# WOC 5 - Utilization
# SG 5.1 Industrial Utilization

## Case study:

## Efficient use of CHP for process & heating in industry in Italy

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***Buenos Aires***
***6th October 2009***

# Agenda - Items

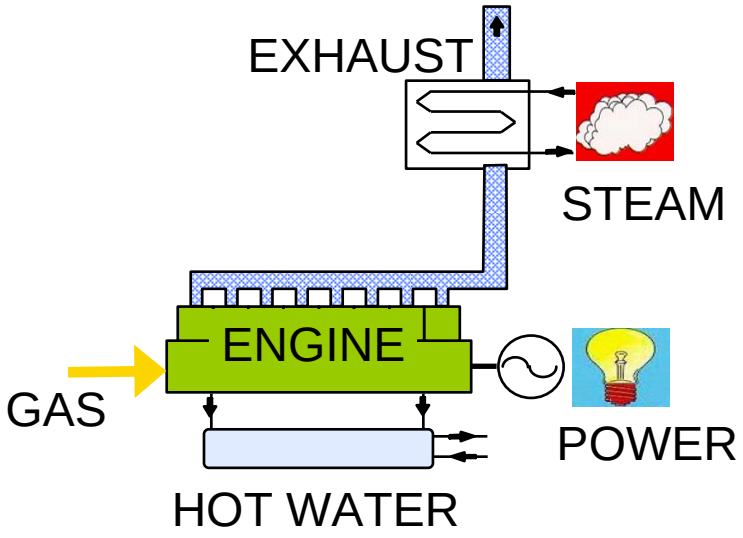
1. Introduction
2. Case study in textile sector
3. Conclusions

# Introduction



**Cogeneration** is the **simultaneous generation** of electrical and thermal energy in the same process***, both considered useful products***

## Example of CHP plant lay out

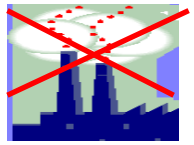



## Main benefits of CHP

Less energy wasting in production

Less losses in power transmission

Reduction of emissions



# Introduction



## Suitability and feasibility

### ➢ Suitability conditions

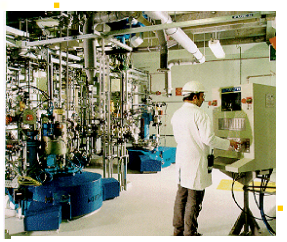
CHP is mainly suitable if there is a **simultaneous demand** of power & heat

### ➢ Feasibility study

To **evaluate effectiveness** of CHP with respect to separate production

### ➢ Industrial sectors

In Industry, **CHP is particularly suitable** in these sectors:



*Chemical*

*Food*

*Textile*

*Paper mills*

*Brick and ceramics*

# Introduction

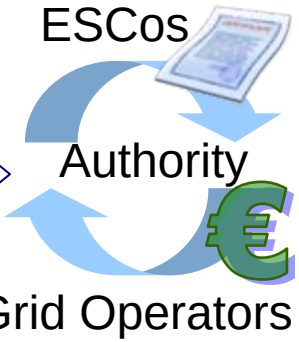


In many Countries, “high efficiency CHP” is defined by law

In **European Union** (EU Directive 2004/8/EC) starting from 2011, minimum **P**rimary **E**nergy **S**aving is required

**PES ≥ 10%**
**(size > 1 MWe)**

In **Italy** “high efficiency CHP” is eligible to **White Certificates System**, a mechanism to incentive **energy efficiency**




Development of CHP needs also:

- smooth administrative processes
- reduction of CAPEX
- incentives to recover external costs of energy market
- information & culture

# Case study



## Natural gas CHP in textile industry

COTONIFICIO ALBINI S.p.A.
Lombardia - ITALY

# Case study: Industrial process

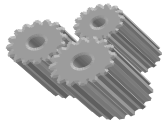


PROCESS: Cotton **dyeing and weaving** factory located in Albino

**PROCESS**

- Dyeing
- Preparation
  - drying
  - vaporization
  - sizing
- Weaving
- Quality controls

**ENERGY DEMAND**



Working program
~ 6,500 h/y

Electricity
12.5 GWh/y

Heat
11.1 GWh/y

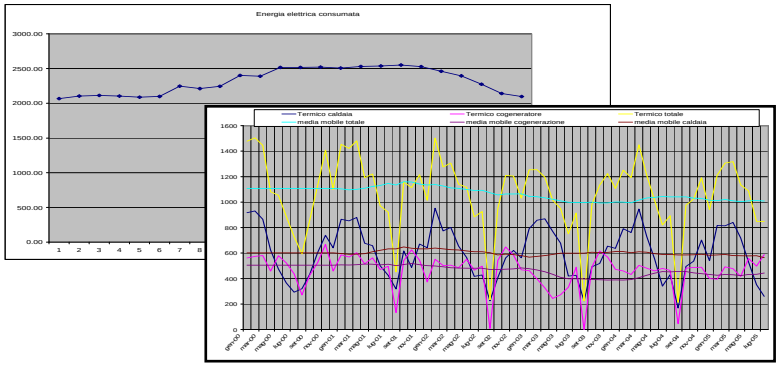
**Previous good experience**

A 1.8 MWe CHP plant – 3 engines – was already installed, to be substituted because of obsolescence of engines

# Case study: Feasibility study



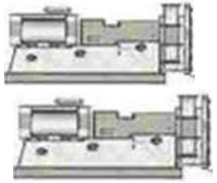
1. Energy audit




~ 1.8 MWe

~ 2.0 MWt

2. Choice of kind and size of CHP



2 **internal combustion engines**
1.7 MWe total

3. Profits estimation vs. separate production

Saving of Primary **Energy** 25 % *
* according to Italian regulation

**Economic** saving 270,000 €/y
(including O&M costs)

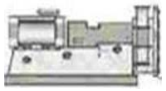
# Case study: Main actions



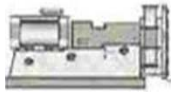
Optimization of power generation and heat recovery

**POWER**

- 2 **internal combustion** Natural Gas **engines:**
  - 1/1 heat/power ratio
  - cheaper than GT



1 **new** engine: 1 MWe



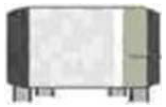
1 **existing** engine: 0,7 MWe

**HEAT**

- **Low pressure** steam (instead of 11 barg)
- **Direct use** of **hot water** instead of steam
- Hot water **storage tank** with **closed loop**

4 barg

65 °C, 95 °C



200 $m^3$

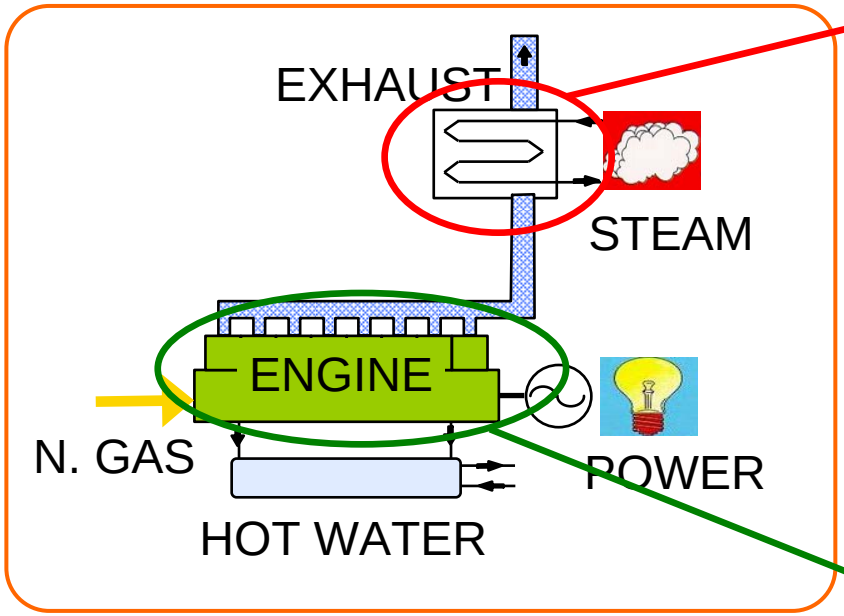
RESULTS

- Optimization of plant efficiency & flexibility
- Preservation of high quality of products

# Case study: Some images…

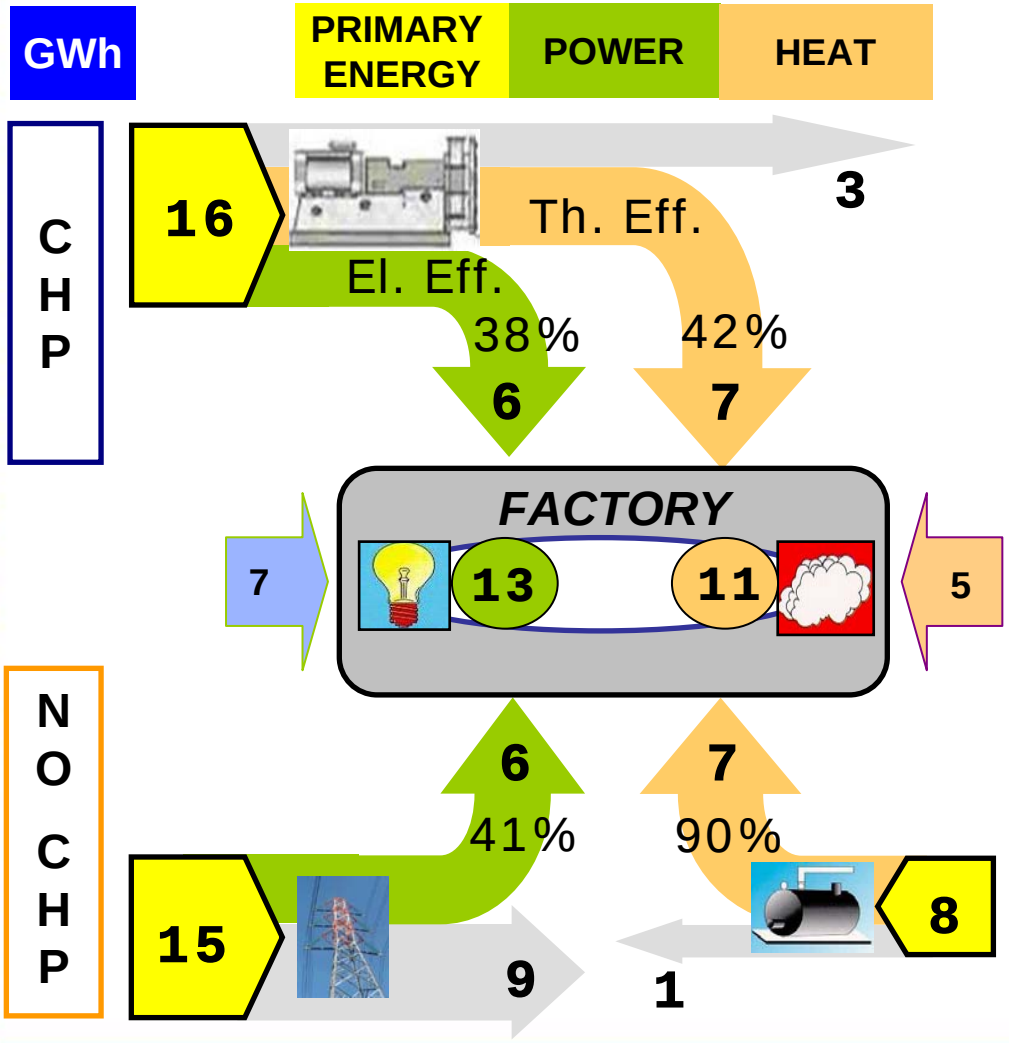


Images of the new 1 MW Engine & Steam Generator




# Case study: Saving






## Efficient

- Saving of energy: **30 %** *

## Clean

- $CO_2$ avoided: **1.8** kt/y **

## Cost effective

- Saving: **~300,000** €/y***
  **~ 20** %
- Pay back time **~ 4** y

* referred to Italian regulation

** referred to: 575 $tCO_2$/GWhe and 2.35 $tCO_2$/Toe NG

*** compared to separate production

*Data are for reference purpose only*

# Conclusions



Energy efficiency is a “virtual” energy source, leading to reduction of greenhouse gas emission and stimulation of technology research

**eni** is committed to promoting energy saving behaviour and offers consultancy services aimed at promoting energy efficiency and CHP among industrial clients

**CHP can play an important role** in:

- **Energy saving**
- **Reducing $CO_2$ emissions**
- **Reducing cost of energy supply**

Good **fields of development** are:

- **District heating**
- **Industry**

# Acknowledgements to:

- Italian firm Cotonificio Albini SpA for information & data on industrial CHP case study

- WOC 5 - SG 5.1 Chairman, Vice Chairman & all the members for their cooperation

## Thank you for your attention!

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