thyssenkrupp – target portfolio defined for turnaround and true performance culture

Reporting structure as of October 01, 2020

Group of Companies

<table>
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<tr>
<th>Stand alone</th>
<th>Dual Track Stand alone or industry consolidation</th>
<th>Multi Tracks</th>
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<tr>
<td>Materials Services</td>
<td>Steel Europe</td>
<td>Multi Tracks1</td>
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<td>MX</td>
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<td>Industrial Components</td>
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<td>Automotive Technology</td>
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<td>Forged Technologies</td>
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<td>Infrastructure</td>
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Sales: €9.9 bn
EBIT adj.: €(85) mn

Stand alone Sales: €2.1 bn
EBIT adj.: €139 mn

Dual Track Sales: €7.0 bn
EBIT adj.: €(820) mn

Multi Tracks Sales: €5.5 bn
EBIT adj.: €(593) mn

1. HP: Heavy plate (SE); Infrastructure: Technical Services excl. Mill Services & Systems (MX); SP: Springs & Stabilizers (AT); BTS: OU Battery Solutions (SY); PTS: OU Powertrain Solutions (SY); AST: Acciai Speciali Terni, stainless steel production and stainless distribution (MX); CPT: Chemical Plants, MIN: Mining, CEM: Cement (PT), CC: Carbon Components
2. Prof-forma based on FY 2019/20
3. Adjustments according to stricter guideline special items as of October 01, 2020
Thyssenkrupp Alkaline Water Electrolysis - Hydrogen technology

Sales FY 2019/20 ~€1.6 bn
tk UCE - leverage leading position in Chlor-Alkali electrolysis for Alkaline Water electrolysis ($H_2$)

History in the water electrolysis process portfolio

- tk Uhde® Chlorine Engineers (JV with DeNora) - established leader in chlor-alkali electrolysis
- In 2016 chlor-alkali technology was basis for alkaline water electrolysis
- First industrial reference (pilot plant) for hydrogen production in 2018 at tk’s steel plant in Germany (2 MW capacity at Carbon-to-Chem (C2C) site)

**tk UCE – #1 supplier in electrolysis market**

**Technical Highlights**
- >300,000 of elements manufactured\(^1\)
- >1.6 million m\(^2\) of electrodes produced\(^1\)
- Introduction of high efficiency anode/cathode design and coating (with DeNora) for hydrogen evolution, proven in chlor-alkali technology
- Optimized high-performance separators and diaphragms based on proven design

**Unique Selling Propositions (overall)**
- 10 GW electrolysis cells supplied
- >1 GW p.a. manufacturing capacity
- Fully modularized and automated
- Long lifetime
- Predictive maintenance
- Worldwide service network
- Proven technology for large-scale solutions
- Integrated power-to-X solutions
- One-Stop-Shop

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\(^1\) For chlor-alkali plants producing hydrogen as co-product

Main suppliers of CA membrane technologies
Global IEM CA Market Shares based on installed capacity;
CA = chlor-alkali; free accessible markets only;
Source: tk UCE database (as of 2019)
Our technical experience and capabilities: industrial scale EP/EPC Chlor-Alkali electrolysis plants
Products: Chlorine, Caustic Soda, Hydrogen

120 MW
Kunde: KEM ONE
Standort: Lavera, France
Kapazität: 400,000 t/a Cl₂

100 MW
Kunde: Tessenderlo
Standort: Belgium
Kapazität: 306,000 t/a of NaOH
272,000 t/a Cl₂

20 MW
Kunde: PCC Rokita SA
Standort: Brzeg Dolny, Poland
Kapazität: 62,285 t/a Cl₂

80 MW
Kunde: Vestolit
Standort: Marl, Germany
Kapazität: 236,900 t/a of NaOH
210,000 t/a Cl₂
Transition of existing hydrogen demand to “green” alone requires significant electrolysis capacities.

Today’s hydrogen market is to a major extent grey

Market sizes 9.8 EJ = 2784 TWh

- Natural gas: 48%
- Oil: 30%
- Coal: 18%
- Electrolysis: 4%
- Ammonia: 45%
- Methanol: 18%
- Refining: 27%
- Other/New applications: 10%

Already 600 GW
Green chemical value chains and markets will develop
Water electrolysis the enabler of growing (green) hydrogen markets

Applications

Power-to-fuels (SNG, Methanol, GTL)
- Chemical feedstock
- Carbon-neutral fuels in mobility and heat applications
- Re-electrification (long-term storage)
- Methanol as energy carrier for hydrogen

Power-to-hydrogen
- Chemical feedstock (e.g. power to steel)
- Re-electrification (long-term storage)
- Direct use in mobility applications (fuel cells)

Power-to-ammonia
- Chemical feedstock
- Fertilizer
- Energy carrier for hydrogen or direct use for energy
- Re-electrification (long-term storage)
Water electrolysis market ramp-up and industrial scale plant sizes will lead to significant cost reduction

**Small scale pilots so far**

- Small scale projects, R&D context
- Hydrogen expensive due to high specific costs
- Little development of scaled technology and supply chains
- No commercial hydrogen offtake

**Industry scale solutions commencing now**

- Refineries and ammonia plants request large volumes
- Scaling reduces hydrogen costs below benchmark of 2 €/kg: supply chains, highly efficient equipment, efficient project development
Large scale industrial projects with tk as supplier for water electrolysis

**Smart Solutions for Climate Protection — Carbon2Chem**

**“Westküste 100” Project, Germany – industrial scale**

- **Phase 1:** 30 MW electrolysis
- **Phase 2:** 700 MW electrolysis, green methanol and fuel for aviation
- **Location:** Heide, Germany
- **Funding:** by BMW
- **RE Feed:** Offshore wind
- **Concept:** Green hydrogen feedstock to refinery of Heide
  Green methanol / fuel production by refinery
  Green hydrogen for fueling stations
- **Startup:** 2023

**“NEOM” Project, KSA – industrial scale**

- **Phase 1:** 20 MW electrolysis
- **Phase 2:** 2 GW electrolysis
- **Location:** NEOM, KSA
- **RE Feed:** Wind and PV
- **Concept:** Green hydrogen feedstock to green ammonia
  Green ammonia as energy carrier
- **Startup:** 2026 (Phase 2)

**Location of Carbon2Chem® Technical Center at thyssenkrupp Steel site in Duisburg**

**“Carbon2Chem“ Project, Germany**
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