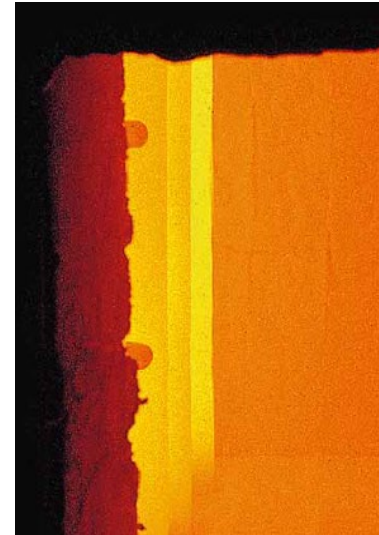




E-Crackers -
Sustainability Developments
in Steam Cracker Technology
from an Industry Perspective



Pascal Coenen

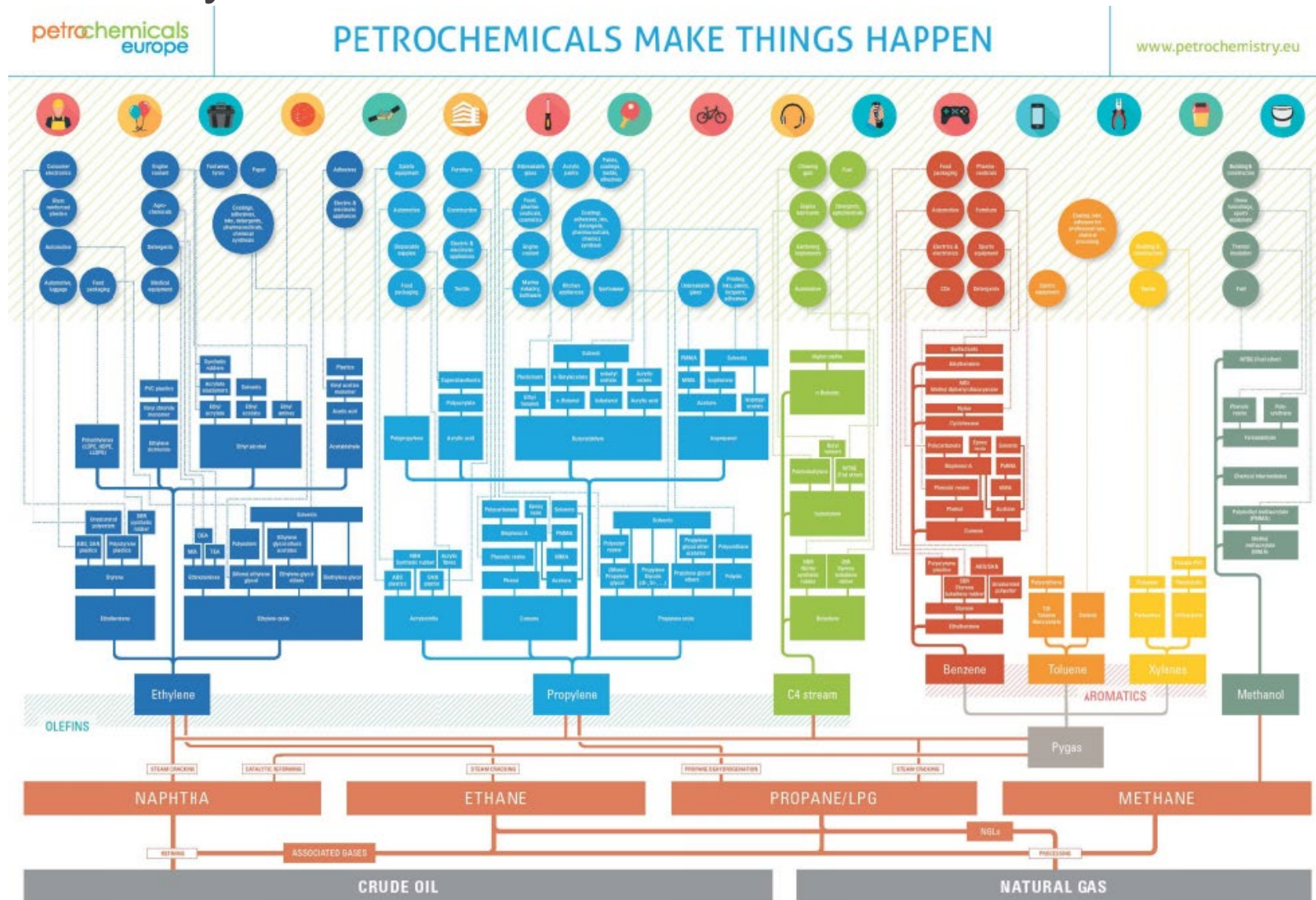
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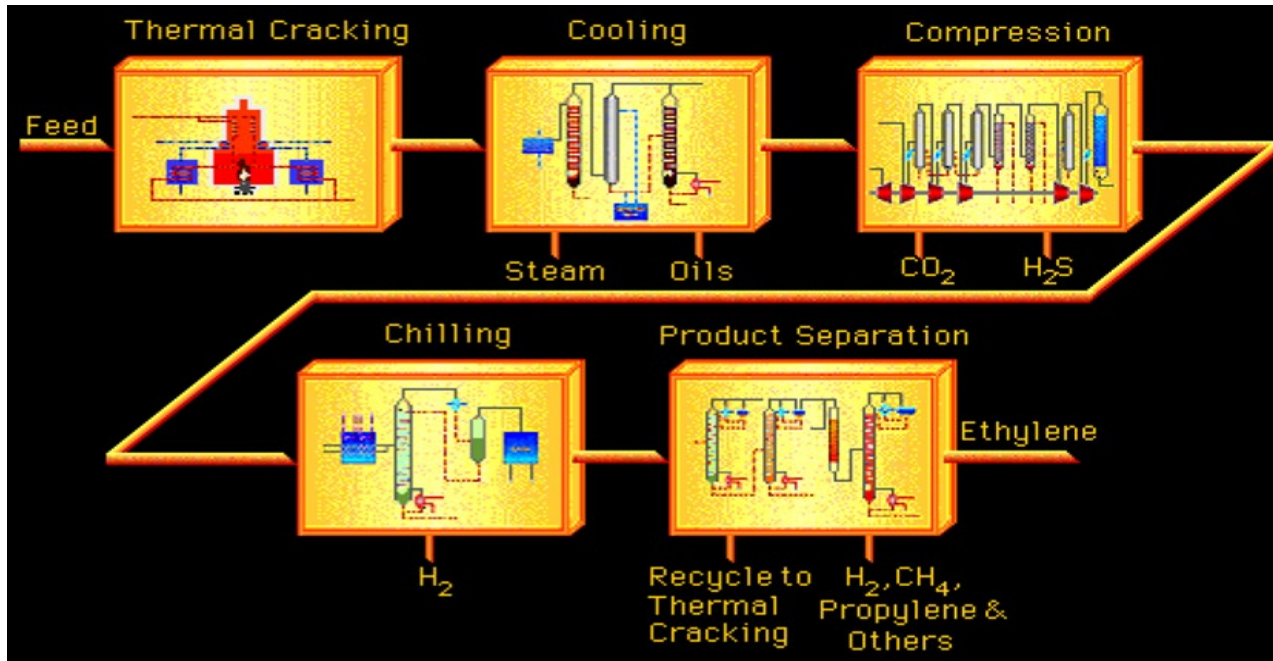
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1. Introduction: Why a Steam Cracker?



1. Introduction: What is a Steam Cracker?



1000kta ethylene naphtha cracker

Annual energy consumed (TWh)	~7
Annual CO_2 footprint (kta)	~1400

NL has about 4000kta ethylene from naphtha crackers

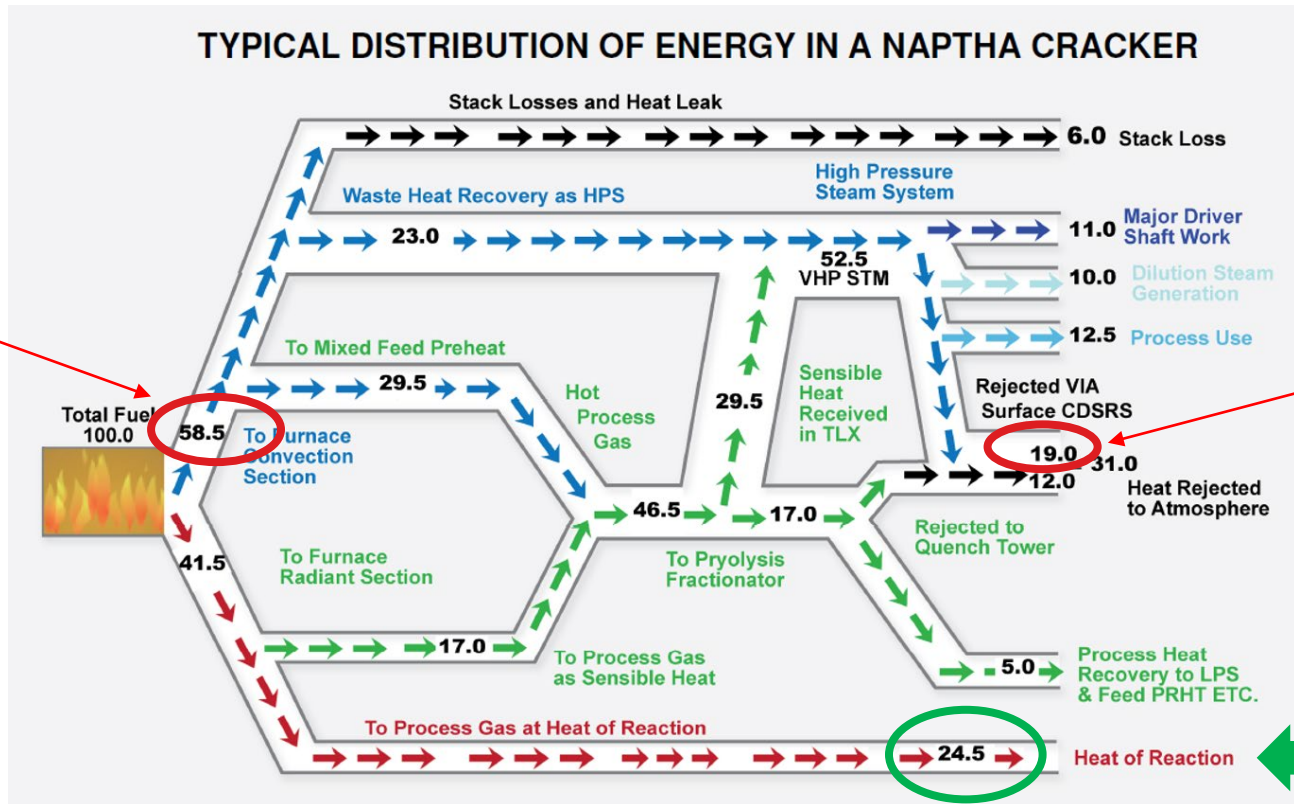
Annual energy consumed (TWh)	~28
Annual CO_2 footprint (kta)	~5600

Why Efficiency improvement through Electrification?

Electrification offers 2 major benefits:

1. Significant CO₂ emissions reduction by using renewable electricity
2. Significant energy saving, potentially > 30% through heat integration optimization

Electrical furnace
avoids flue
gas production



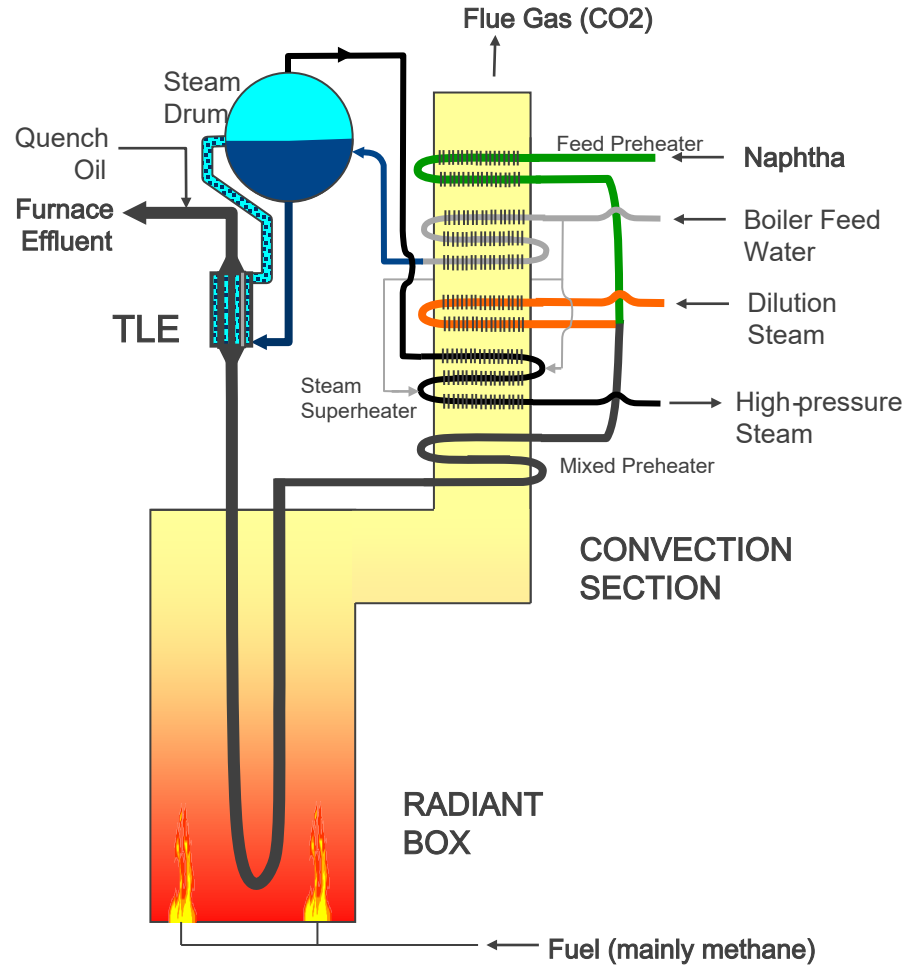
Electrical motor avoids
the inefficiency of a
condensing turbine

In an ideal situation only Heat
of Reaction is provided

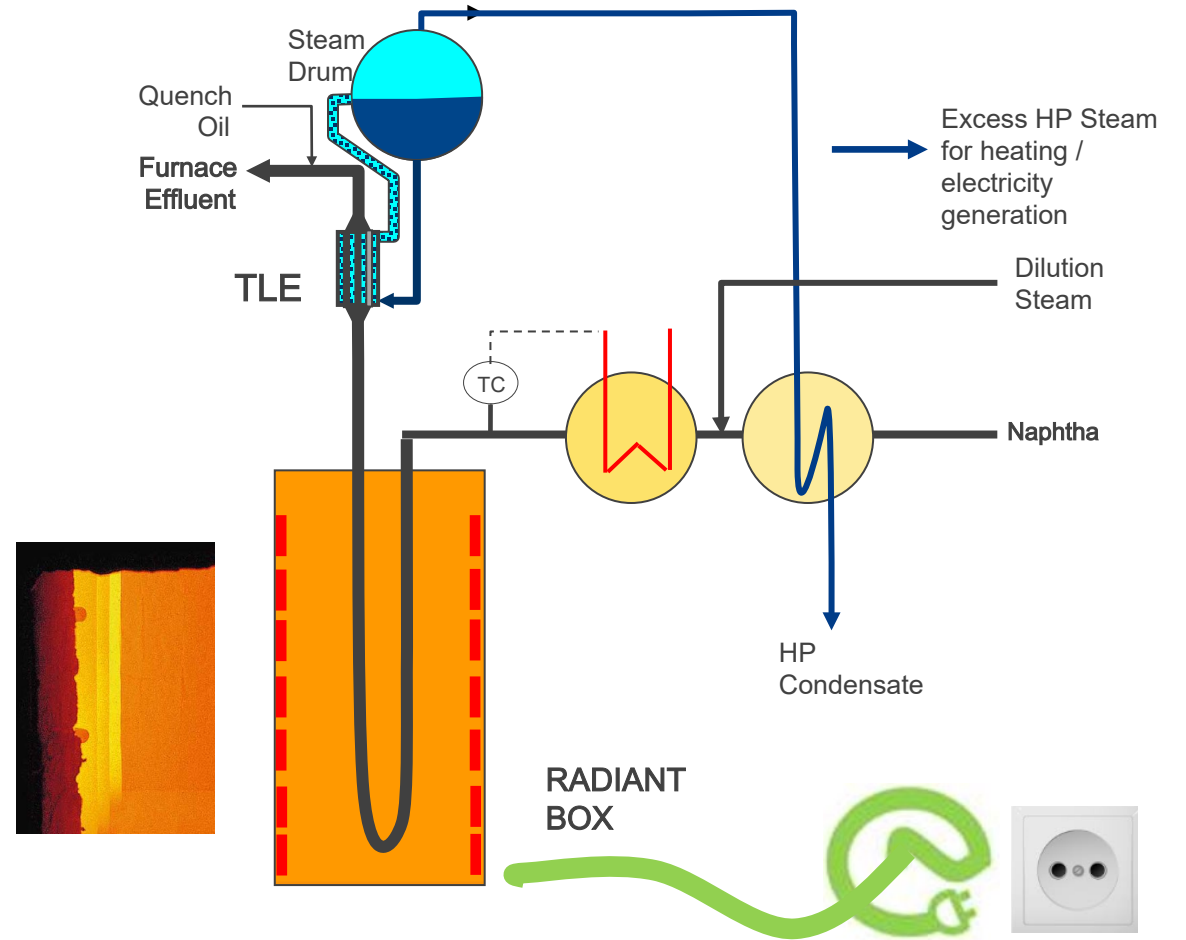
(Source: Michael Tallman, KBR, EEPCC seminar Oct 2008)

E-furnaces

Conventional Furnace



E-furnace



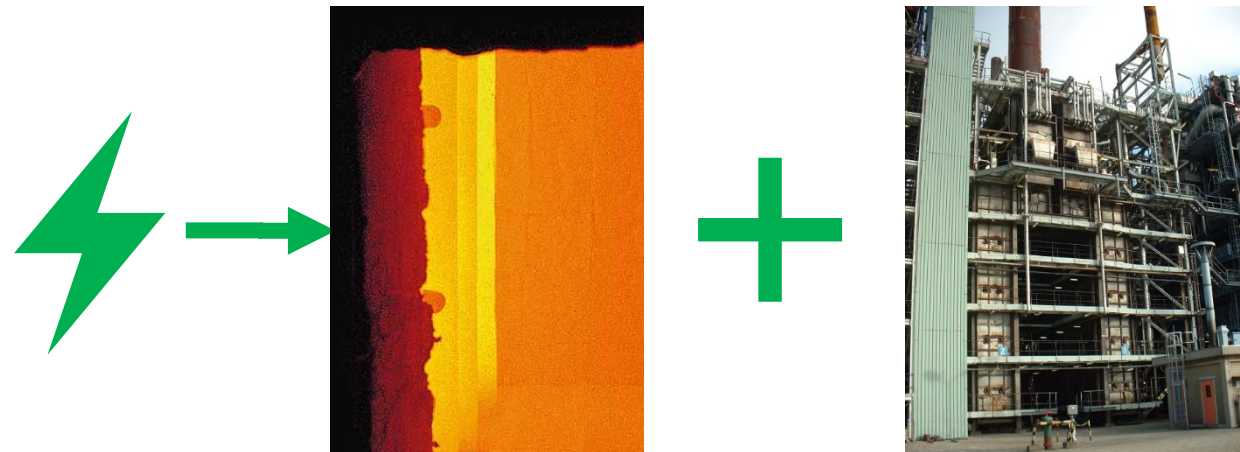
E-furnace Strengths, Opportunities & Challenges

Strengths & Opportunities

- Eliminates scope 1 CO₂ emissions
- Same chemistry, same feedstock, same products
- Potentially improved heat flux profile
- No flame impingement
- No burner light-off
- Larger heating turndown
- Deploy to other processes
- Widespread public acceptance

Challenges

- Require outlet for fuel gas
- Require > 500MW green electricity
- Require continuous supply of renewable electricity



Challenges

Challenges & requirements for successful electrification of the industry:

- Impact on Steam & Power & Fuel Balance requires new technical solutions
- Uninterrupted renewable power is required to reduce carbon footprint
- Alternative solutions and their development speed (CCS, CCU, H2 economy, etc)
- Upgrade of electrical grid infrastructure required both inside and outside battery limits
- Cost of electricity vs hydrocarbons. CO₂ pricing and project subsidies will help.
- Footprint/ space in case of brownfield electrification
- Reliability of power supply/ grid



