



# **CLEAN FUELS**

## **Case Studies for the Food Industry**

**CLEAN FUELS  
FOR CALIFORNIA  
AND THE WEST**

Presented by  
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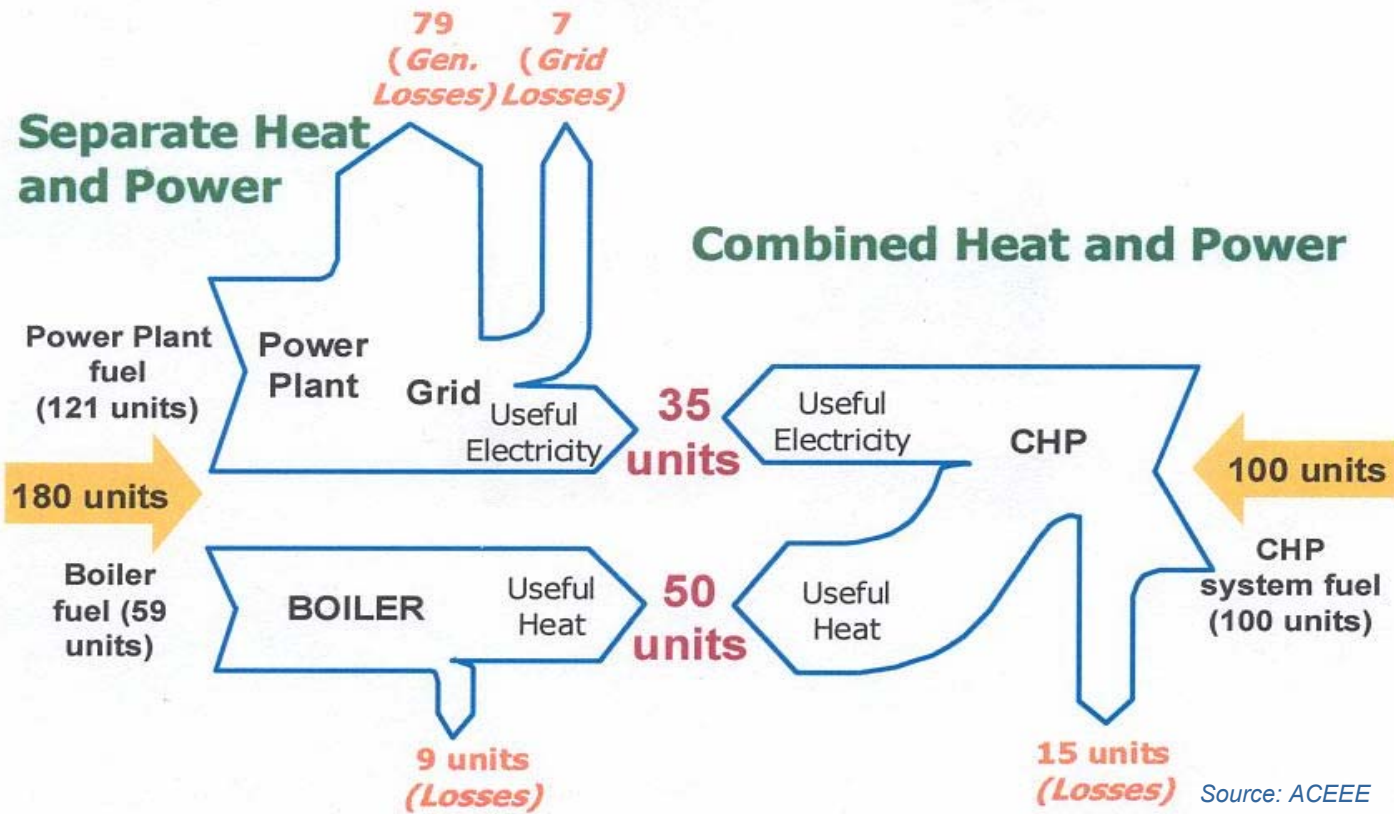


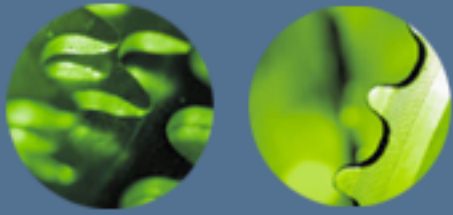
# AGENDA

- Clean Fuels
- Cogeneration Case Studies
- Conclusions



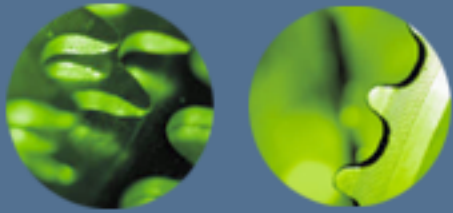
# Why Co-generate?





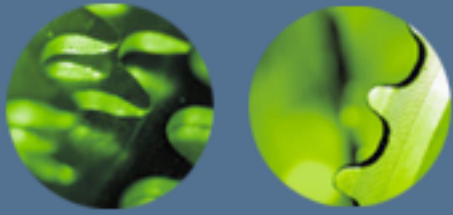
# **Cogeneration – Important facts**

- **Full utilization of electricity and heat – Achieve high efficiency**
- **“Spark spread” (which is the difference in the cost of electricity and gas) is a key driver**
- **Successful application of equipment characteristics to loads**
- **Successful cogeneration systems are economics driven**



## Rules of Thumb - Biogas

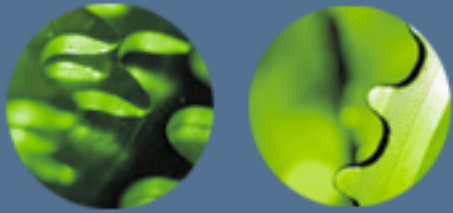
- Organic based waste water plants produce high methane bio-gas (range of 55-75%)
- Fuel treatment required but not as onerous as landfill gas
- Siloxane usually not an issue
- Approximately 2.5 to 4 lbs of COD/kWh
- Currently bio-gas based cogeneration payback is less than 2 years.



# Application of Cogeneration

## Specific Examples

- Beer
- Dairy



## **Beer Processing – Biogas application**

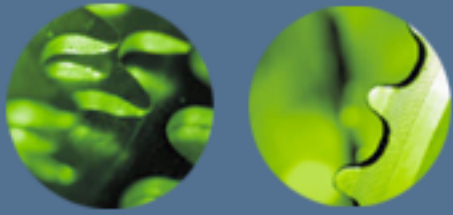
**Location: Irwindale, CA**

**Industry: Beer Maker**

**Size: 1 MW / 3,000 KBtu/hr**

**Electric Load: Stable at over 10 MW**

**Thermal Load: Influent heating at waste water treatment plant**



# Beer Manufacturing

**COD (Chemical Oxygen Demand) loading of 60,000 lbs/day**

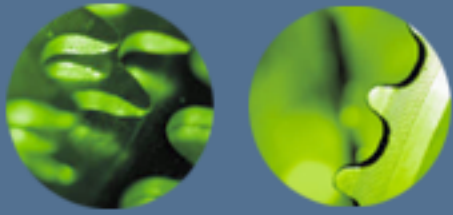
**Flow rate of waste water @1.6 MM GPD**

**Anaerobic Digester – producing 360,000 SCFD @76% Methane**

**1 MW Lean burn engine**

## **Economics**

- Rebate of \$1MM
- Payback of 7 months



# **FOOD PROCESSING INDUSTRY**

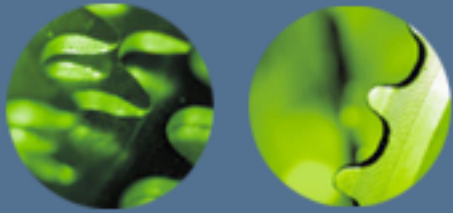
**Location: Massachusetts**

**Industry: Large Fluid Milk Processing**

**Electric Load: Fairly constant base load of 2 MW  
with peak of 4 MW.**

**Thermal Load: Fairly large boiler load with installed  
capacity of over 800 hp**

**Existing waste water treatment plant producing bio-gas.**



# **Food Processing (Contd)**

## **Solution Involves**

- **2 MW high efficiency lean burn engine (43% electrical efficiency)**
- **2,950 kBtu heat recovery boiler @ 125 psig**
- **800 kBtu exhaust hot water economizer**
- **3,400 kBtu jacket heat recovery system**

**System Efficiency – 86%**



# Food Processing (Contd)





# Food Processing Application

## Plant thermal loads

### Steam

- Boiler Header

### Hot Water

- Clean in Place (CIP) systems
- Boiler Feed Water
- Milk Pasteurization



# Questions and Answers

