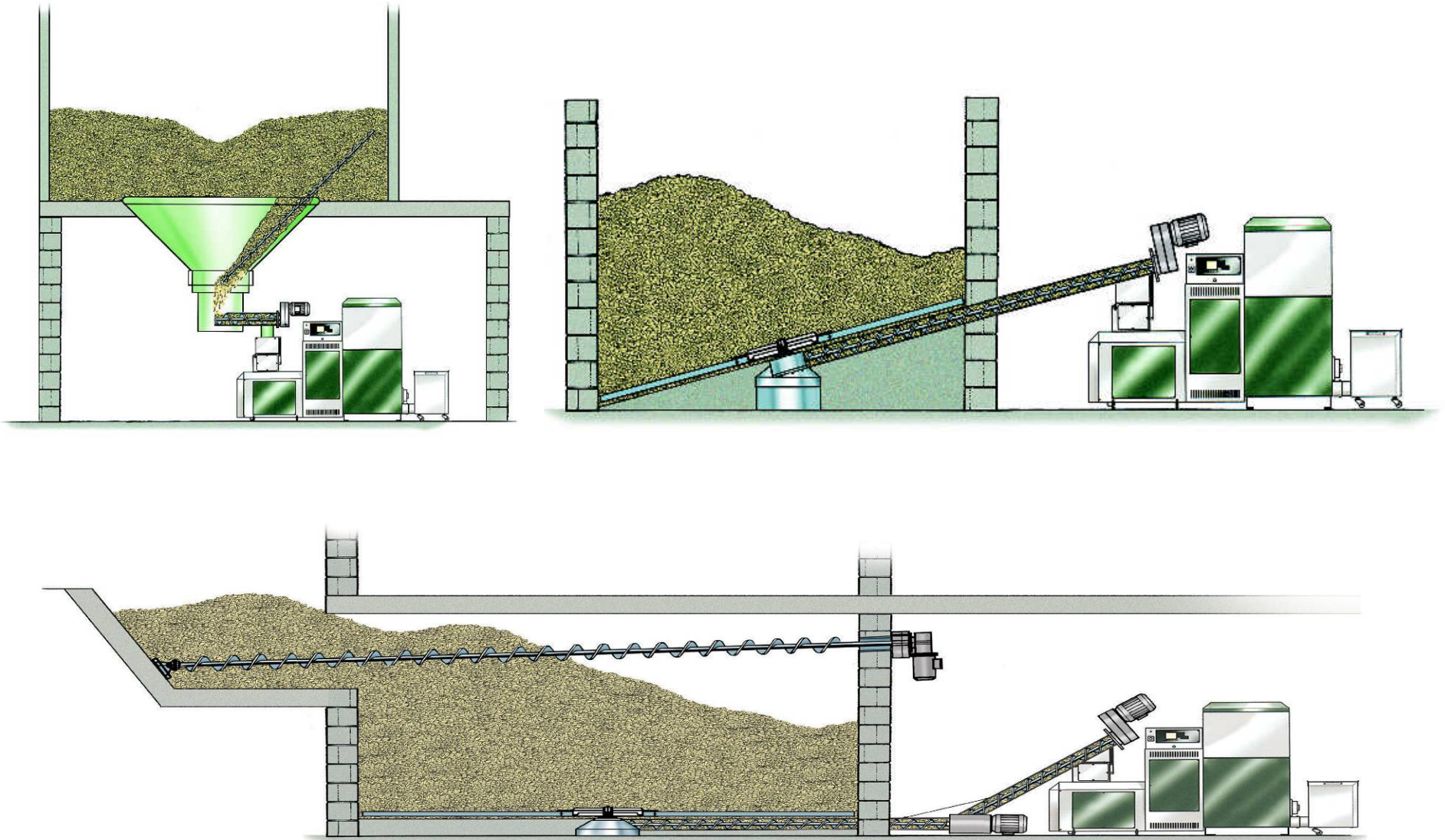
# Overview of a biomass boiler system

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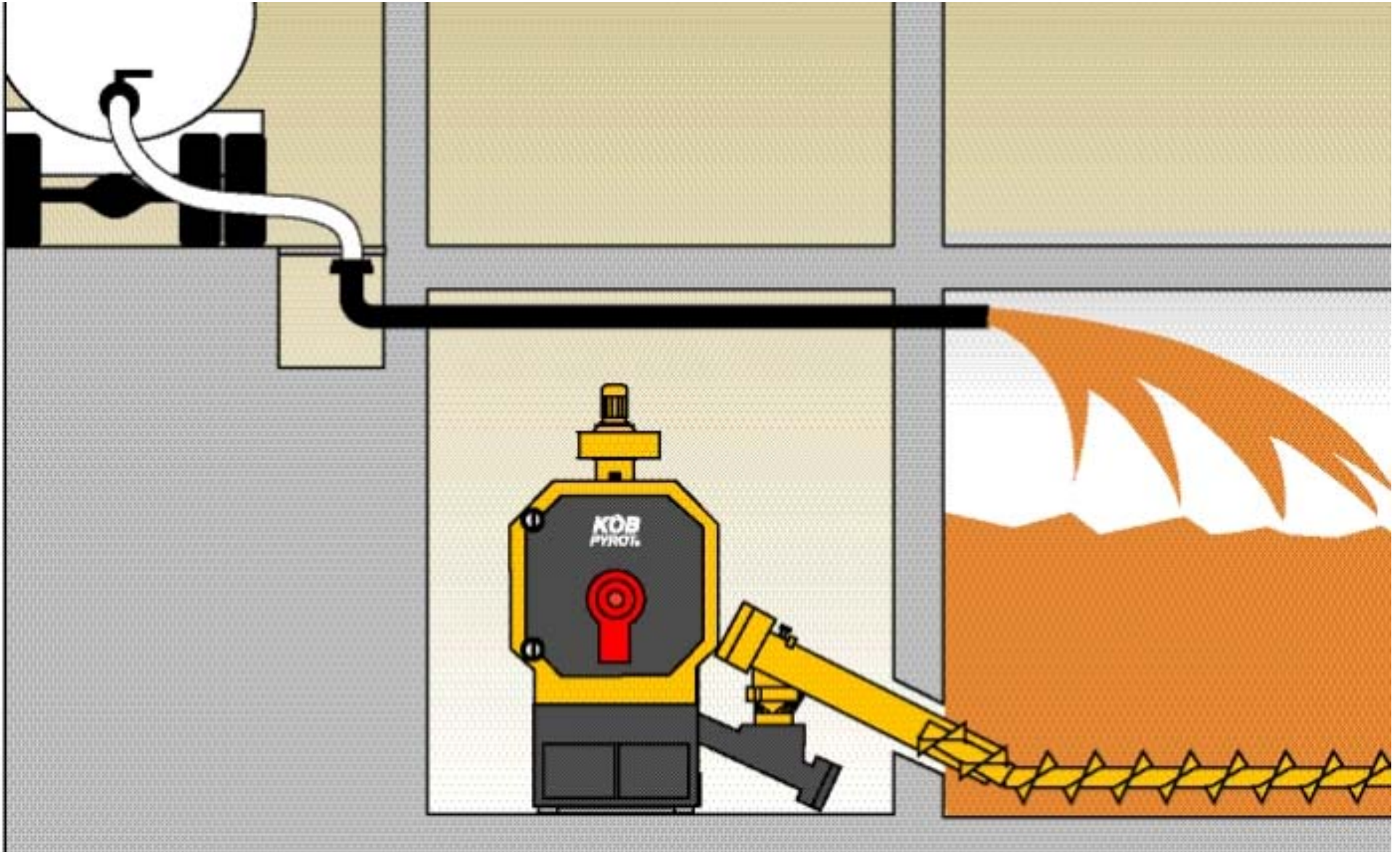
# Auto Feed - System Components



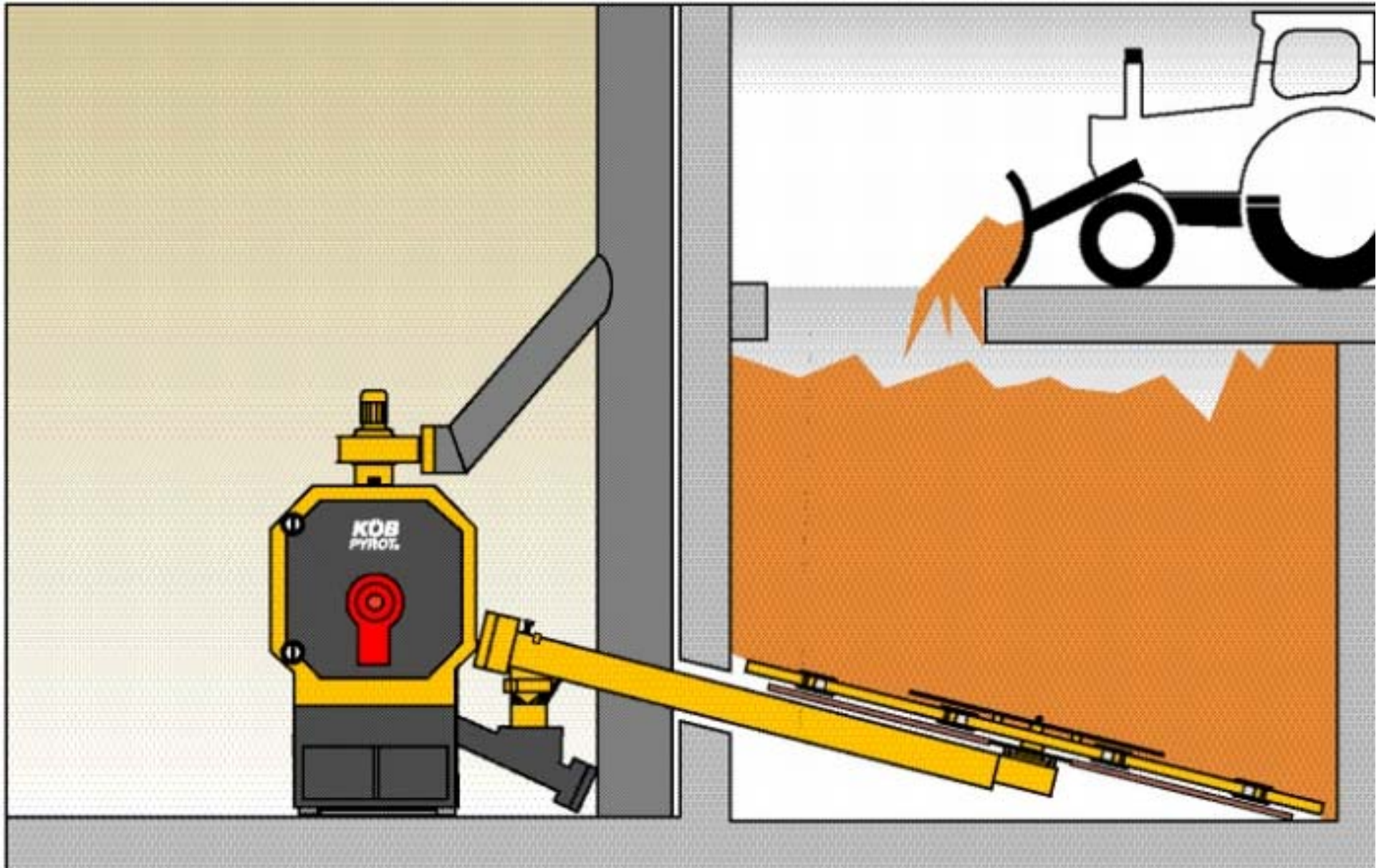
# Wood Chip Storage Options



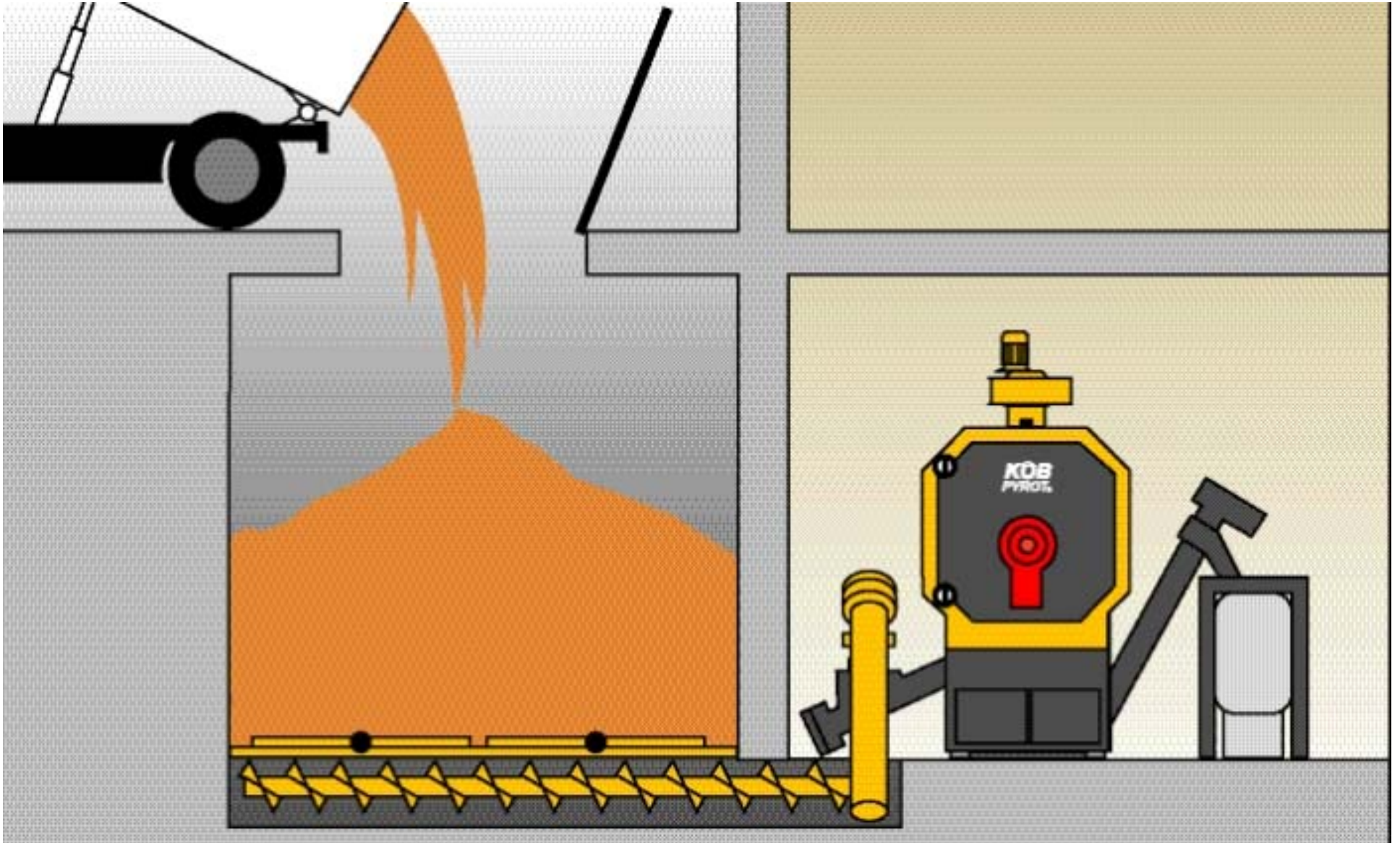
Pneumatically blowing in pellets into a room inside the building



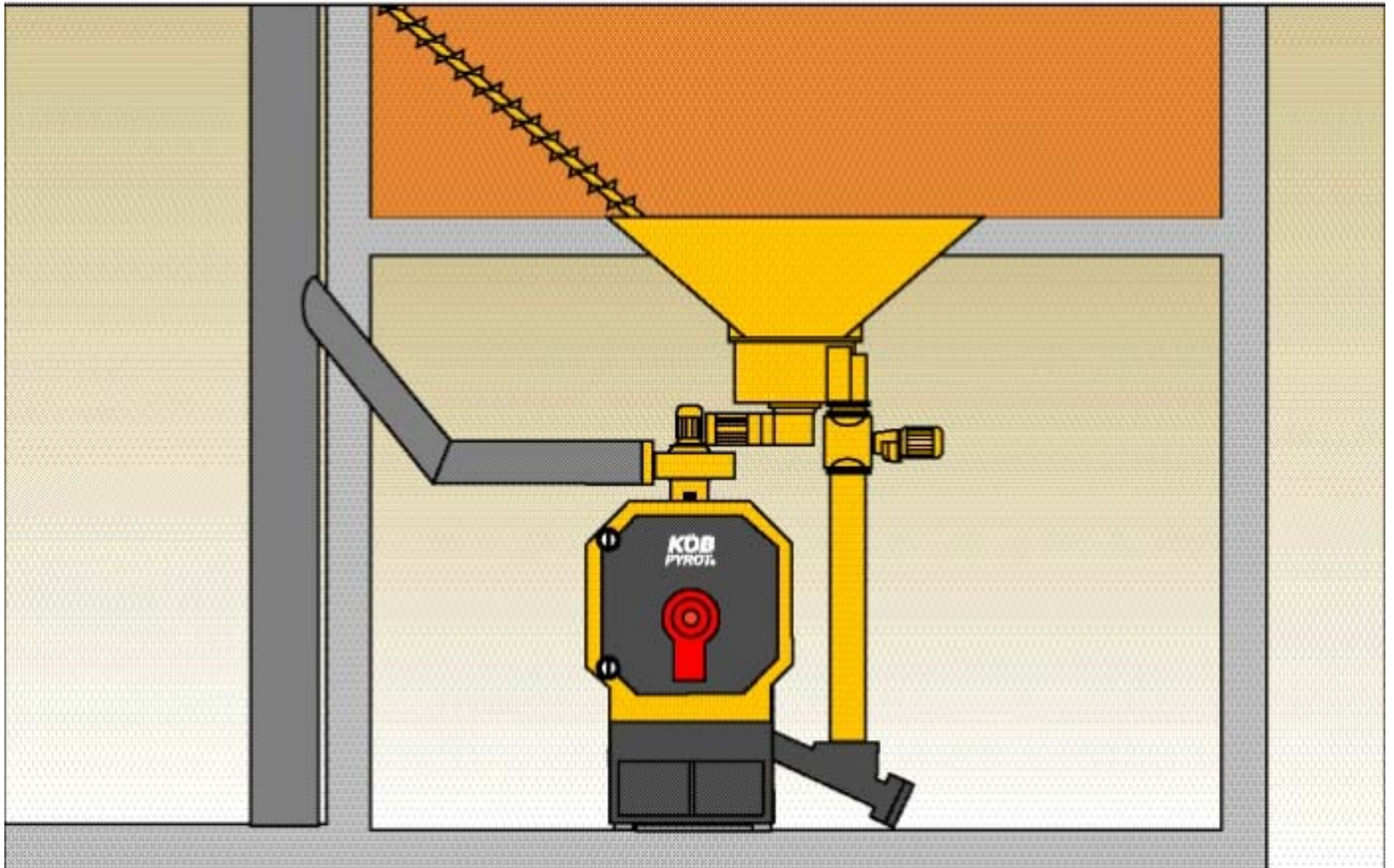
Filling small bunkers from the top



## Filling large bunkers from the top



## Silo storage above the boiler room





# Examples of biomass boiler installations

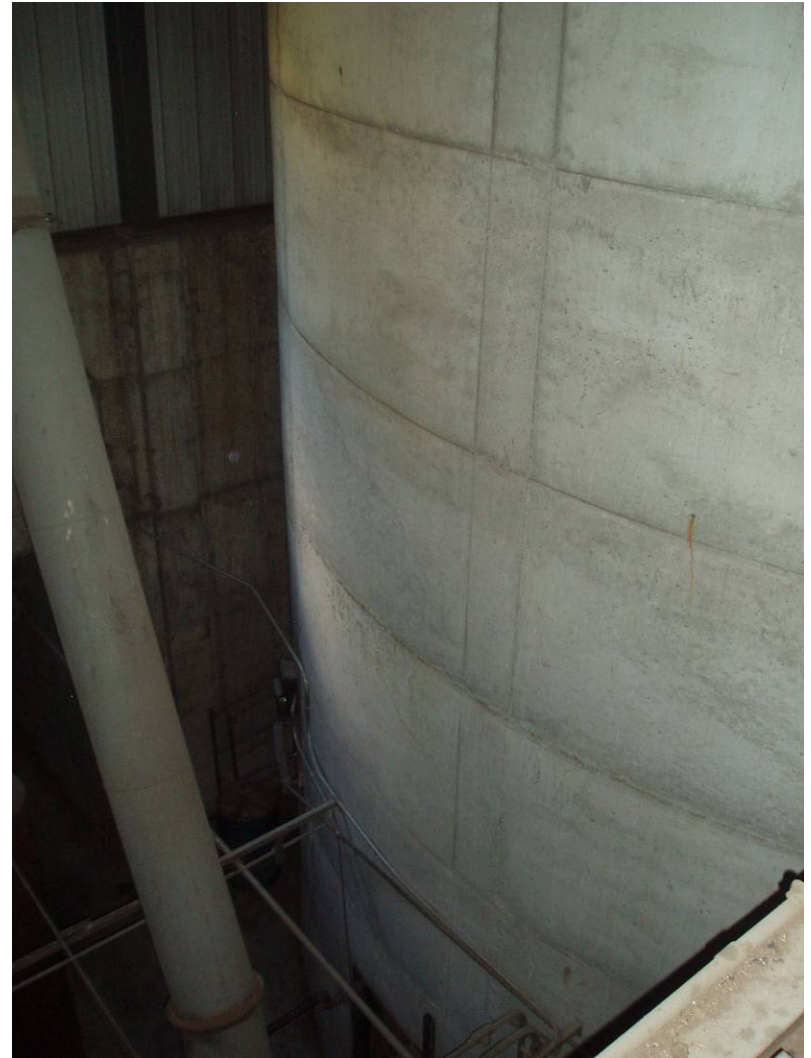
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# Central Michigan University Wood Chip Boiler Operations



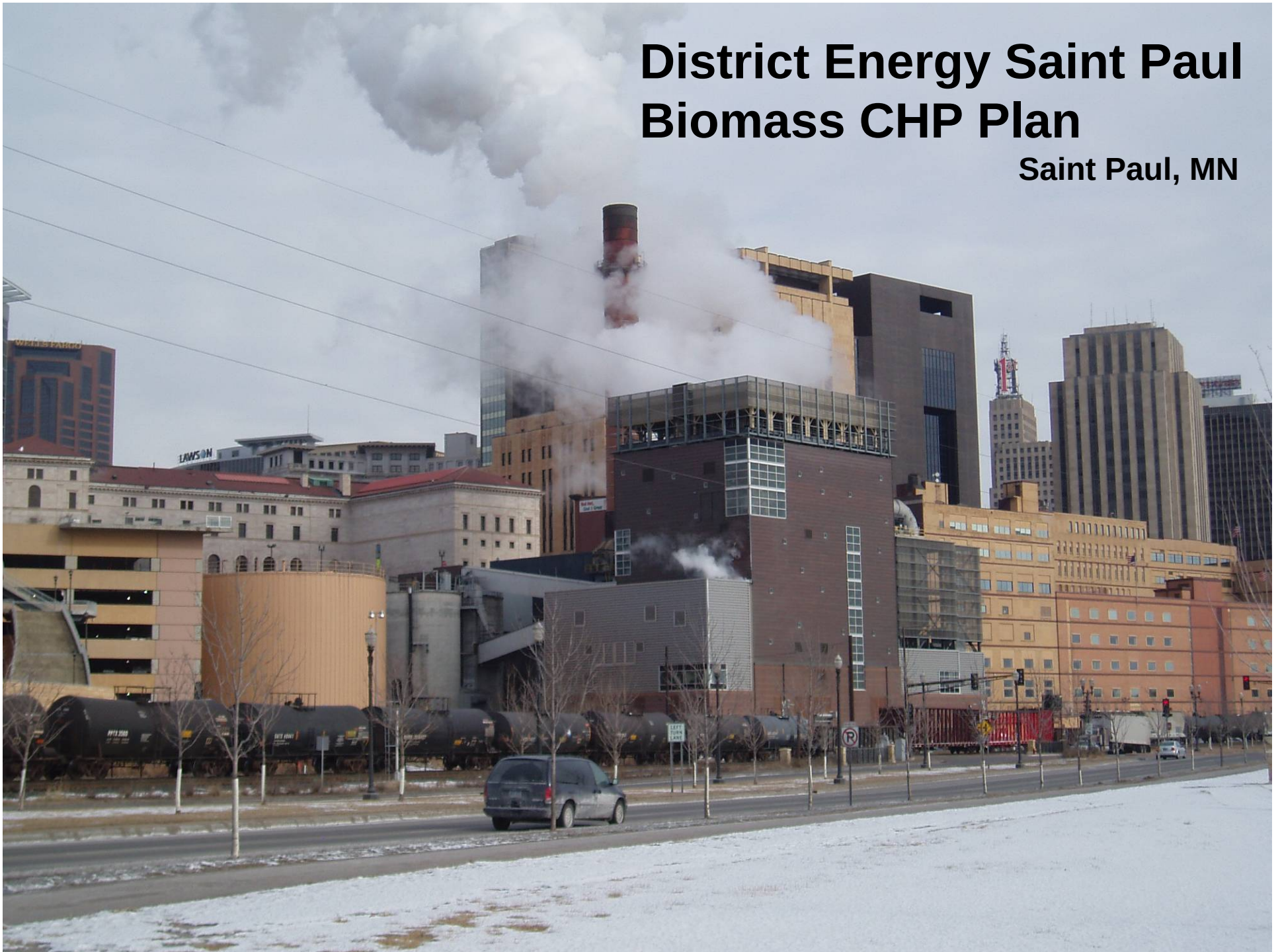






# District Energy Saint Paul Biomass CHP Plan

Saint Paul, MN





# KOB Containerized Installation





# Oakland University Wood Chip Boiler Project

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**FINK**  
MACHINE INC.



**Johnson & Wood**  
MECHANICAL CONTRACTORS

**KOB**

**VIESMANN**

**METRO**  
CONTROLS, INC.

**MATRIX**  
CONSULTING ENGINEERS, INC.



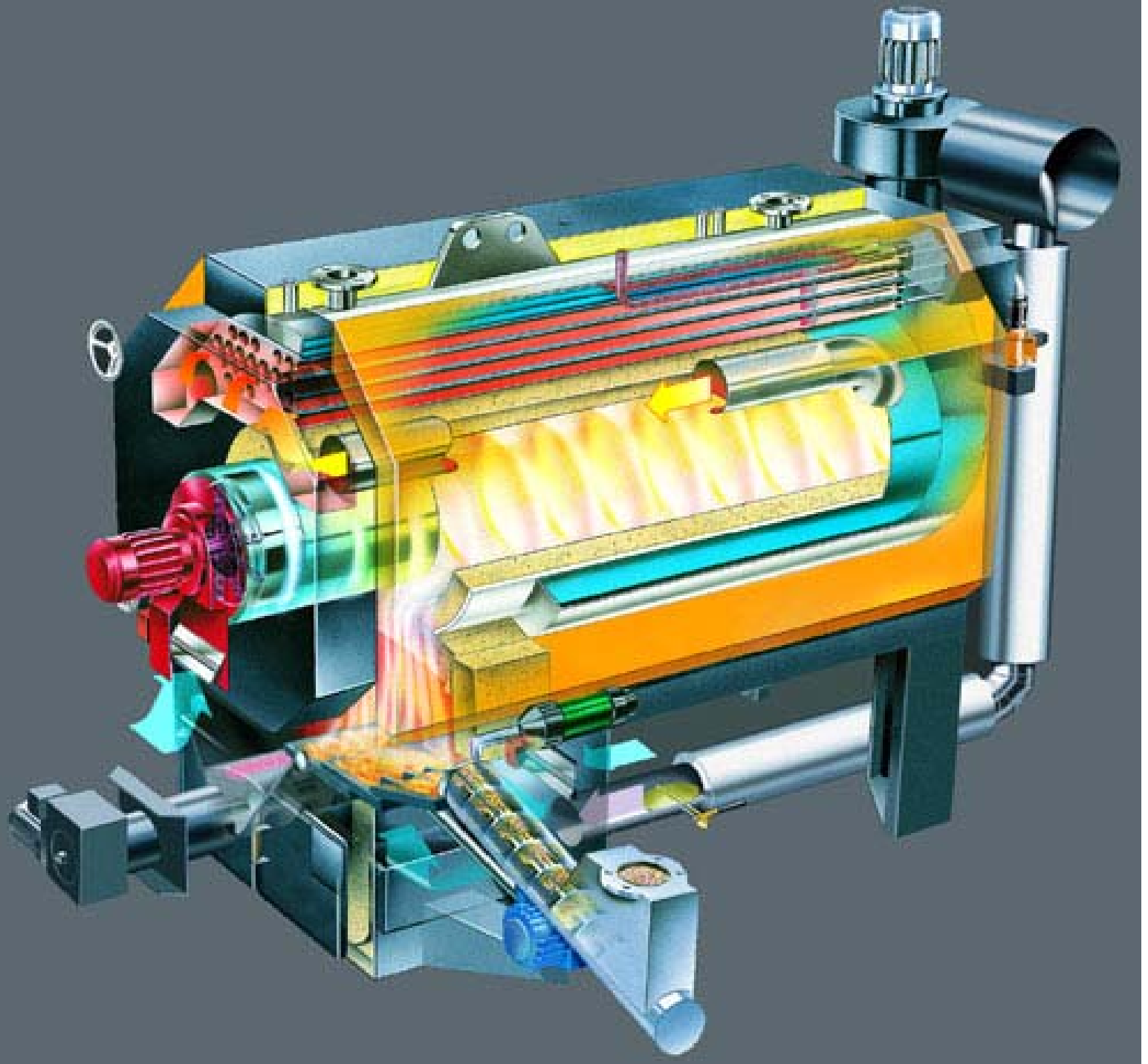
U.S. DEPARTMENT OF  
**ENERGY**



- Phase 1
  - High tech wood chip boiler
  - Steam elimination (convert to HW)
  - DDC controls
  - Lighting upgrades
- Phase 2
  - Cooling tower replacement (or geothermal)
  - Small solar thermal installation
    - Five solar tube collectors, same construction of HHB project but at ground level for the public to view.

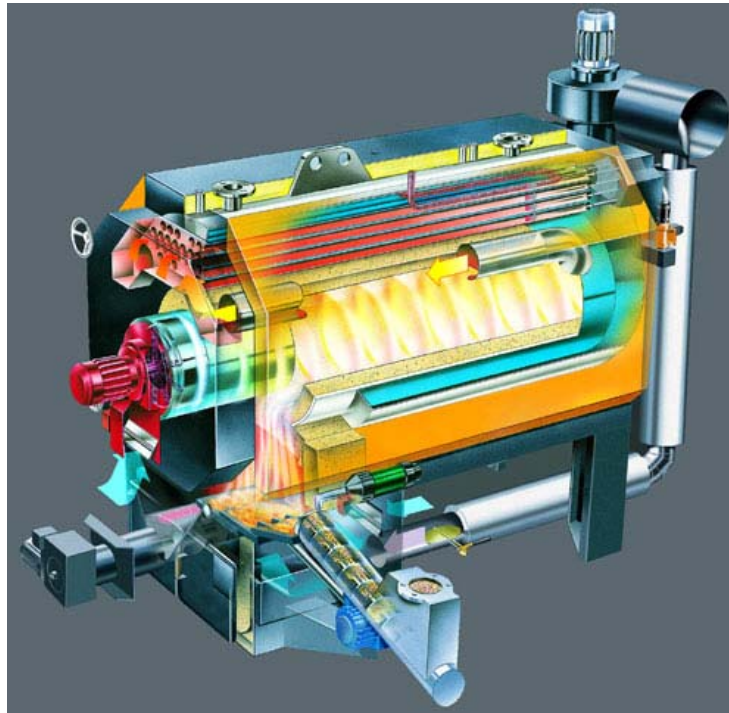


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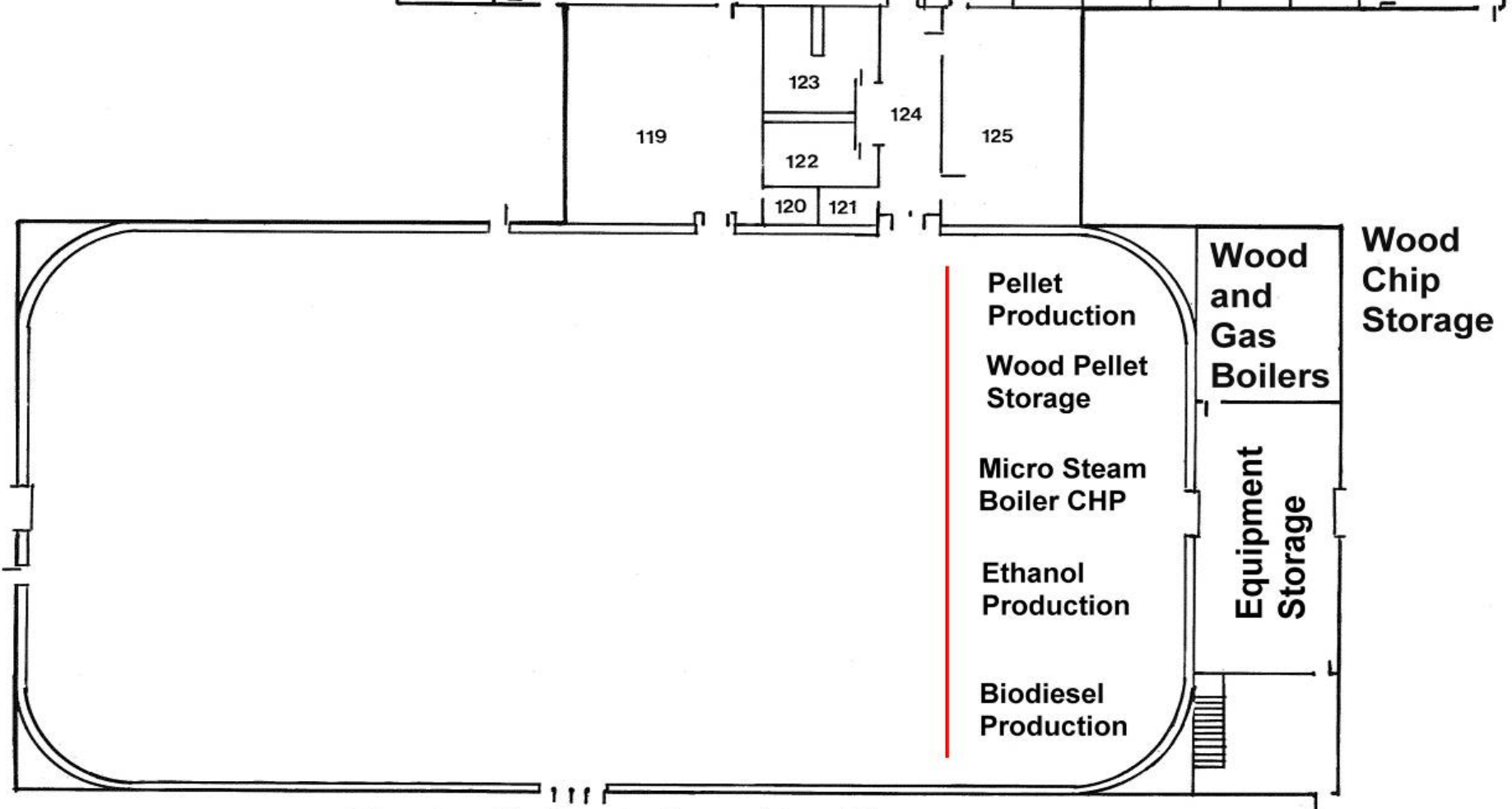
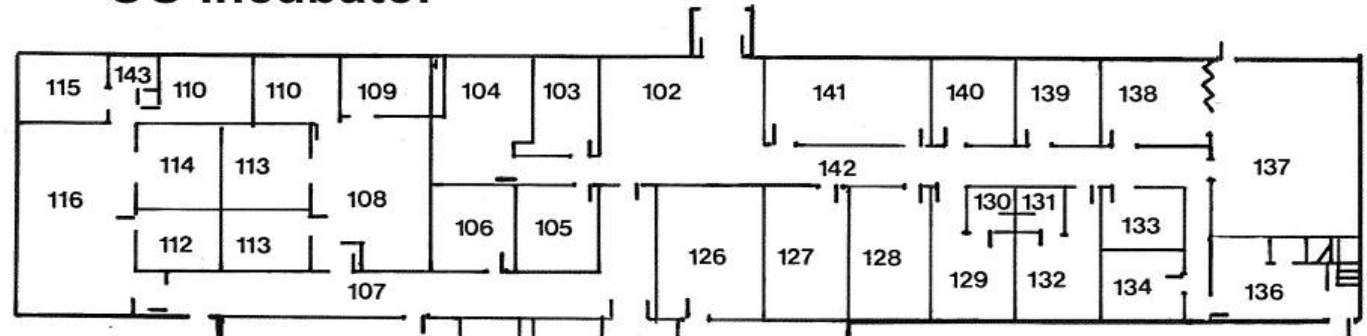




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## OU Incubator



## Shotwell-Gustafson Pavilion



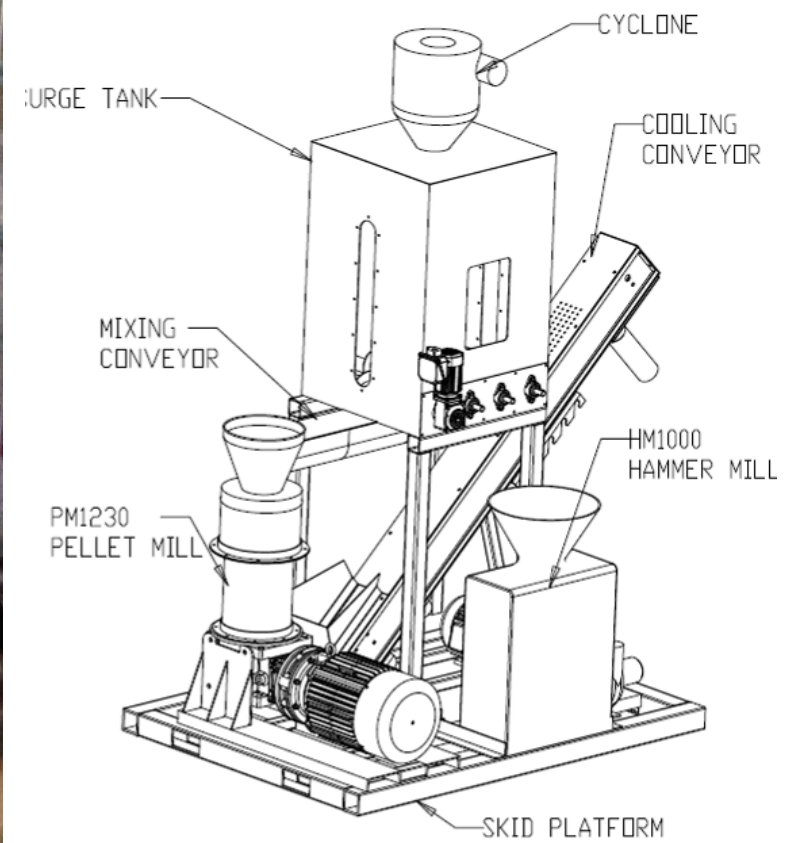
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## 30 HP Pellet Mill



# Pellet Mill





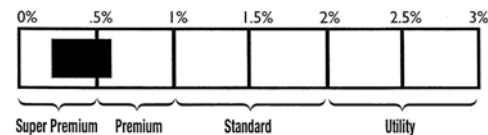
# Densification Testing and Demonstration

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## Proposed Ash Rating Scale Version 1

### ASH CONTENT SCALE



To learn more about this Ash Content Scale as well as other information on pellet heating, please visit [www.pelletheat.org](http://www.pelletheat.org)



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## Other Equipment





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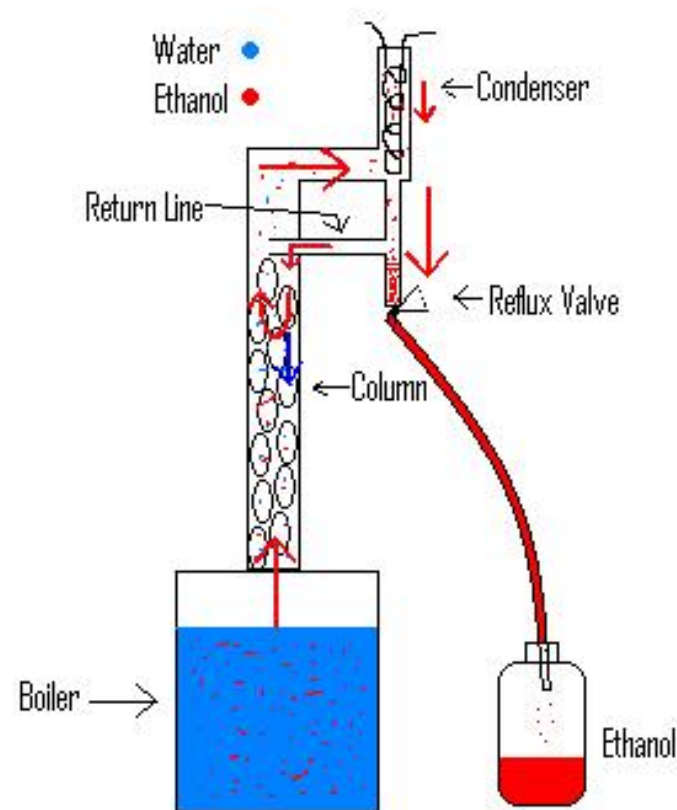


# Biodiesel Demonstration



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# Fuel Ethanol Demonstration

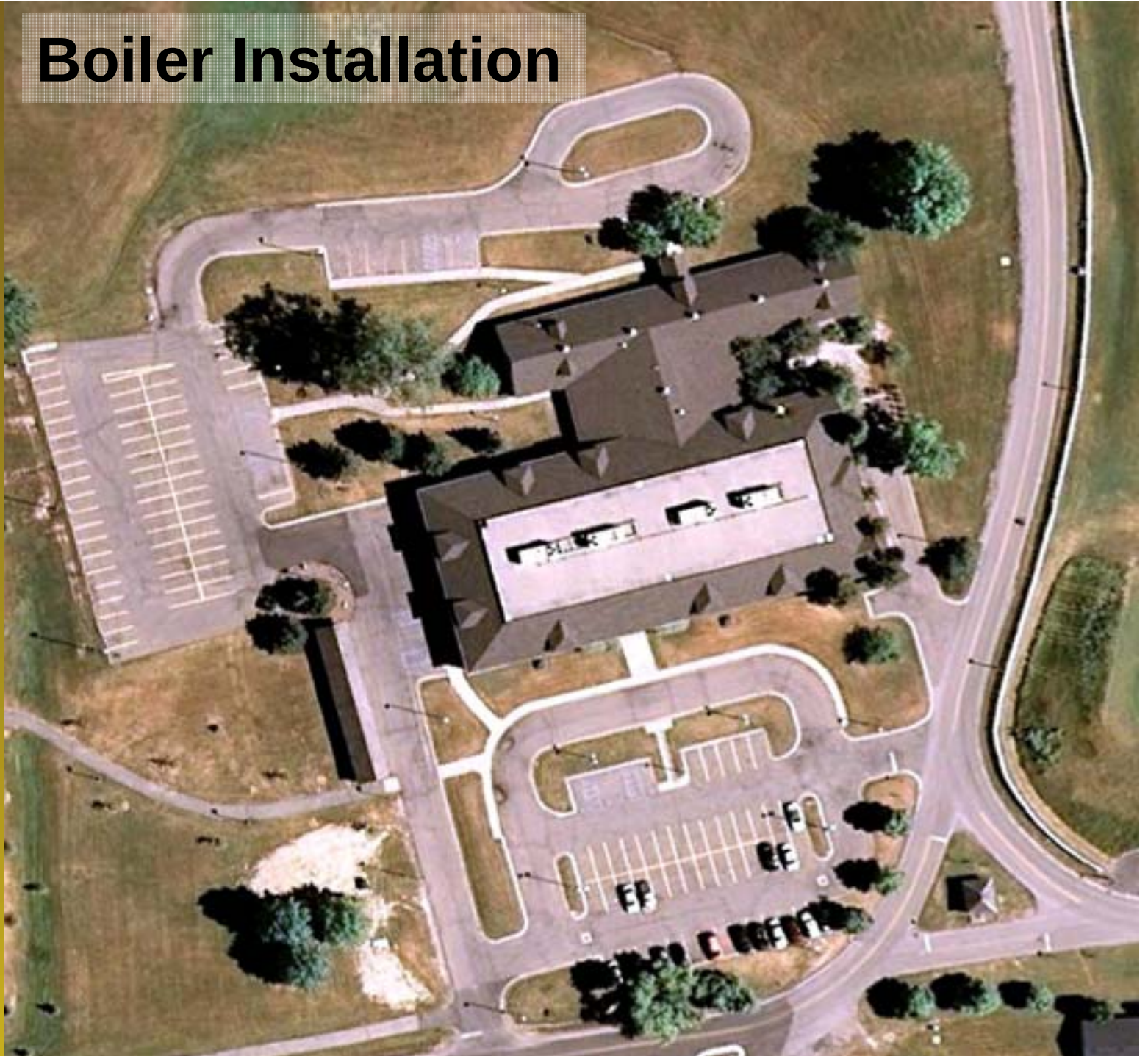


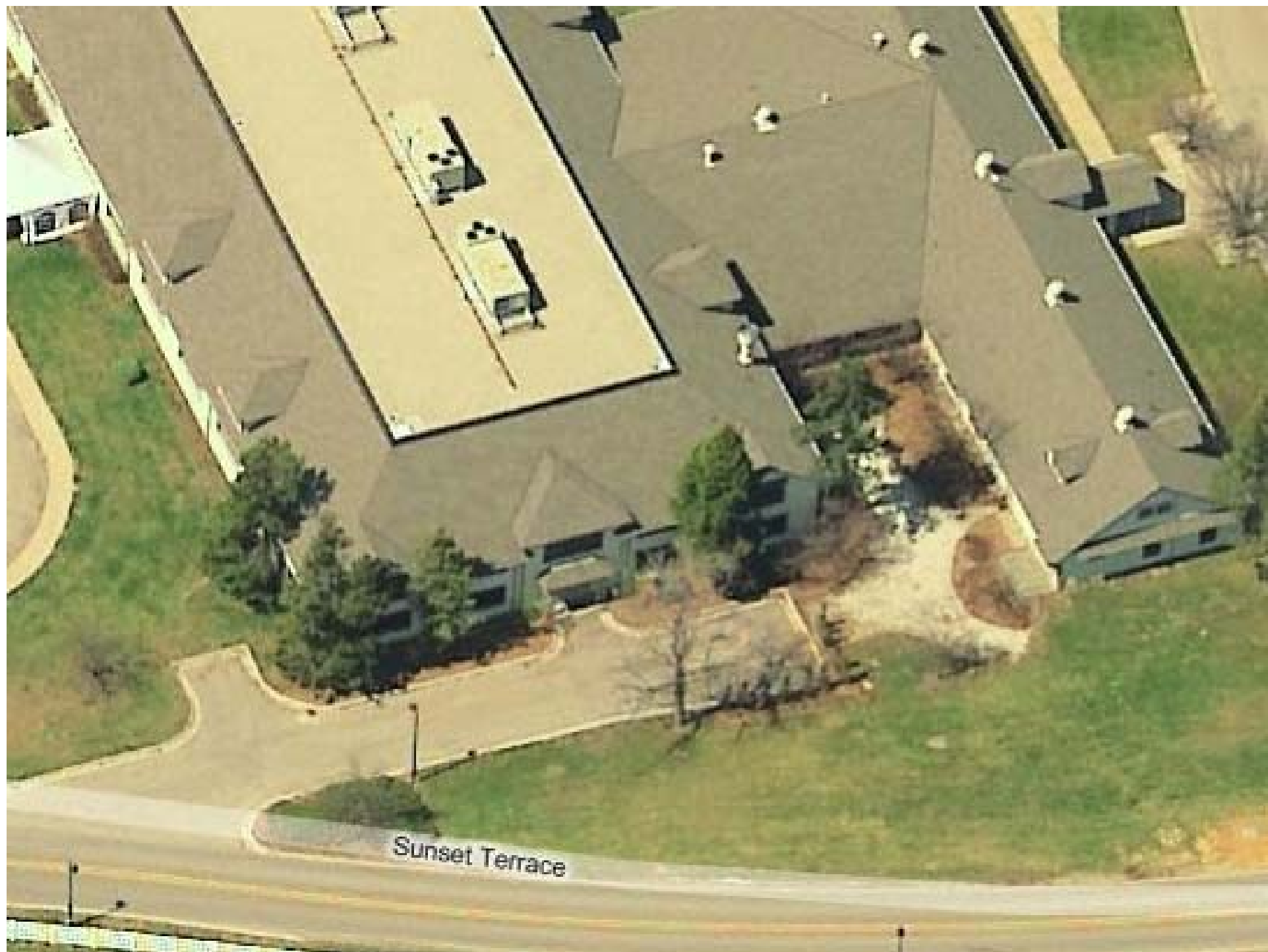




# Boiler Installation

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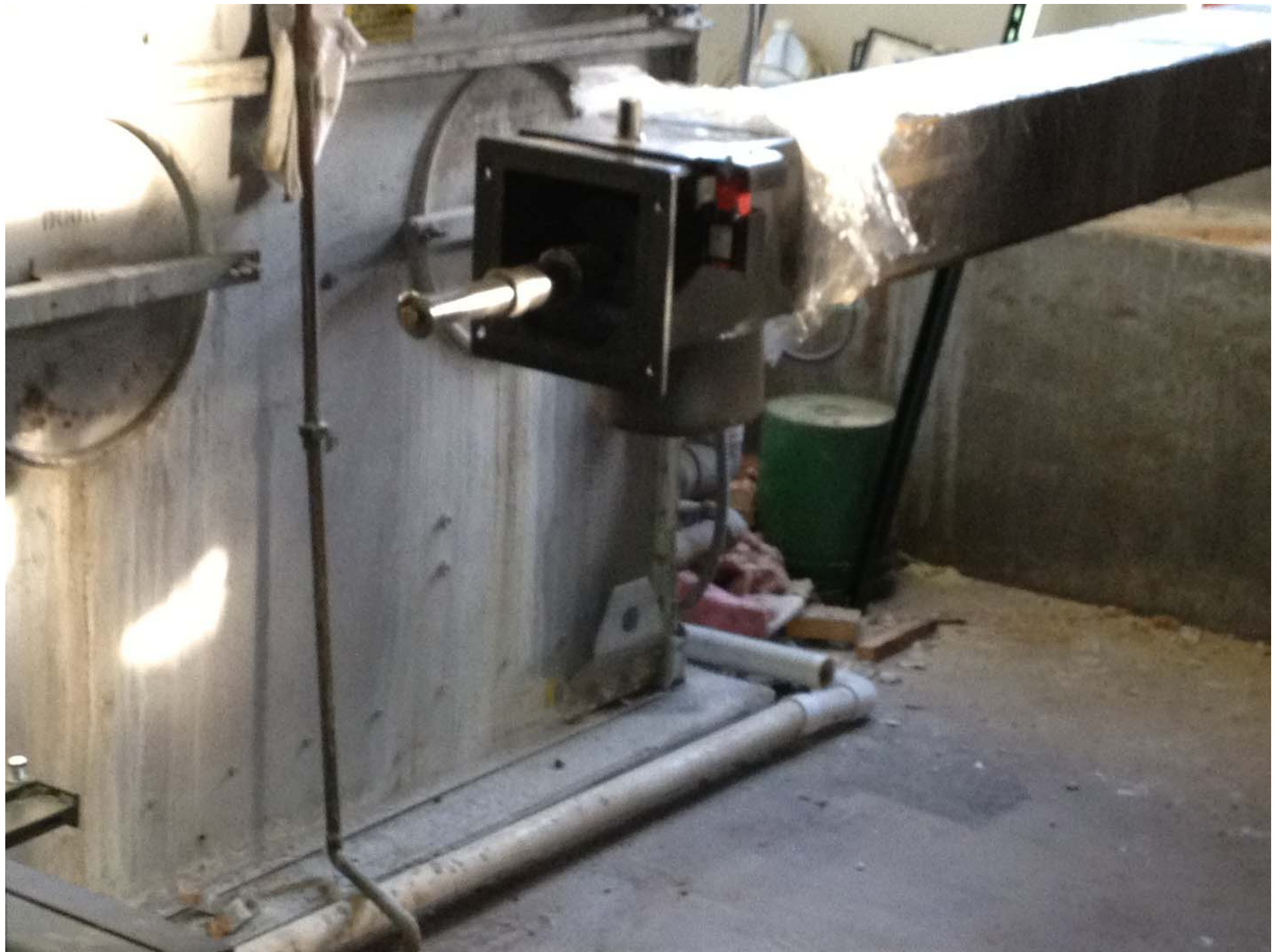






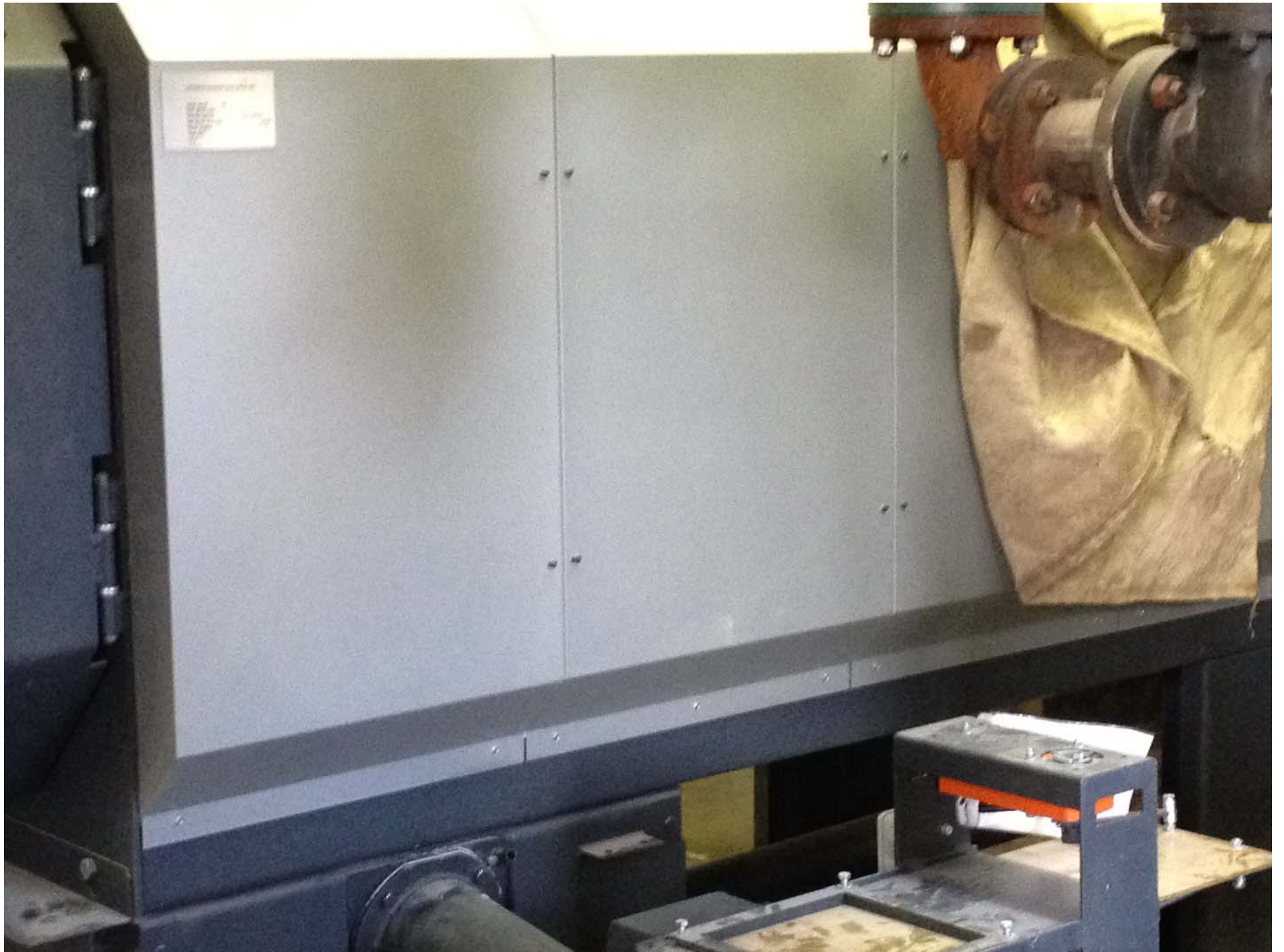
































[Click for 2 min Video](#)

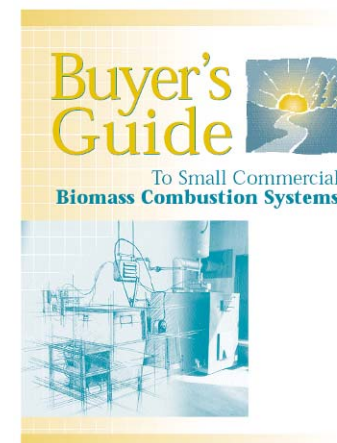


## *For More Information*



[www.biomasscenter.org](http://www.biomasscenter.org)

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<http://publications.gc.ca/collections/Collection/M92-186-2000E.pdf>



<http://michiganwoodenergy.org>