

# Demonstration of Small Scale Biomass Gasification for Combined Heat and Power Production

S. Trottier, A. K. Chambers, M. E. Olson  
Alberta Research Council

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# Overview

## Objectives

- Evaluate small scale biomass fuelled combined heat and power production

## Target

- Practical system for combined heat and power
- Evaluation of equipment performance and characteristics
- Compile information to inform decision making regarding project specific feasibility

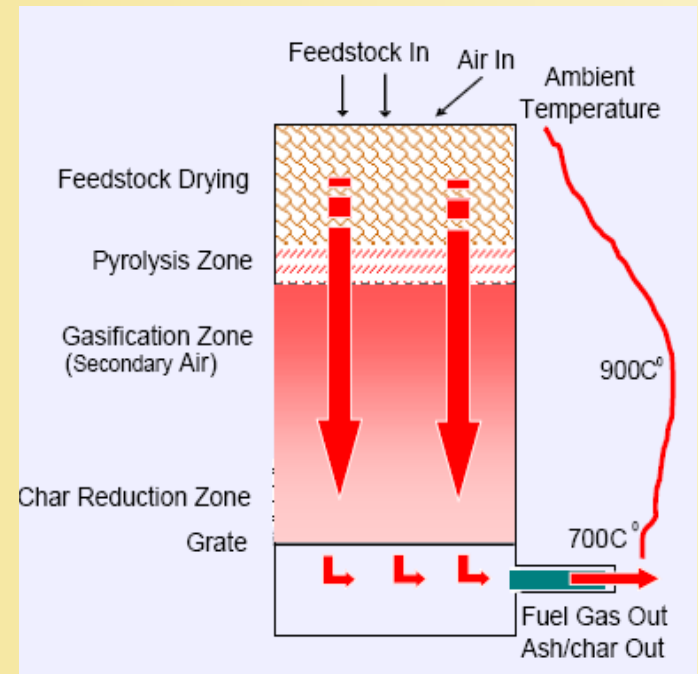
# Overview

## Approach – Currently in Phase 3

- Phase 1
  - Review technology status for small scale combined heat and power production from wood
  - Chose best suited technology and supplier
- Phase 2
  - Purchase demonstration unit
- Phase 3
  - Test performance of unit for ease of deployment, utilization and maintenance for intended user

# Recommended Technology

- Fixed bed downdraft gasification with diesel generator
- Capacity:
  - 50 kW electrical
  - 40 kW thermal
- Supplier: Community Power Corporation

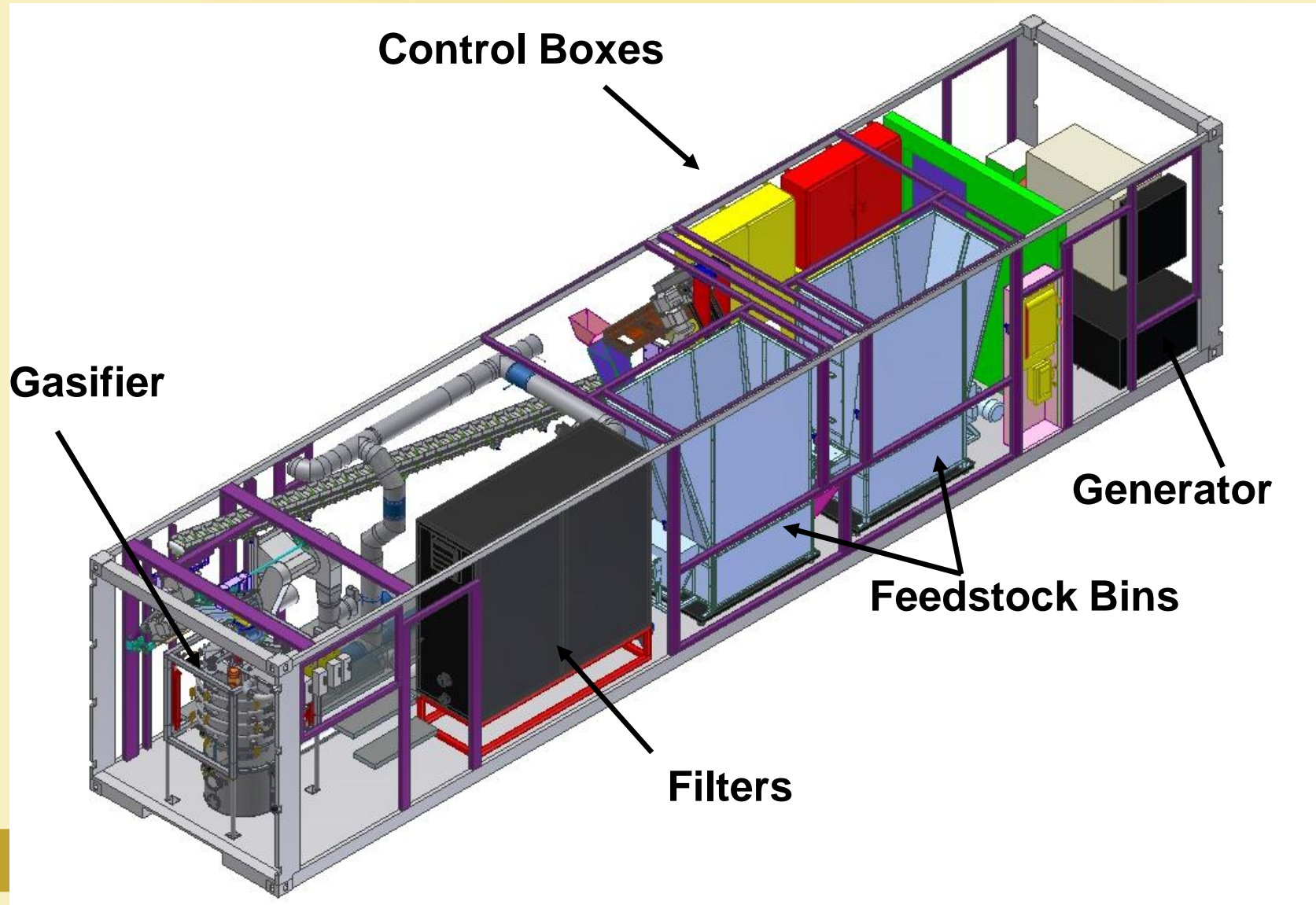


# Key requirements

- Equipment is mobile and stand alone
  - 40' ISO shipping container
- Winterized design
- High level of automation to minimize operator requirements and maintenance
- Hazard mitigation for safe operation
- Meet Canadian Electrical Code standards

All considered very important to ensure successful demonstration in Alberta

# System Description - Overview



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Hydraulic doors -  
Access  
feedstock bins

Flare

Engine  
Compartment

Gasifier



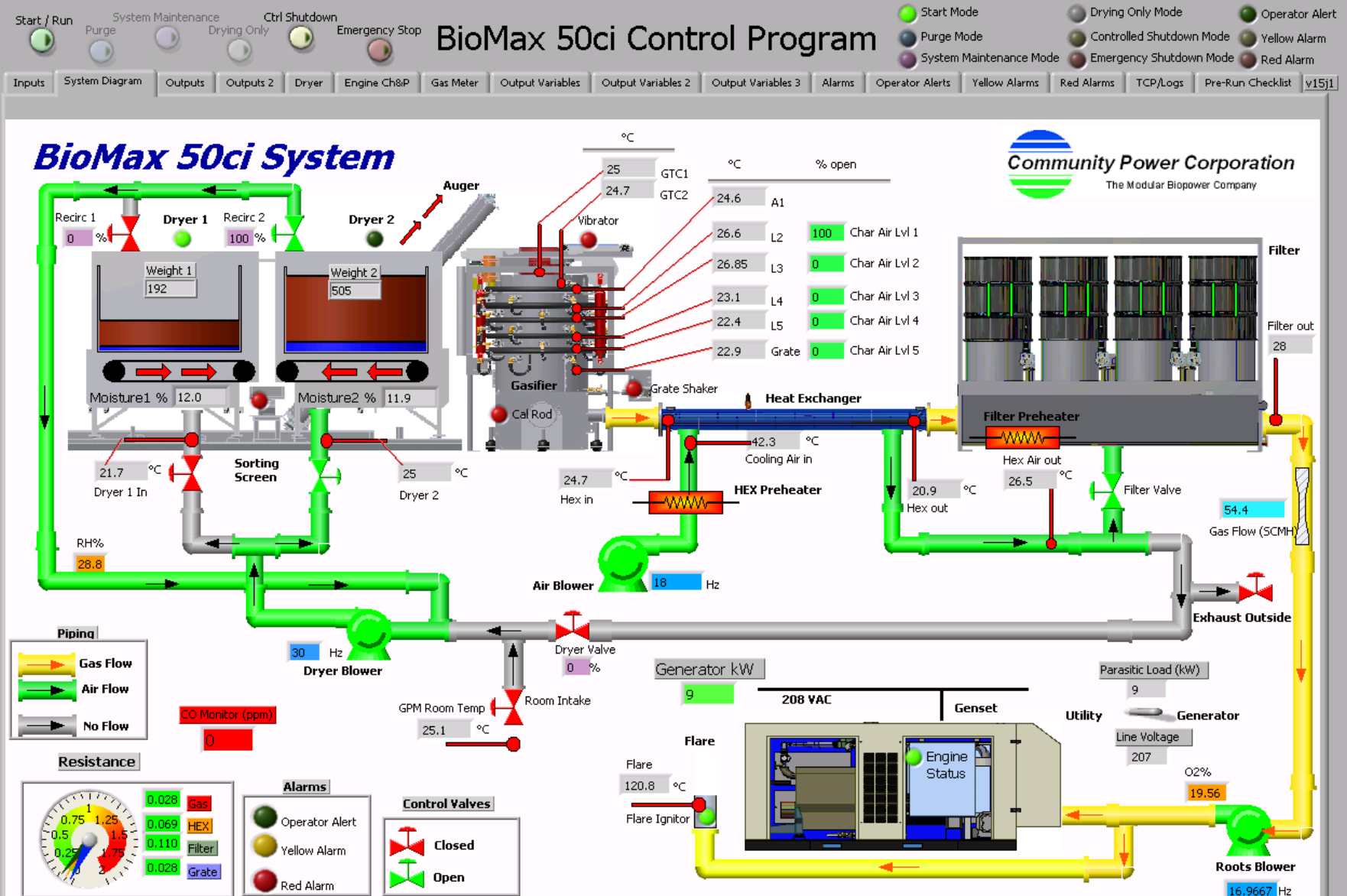


# System Description - Gasifier





# System Description – Control System



# System Performance – Operation

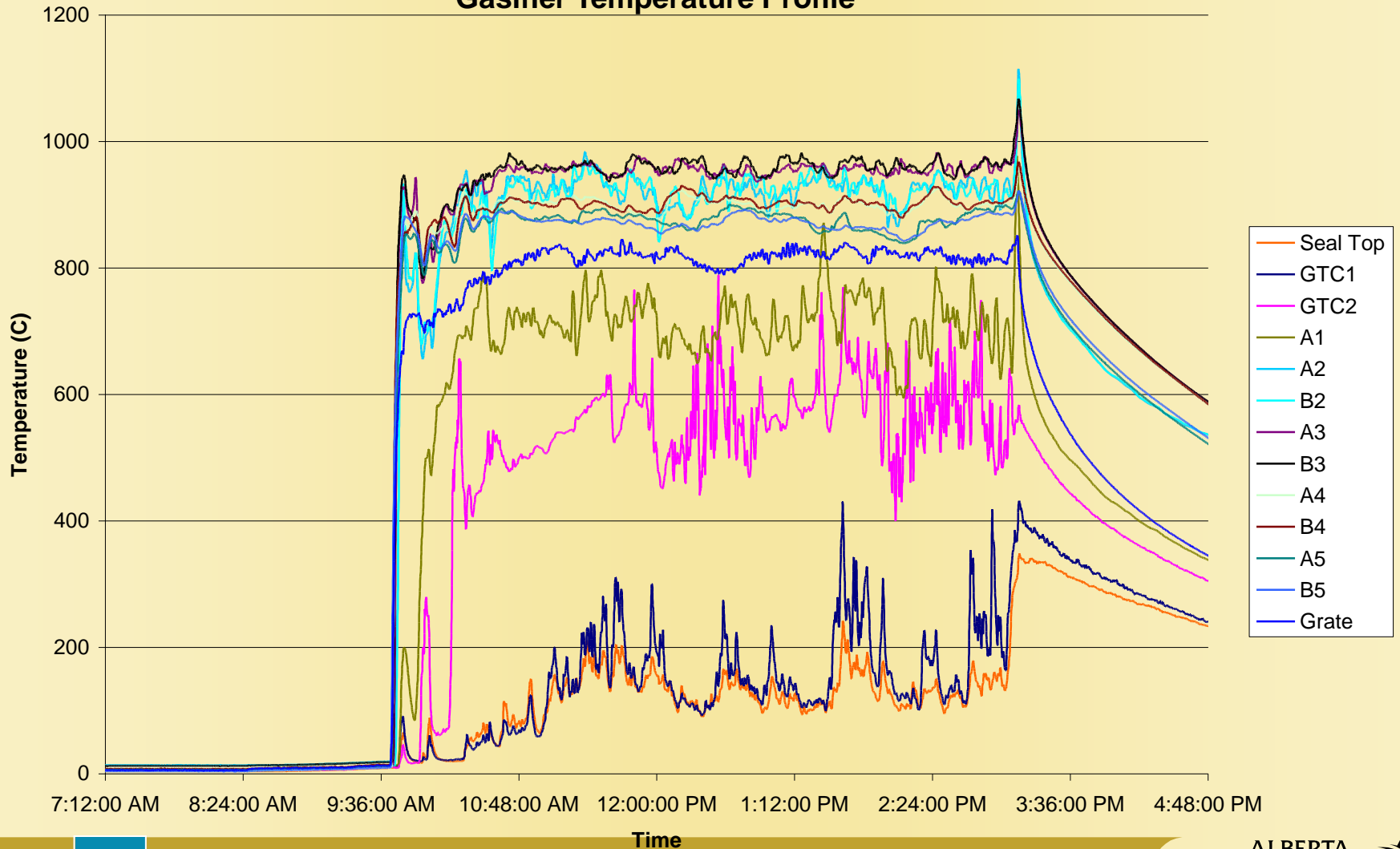
- Over 100 hours of operational experience
- Control system very successful at maintaining optimal gasifier conditions
- Start up and shut down can usually be carried out and controlled by system successfully
- Gasifier operation stable following startup

# System Performance – Operation

- Tar production from gasifier found to be minimal issue in system performance
  - Bag filters remove particulate and tars
  - Pressure drop across bag filters maintained at acceptable levels (high pressure drop indicates plugging)
- Some operation issues related to mechanical failures of feeding and ash disposal systems

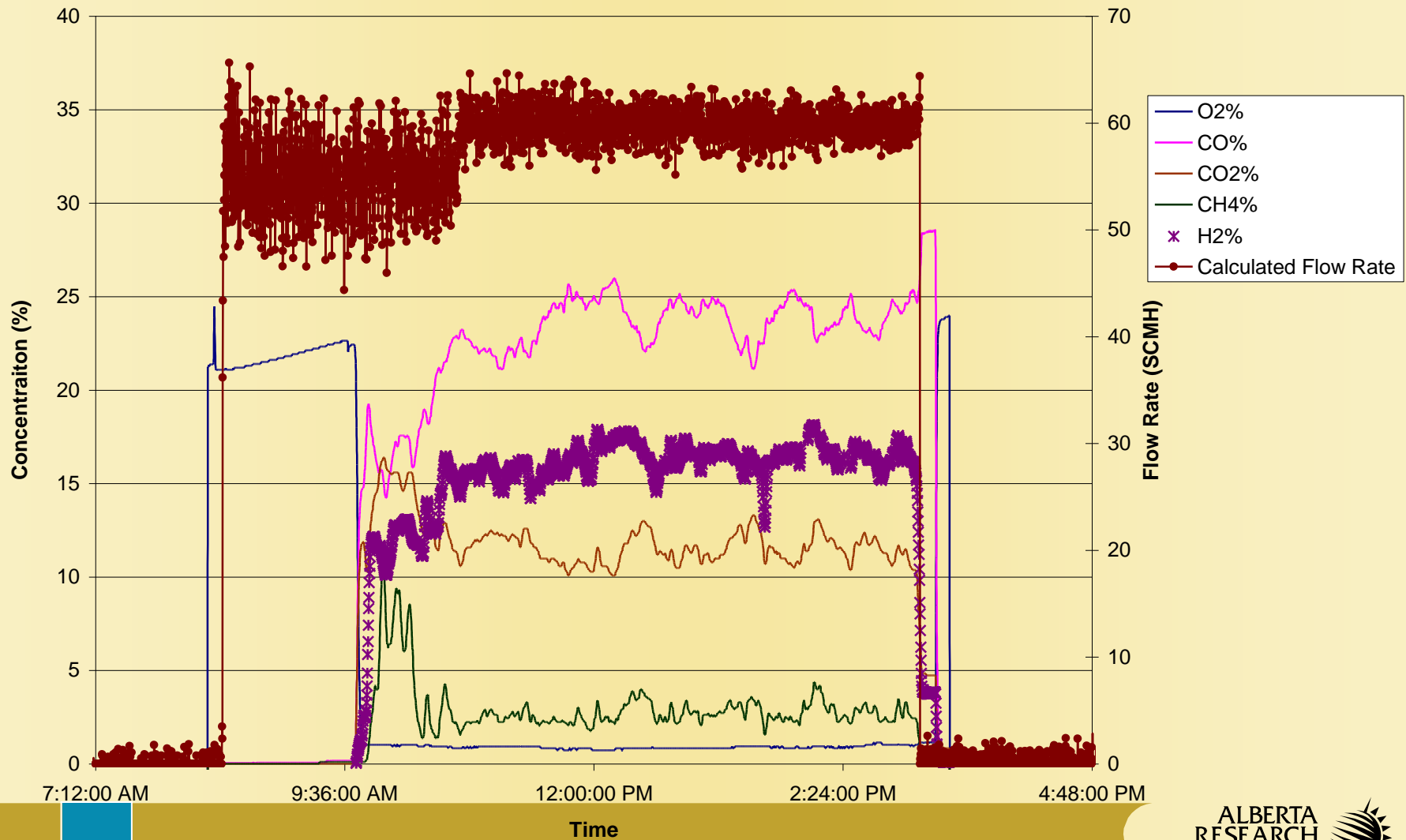
# System Performance – Operation

Gasifier Temperature Profile



# System Performance – Operation

## Producer Gas Monitoring





# System Performance – Operation

- Engine operation
  - Syngas offsets engine diesel consumption
    - (5.5 L/hour vs. 12.5 L/hour)
  - Engine susceptible to knocking
    - Significantly reduced efficiency
    - Possible engine damage
  - Operator interference required to stop knocking

# System Performance – Efficiency

- At full load (47-50kW electrical)
  - Feedstock consumption
    - 5.5 liter/hour diesel + 25 kg/hour softwood
  - System efficiency
    - Electrical ~ 24%
    - Thermal ~ 20%

# Steps Forward

- Testing and validation of other feedstock
- Aim to demonstrate technology at proponent location
- Evaluate opportunities for converting syngas to liquid fuels

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## **Contact:**

**Stephanie Trottier**

[Trottier@arc.ab.ca](mailto:Trottier@arc.ab.ca)

(780) 450-5469