

Biogas Case Study: Casco, London

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Discussion

The background of the slide shows an industrial facility, likely a biogas plant. It features several large, vertical cylindrical tanks with metal ladders and walkways. A complex network of metal pipes and structural beams is visible in the foreground and middle ground. The sky is a clear, light blue.

- ▶ Basics
- ▶ Biogas Composition
- ▶ Utilization Options

Basics

- ▶ Anaerobic (without oxygen)
- ▶ Single-stage, **two-stage process**
- ▶ Decomposition of organic material (sugar) to gases and bacterial mass
- ▶ Gas is currently flared
- ▶ Gas volume and composition fluctuates with food source (quality) and quantity

Biogas Composition

- ▶ Typical (depending on source)
 - 55-65% methane (CH_4)
 - 35-45% carbon dioxide (CO_2)
 - Less than 0.2% (2,000 ppm) hydrogen sulphide (H_2S)
 - 600 BTU/ft³
- ▶ At Casco
 - 70-75% methane (CH_4)
 - 20-25% carbon dioxide (CO_2)
 - 0.2-0.5% (2,000-5,000 ppm) hydrogen sulphide (H_2S), up to 2% (20,000 ppm)
 - 730 BTU/ft³
 - 80-350 m³/hr (45-200 cfm)

Utilization Options

- ▶ Flaring
- ▶ Direct Flash Dryer fuel
- ▶ Throw-away boiler with heat recovery
- ▶ Purification and distribution on-site
- ▶ Micro-turbines
- ▶ Fuel cell technology

Utilization Analysis at Casco

- ▶ Quality & Quantity
- ▶ Scrubbing Options
- ▶ Unit Selection & Sizing
- ▶ Heat Recovery
- ▶ Capital Cost Offsets
- ▶ Simple Payback

Quality & Quantity

► Quality

- High H₂S levels (2,000-5,000 ppm)
- High heating value (730 BTU/ft³)

► Quantity

- Approximate mean daily volume of 5,100 m³
(212 m³/hr, 125 cfm)

Scrubbing Options

► Red Flag:

- Due to the aggressive nature of H_2S , removal is necessary

► H_2S Removal Options

- Catalytic carbon media
- Chemical treatment
- Sulfa-Bind™

Power Unit Selection & Sizing

- ▶ Option I – Gas Turbine
- ▶ Option II – Reciprocating Engine

- ▶ Option II was selected based on life cycle cost and heat rate

- ▶ Based on a heat rate of 8,123 BTU/kW and available gas volume, a 1 MW unit was chosen

Heat Recovery

► Available Heat:

- Exhaust
- Jacket cooler
- Oil cooler
- After cooler

► Total: approximately 2.5 million BTU/hr

Heat Recovery (cont'd)

Biogas (5,100 m³/day)

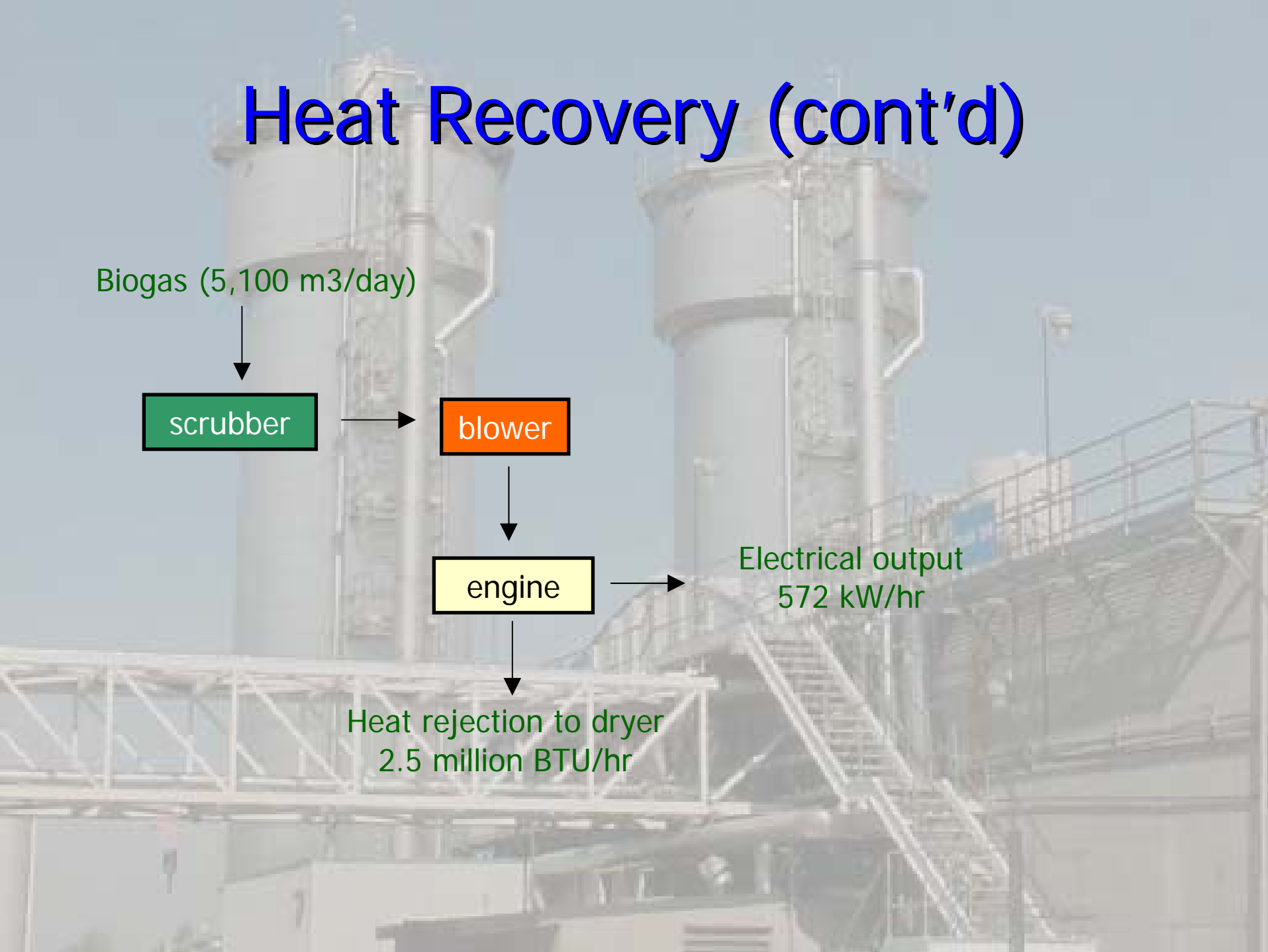
scrubber

blower

engine

Electrical output
572 kW/hr

Heat rejection to dryer
2.5 million BTU/hr



Capital Cost Offsets

- ▶ O.P.A. Standard Offer Program
 - \$0.11679/kWh
- ▶ Union Gas Energy Wise Program
 - 10% (max. \$30,000) of installed cost on eligible high-efficiency equipment
- ▶ Avoided capacity reserve costs

Simple Payback

- ▶ 2.93 years on a \$2.25 million investment



The image shows an industrial facility with two prominent, tall, cylindrical towers. Each tower has a metal ladder running vertically along its side and a horizontal walkway near the top. In the foreground, there is a complex network of metal walkways and stairs. The sky is a clear, light blue. The overall scene is industrial and technical.

Questions?