

thyssenkrupp Industrial Solutions AG

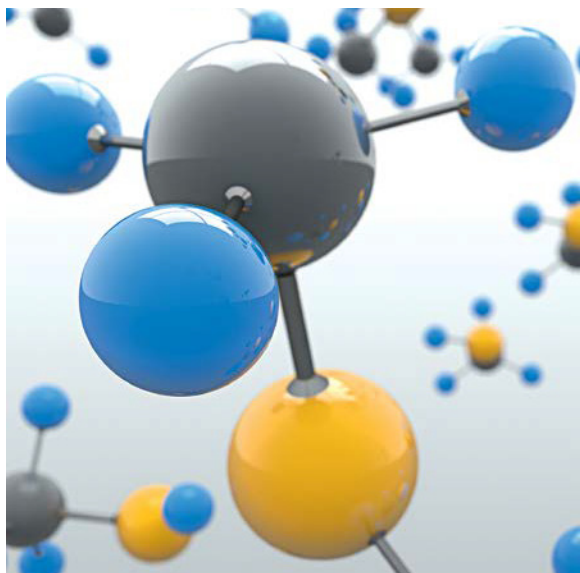
Green Methanol, a path forward to replace fossil fuel

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engineering.tomorrow.together.



thyssenkrupp



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thyssenkrupp Industrial Solutions –
Your partner for technologies and implementation



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2. Advantages of cooperation with tk Industrial Solutions
3. Silicon Fire / UHDE Technology for CO₂ based “Green Methanol” plants
4. Site seeing: tk Industrial Solutions’ global references



1. thyssenkrupp – Business Areas

Key indicators – fiscal year 2017/2018

Components Technology



Sales [€ mn]

7,875

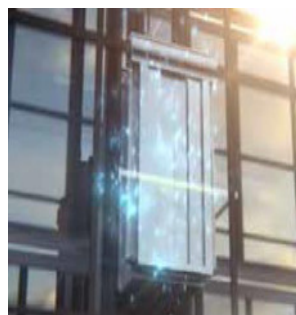
EBIT_{adjusted} [€ mn]

197

Employees

34,481

Elevator Technology



7,554

866

53,013

Industrial Solutions



5,020

255

21,535

Materials Services



14,652

317

20,273

Steel Europe



9,470

687

27,764

thyssenkrupp AG

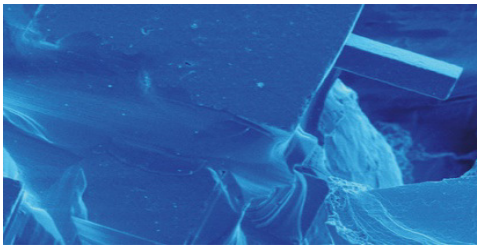
Sales: 42,754 | EBIT adj.: 1,551 | Employees: 161,096



1. thyssenkrupp Industrial Solutions

Business Units

Electrolysis & Polymers Technologies



Fertilizer & Syngas Technologies



Industrial Specialties



Cement Technologies



Mining Technologies



Service



System Engineering



Marine Systems



Network of Excellence



2. Advantages of Cooperation with tk Industrial Solutions

The right partner for your project

Engineering (E)



Procurement (P)



Construction (C)



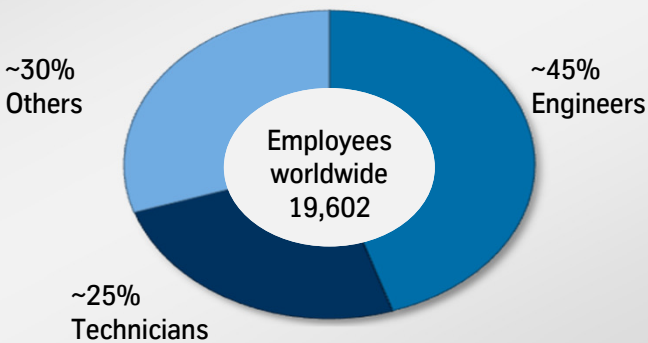
Know-how Exchange

Knowledge transfer via a closely knit global network



Technical Excellence

70% of all employees are engineers or technicians



2. Advantages of Cooperation with tk Industrial Solutions

Competence aspects

- All Licenses, Basic & Detail Engineering, EP-packages or full EPC execution from one single source
 - tkIS is **Owner / Co-Owner** of the **Alkaline Water Electrolysis** and the **SLF/Uhde Methanol technology**
 - No gaps
 - No interfaces with other third parties
 - Shortest possible workflow, thus minimum overall project execution schedule
 - Track record of in time and in budget delivery
- Full competence for all project phases including
 - early project development steps, concept development and first feasibility considerations,
 - generation of basic input information,
 - basic & detail engineering and construction of a plant,
 - after sales services and assistance during plant operation
 - Training services

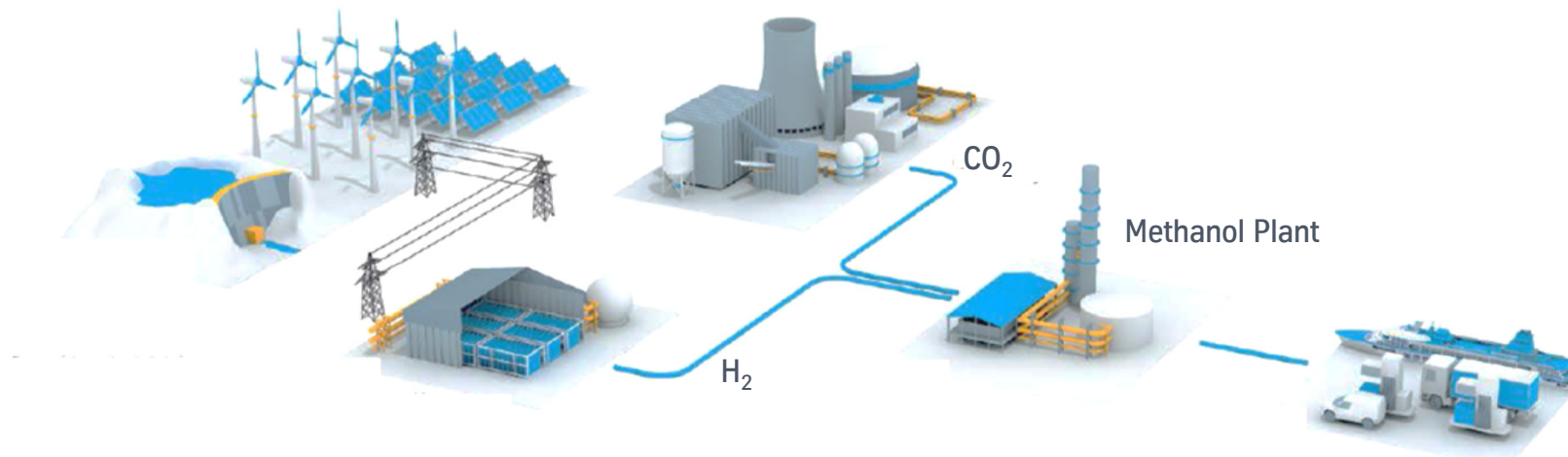
Competitiveness proven by a large number of projects won under competitive bidding in recent years



3. Silicon Fire / UHDE Technology for “Green Methanol” plants

Business idea for small scale plants

- Storage of green power as green fuel
- Replacement of fossil gasoline
- Decentralized production in direct proximity to power plant substation, no transmission losses
- CO₂ compensation
- Production independent from oil or fuel imports
- Increased economics of renewable power generation

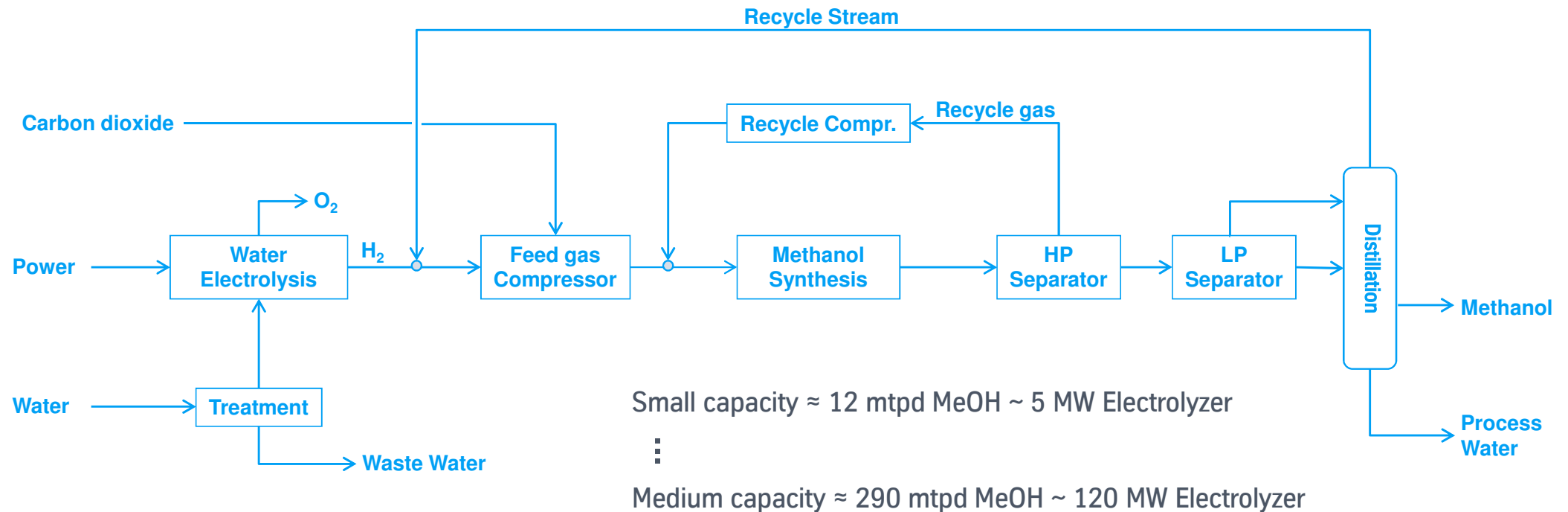


Green Methanol directly utilized as fuel



3. Silicon Fire / UHDE Technology for “Green Methanol” plants

Plant configuration optimized for small and medium capacities

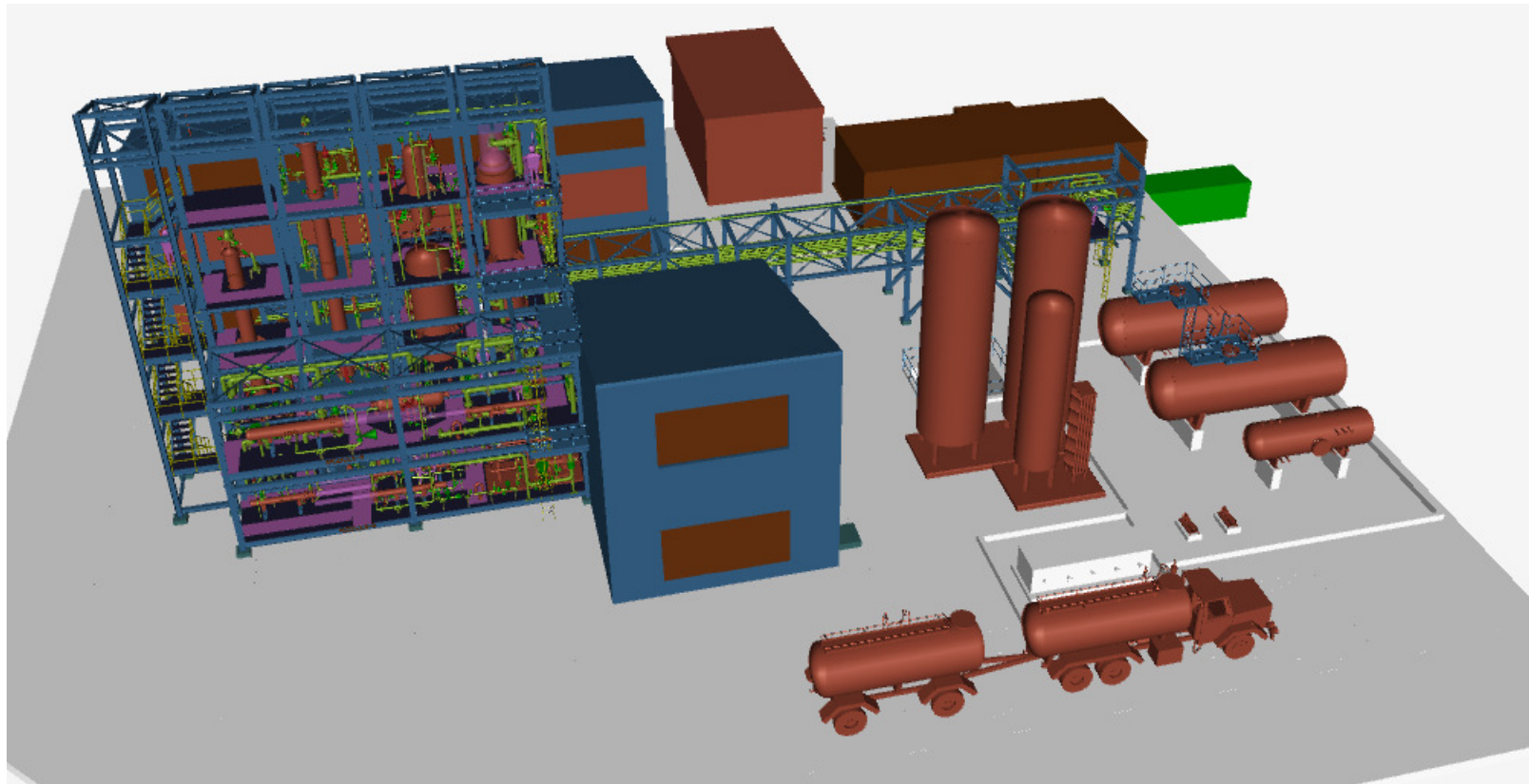


Silicon Fire / UHDE Technology is an advanced technology for small and medium scale methanol plants



3. Silicon Fire / UHDE Technology for small scale “Green Methanol” plants

Advanced modularized concept optimized for small capacities



Modularization improves economics, all truckable, first capacity template ready to implement



3. Silicon Fire / UHDE Technology for small scale “Green Methanol” plants

Typical project – recent example

- ❑ Plant type: Methanol from CO₂ and H₂
- ❑ Technology: Methanol: Silicon Fire / UHDE Technology
Water Electrolysis: thyssenkrupp Industrial Solutions
- ❑ Production capacity: 12 mtpd fuel grade methanol
- ❑ Typical scope of supply: EPC LSTK
- ❑ Total Investment incl. O&U: low double digit Mio. € overall
- ❑ Shortest implementation period due to pre-configured plant concept
- ❑ Consideration of architectural necessities in protected landscapes possible
- ❑ Service agreement starting with temporary operations support, new agreement for full O&M services under negotiation.

Economics strongly depend on local conditions



4. Site seeing thyssenkrupp Industrial Solutions

More than 2,000 built plants around the globe

Fertilizers



Nitric acid



Refineries



Aromatics



Hydrogen, ammonia, methanol



Organic chemicals, petrochemicals



Plastics, synthetic fibers



Polyester, polyamides



Electrolysis / electrochemical technologies



Coke plants



Gasification



Industrial plants



Thank you for your attention!



Backup - Silicon Fire / UHDE Technology for “Green Methanol” plants

Exemplary Offsite & Utilities for small capacities

