



nexterra

a new era of energy security

Gasification fuels new era of energy for the forest industry

IEA Bioenergy Workshop

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Nexterra Energy
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Nexterra - A Brief Introduction



- Develop & supply turnkey gasifier solutions for inside-the fence industrial and institutional customers
- Simple, low cost and versatile gasification technology
- Retrofit boilers, lime kilns, dry kilns & dryers from natural gas to syngas
- Syngas is a clean burning substitute for natural gas or fuel oil
- Targeting multi-billion dollar natural gas displacement market forest products, institutions, oil & gas
- Customers & partners include:



Weyerhaeuser
The future is growing™

Nexterra Ownership/Financing



- Majority owned & financed by Calgary-based ARC Financial – ARC has invested \$10 MM in 2 rounds of equity financing
- ARC is Canada's largest financial management firm focused on energy with over \$1 Billion invested in energy companies
- We are well financed, with a strong balance sheet and working capital position
- Nexterra's product development program supported by over \$7.0 MM in soft funding from STDC, National Research Council, Natural Resources Canada, TREAM - Technology Early Action Measures and Ethanol BC



Natural Resources
Canada

Canada



The Energy Challenge

**NA forest industry
spends \$ 9 B/ yr
on fossil fuels**

**A typical pulp/paper
mill spends
\$10 – 30 M/yr on
natural gas**

*World Bank; compiled
by ACC*



**Solid wood
manufacturing cost
now 10 – 20%
natural gas**

Updated: September 8, 2005

COALITION OF INDUSTRIAL ENERGY CONSUMERS

4

**In North America gas costs threatening
forest industry competitiveness**

The Big Driver - A New Era of Industrial Fuel Insecurity



North America's forest products industry spends approx. \$9 B/yr in natural gas and fuel oil

<u>Mill type</u>	<u>\$/unit production</u>	<u>% of production cost</u>
Pulp mills	\$20 – \$40 / tonne	5 – 15%
Paper mills	\$40 – \$60 / tonne	10 – 20%
Sawmills	\$10 – \$14 / mfbm	10 – 15%
Plywood	\$15 – \$30 / msf	15 – 25%

Reducing energy costs is viewed industry-wide as imperative for mills to remain competitive

- | | |
|----------------------------|---------------------------------|
| 1. Power Boilers: | Direct or co-firing with syngas |
| 2. Package Boilers: | Direct-firing with syngas |
| 3. Lime Kilns: | Direct or co-firing with syngas |
| 4. Veneer Dyers: | Direct or indirect heating |
| 5. Dry Kilns: | Direct or indirect heating |
| 6. Cogeneration: | up to 5 MW electricity |

A suite of unique, highly competitive applications to provide customers with corporate-wide energy solutions

Application Roadmap Wood Fuels



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Customer Value Standardization

4. Syngas Plant (distributed syngas)

- Output: Cleaned, cooled distributed syngas
- Apps: Distribute syngas to multiple end users

3. Syngas Plant (cleaned syngas)

- Output: Partially cleaned, pressurized syngas
- Apps: Direct-fire syngas in lime kiln/boilers/dryers

2. Syngas Plant (unprocessed syngas)

- Output: Raw, unprocessed, pressurized syngas
- Apps: Direct-fire syngas in large single users – lime kilns/boilers/dryers

1. Indirect-Fired Heating Plant

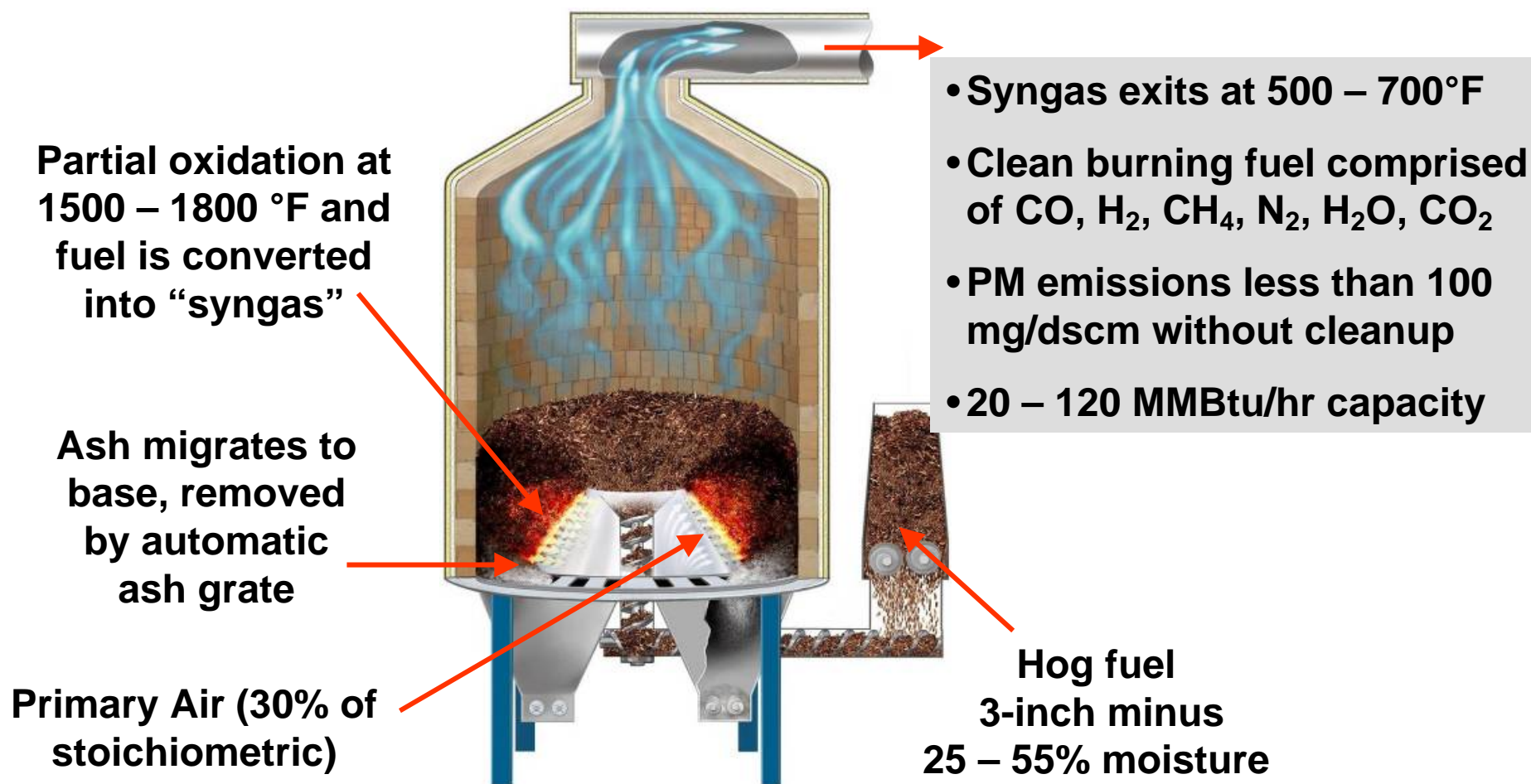
- Output: Process heat, hot air, steam, hot water, thermal oil
- Apps: Plywood/veneer dryers, sawmills, institutional boilers and cogen

Nexterra's Fixed Bed Updraft Gasification Technology



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Nexterra Test Plant



- Commissioned in Feb '04
- Located Kamloops, BC
- Capacity 8 MMBtu/hr net useable heat
- Site used for fuel testing and application development
- Fuel testing on unprocessed hog fuel from local mills
- Emissions consistently measured at <50 mg/dscm
- Rigorously monitored by Province of BC (MWALP)



Technology Advantages

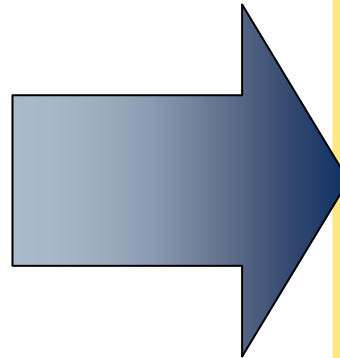


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Features

- Design Simplicity
- Advanced control system
- Fuel Flexibility (up to 55% moisture)
- High Turn Down Ratio (5:1)
- Free Flowing Ash
- Clean, Low Temperature Syngas



Benefits

- Application Versatility
- Low Capital, O&M Cost
- Low Particulate & NOx Emissions
- Easy Automated Operation

Gasification System at Tolko Heffley Plywood Plant



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Gasification System at Tolko Heffley Plywood Plant



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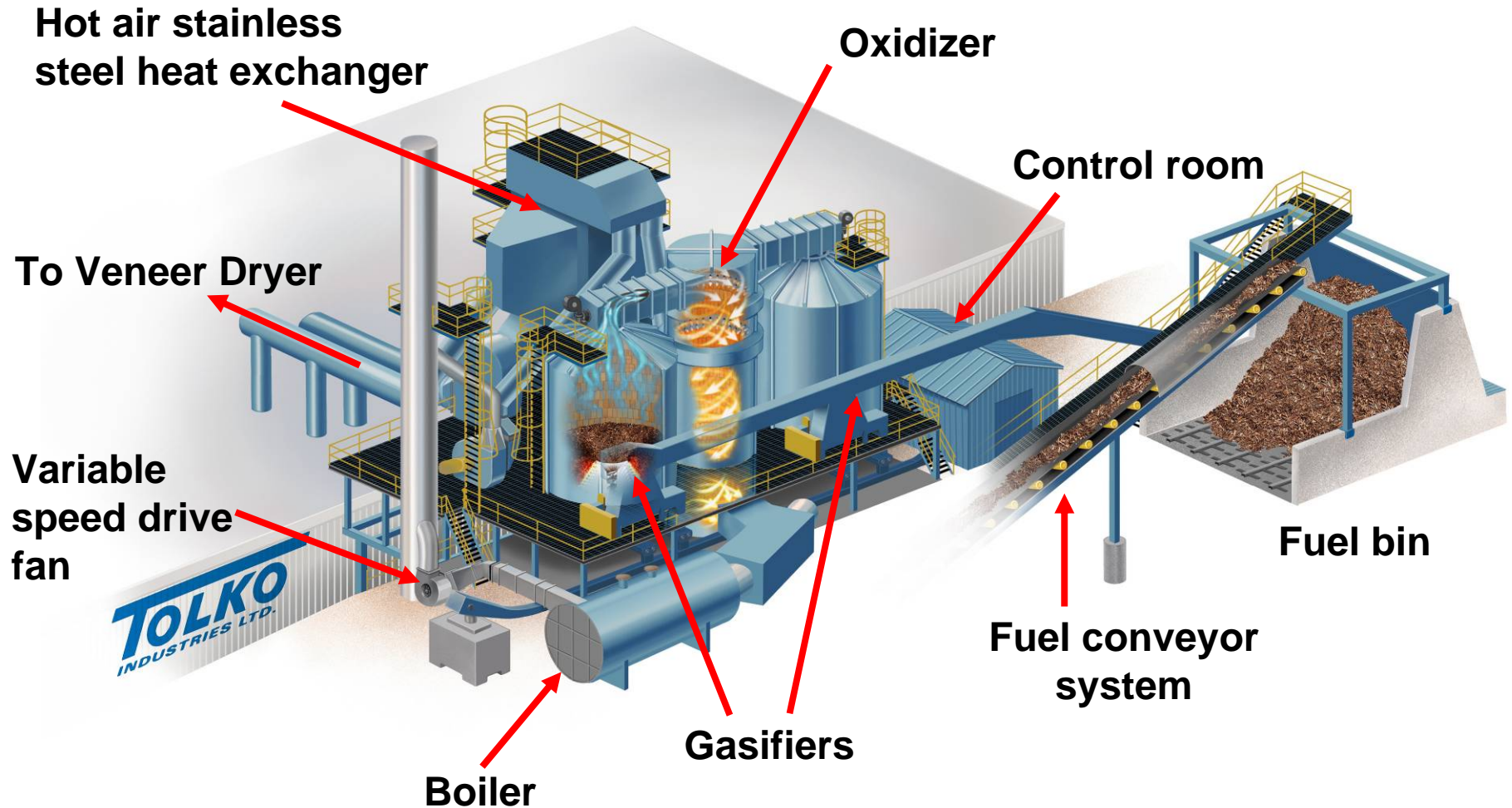


Tolko Gasification System



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Tolko Gasification Project

Project Economics



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NG Displacement Capacity Utilization Factor	40 GJ/hr 70 %
Annual Gas Displacement	235,000 GJ/yr
Hog Fuel Requirement	14,000 BDMT/yr
Net Operating Cost (\$5/tonne)	\$ 354,000/yr
Net Annual Savings (NG @ \$10/GJ)	\$ 2,051,000/yr
Simple Payback	<3 years
Greenhouse gas reduction	12,000 tonnes per year
Reduce VOC & particulate emissions	<115mg/dscm

Johnson Controls/University of South Carolina Cogen System



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BIOMASS FACILITY
UNIVERSITY OF SOUTH CAROLINA
View East Far



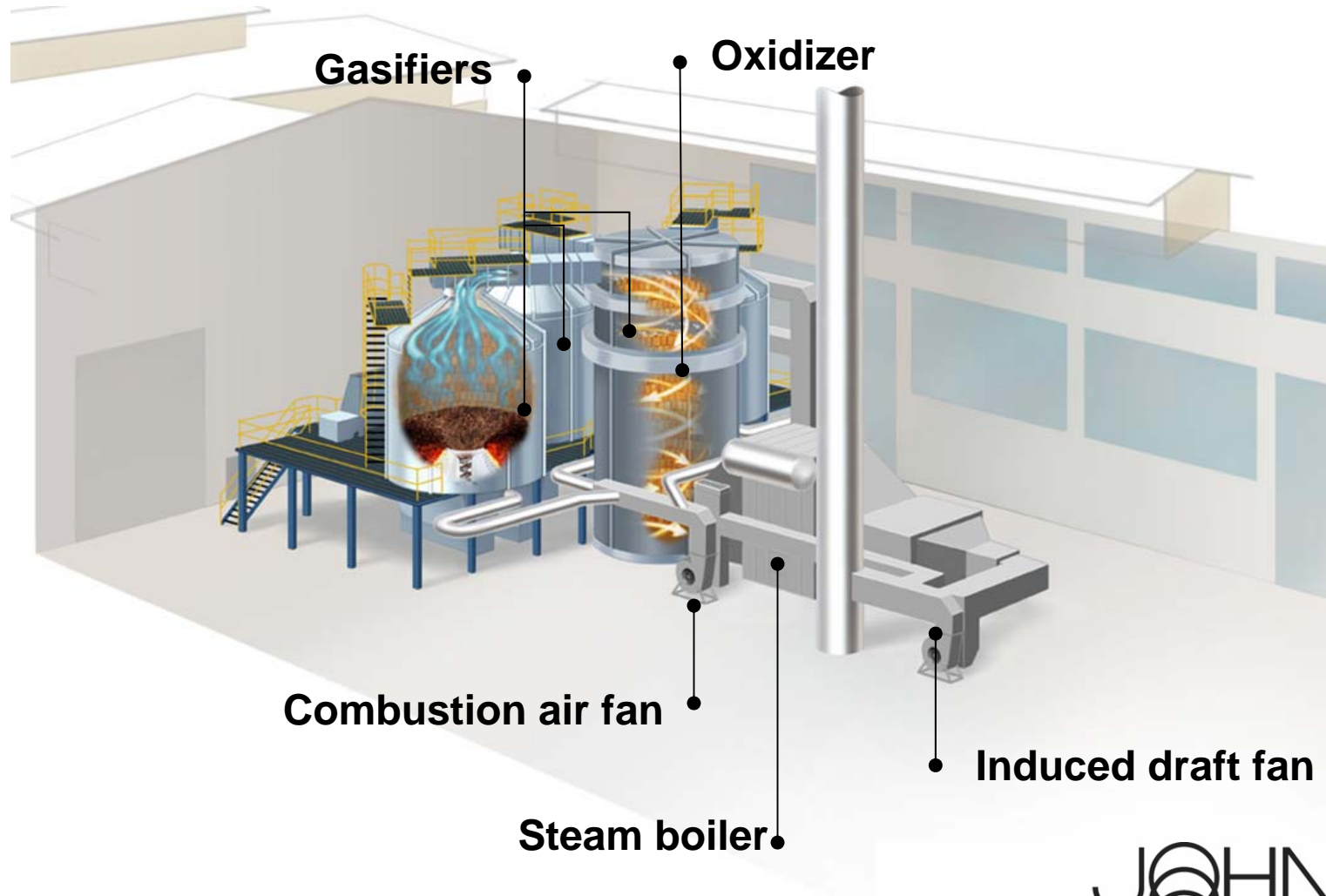
JOHNSON
CONTROLS

Johnson Controls/University of South Carolina Cogen System



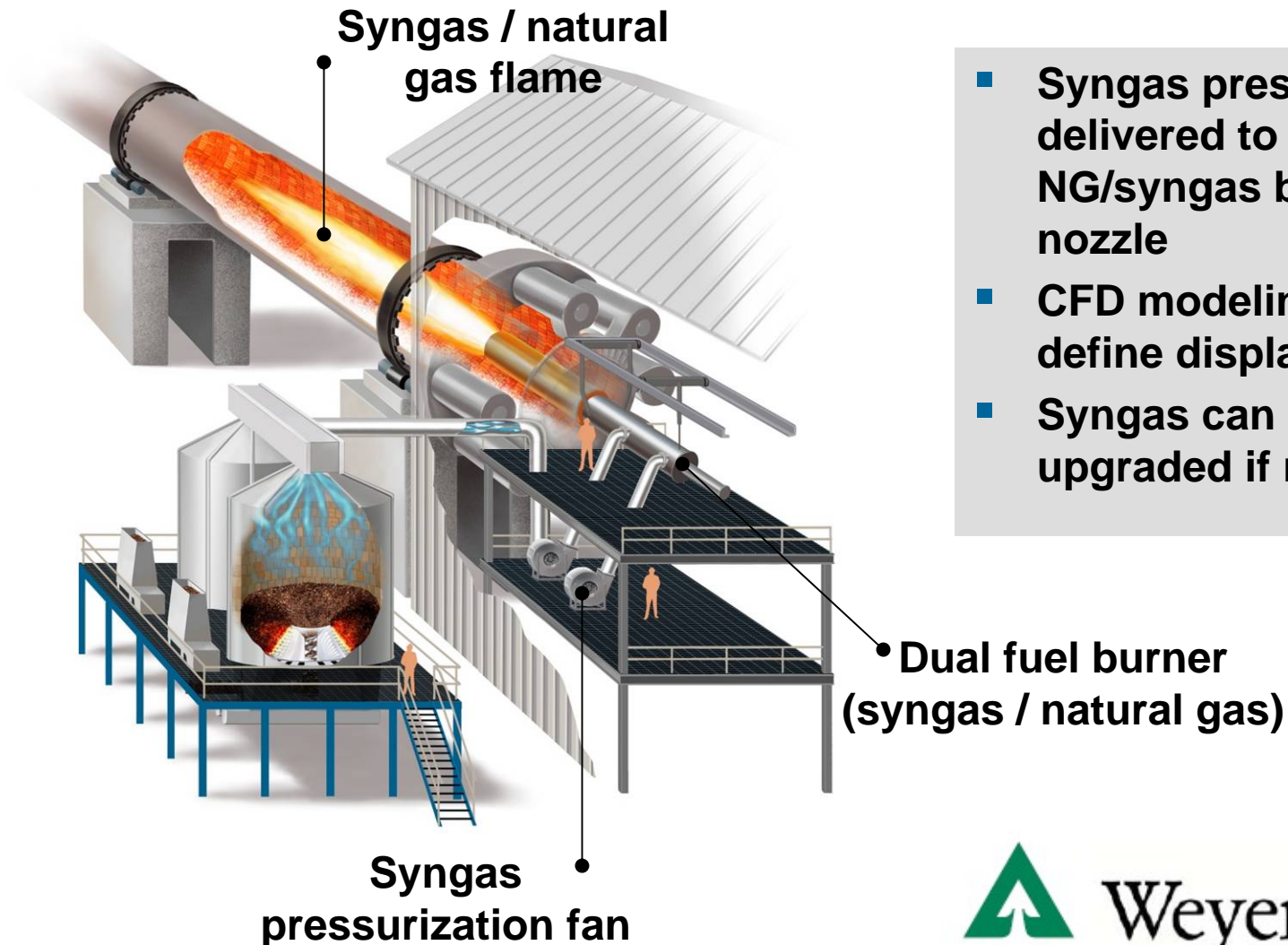
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JOHNSON
CONTROLS

Syngas Plant: Lime Kiln Retrofit



- Syngas pressurized and delivered to dual fuel NG/syngas burner nozzle
- CFD modeling will define displacement %
- Syngas can be upgraded if required

Gasifier/Lime Kiln: Sample Business Case

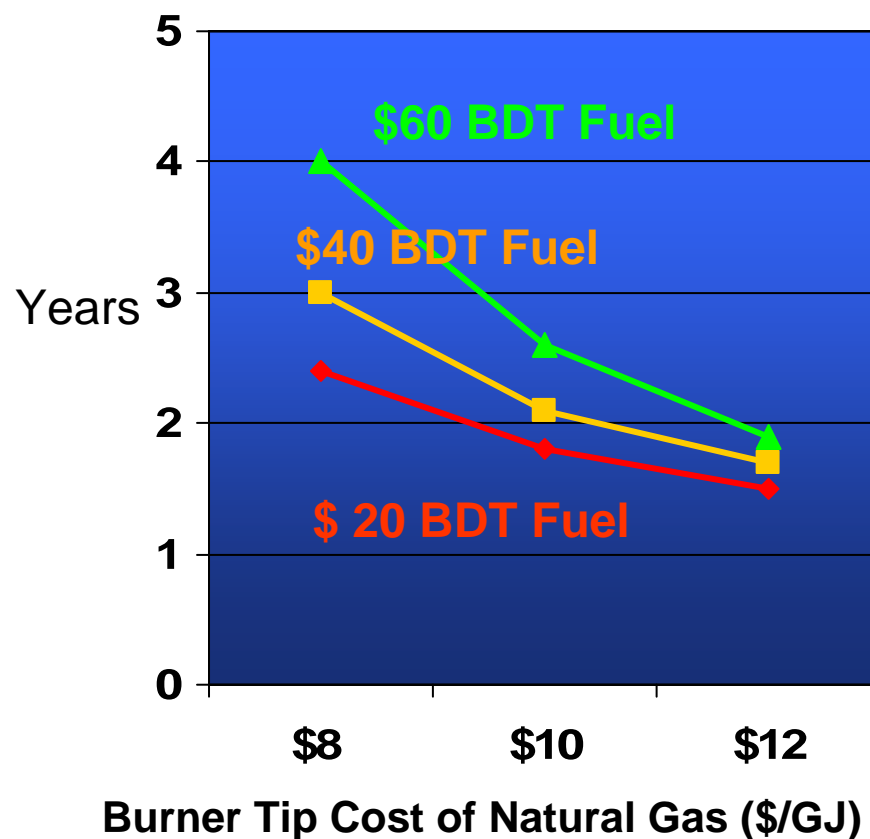


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Gasifier NG Displacement Capacity	63 GJ/hr
Capital Cost	\$8 M
Annual Gas Displacement	529,200 GJ/yr
Hog Fuel Requirement	33,000 BDMT/yr
Net Operating Cost \$40 / tonne	\$1,570,000/yr
Net Annual Savings (NG @ \$10/GJ)	\$3.72 M /yr
Simple Payback	2.1 yr

Payback Sensitivity

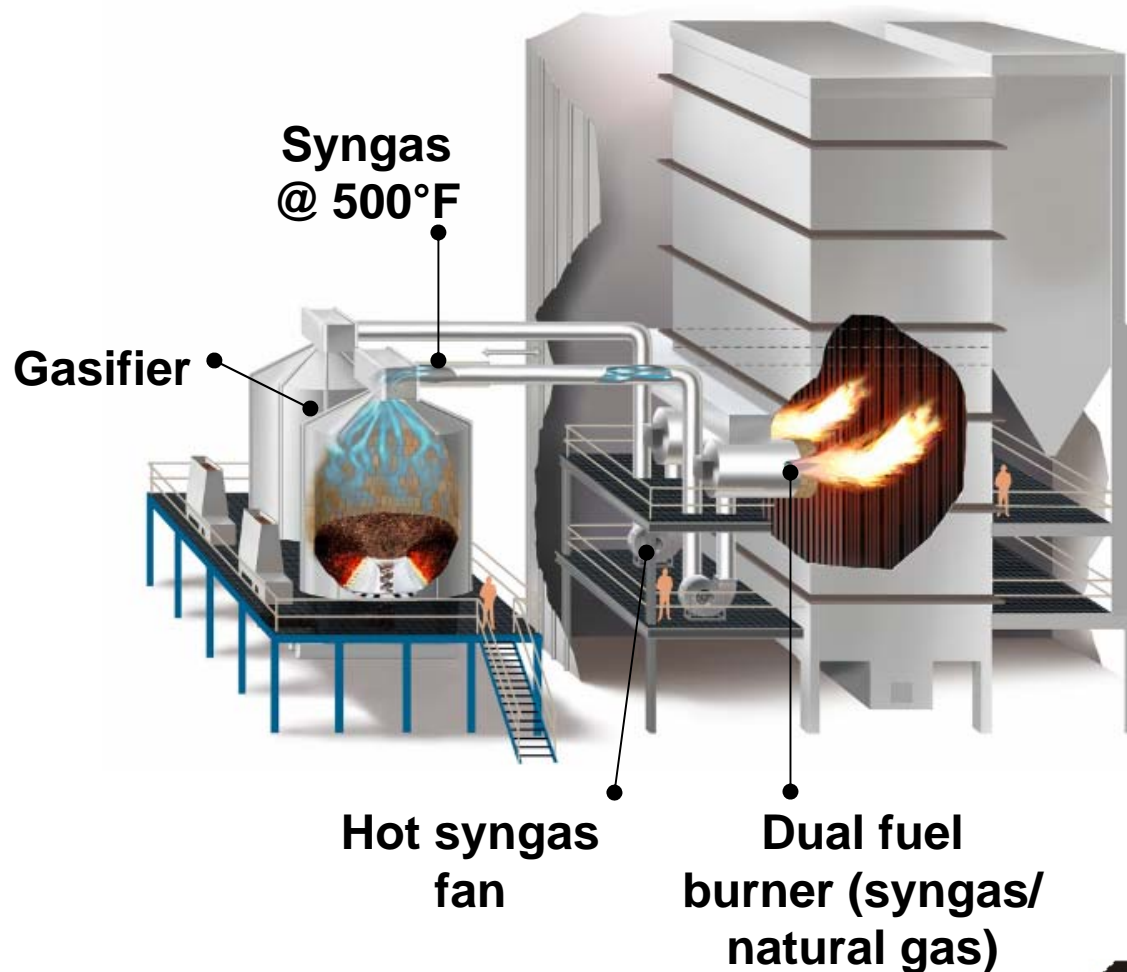


Syngas Plant: Boiler Retrofit



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- Syngas pressurized and delivered directly into boiler via dual fuel burner nozzle
- Syngas is combusted, replacing natural gas
- Up to 35 GJ/hr natural gas displacement per gasifier

St. Marys Paper Ltd.

Gasification Provides Immediate Bioenergy Opportunity



- Gasification offers the forest industry an immediate, proven, clean, and economic way to self generate energy
- Potential for widespread application
 - across the forest industry
 - In other industries
 - In commercial and institutional applications
- Value for energy consumers and local, regional and global community
 - Significant reduction in fossil fuel consumption
 - Increased value of forest industry product
 - Value for pine beetle wood
 - Reduced green house gas emissions
 - Enhanced competitiveness for forest product companies



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Thank You

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Nexterra Energy

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