ABB blending and formulation – Partner conference

Winning together

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ABB group A global automation leader





2. A definition of this measure and a reconciliation between this measure and its US GAAP counterpart can be found in the "Supplemental Reconciliations and Definitions" section of the "Financial Information" booklet found under "Q4 2021" on ABB website

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Helping society and industry achieve a more productive, sustainable future

We enable a low-carbon society



We promote social progress We act with integrity & transparency

Successful relationship management with partners require:

- Transparency
- Accountability
- Reliability
- Interdependence

Advantages of functional business relationships:

- Efficiency
- Innovation
- Risks mitigation

Customers satisfaction

World-class performance

ABB technology and partners

Investments with partners signed during 2022





Green Hydrogen At Scale





Hard to abate decarbonization



Electrolysis at scale



Digital twin for CCS¹ infrastructure



Partnering to reinforce, innovate and expand

ABB blending and formulation

Established segments:

- Lubricants
- Greases
- Paints and coatings
- Pulp and paper

Attractive adjacent segments:

- Pharmaceutical
- Food and beverage
- Fragrance and flavor
- Cosmetics
- Detergents



ABB + Coolbrook



01 Burping of fossil fuel

Burning of fossil fuels is the major source of industrial CO2 emissions \rightarrow It needs to stop

03

No electric technologies available to produce sufficient temperatures for key industrial processes

 \rightarrow Green electricity needs to be unleashed

02

Emissions from energy intensive industry have not reduced with the required pace

 \rightarrow De-Carbonization to be accelerated

04

Other solutions to reduce industrial emissions highly expensive and/or lack the required scale

 \rightarrow New innovation needed

The beginning of a clean new industrial era

Our technology has the potential to be the most significant single technology to reduce industrial CO2 emissions globally

We can reduce annual CO2 emissions with more than 2 Gt through electrification in hard-to-abate industrial sectors

The Challenge: Fossil fuels are burnt to generate high temperature heat for heavy industry processes

Coolbrook reactor / heater

2

ABB electric motor

The Solution:

Our technology provides high-temperature heating up to 1,700 degrees based on green electricity and replaces burning of fossil fuel

3.

Coolbrook – the new standard in industrial electrification

Our technologies to reduce industrial CO2 emissions with over 2 Gt annually



RDR to replace fossil furnaces in petrochemical industry with electric reactor to reach 100% CO2 free olefin

- ✓ Higher yield and energy efficiency
- $\checkmark\,$ Zero carbon steam cracking
- ✓ Lower coking

production.

- ✓ Competitive CAPEX and OPEX
- ✓ Compact equipment size



ROTODYNAMIC HEATER™

RDH to electrify industrial process heating in cement, steel, chemicals and beyond

- ✓ 90+% efficiency
- ✓ Zero carbon heating
- ✓ Up to 1,700 °C temperature
- ✓ Competitive CAPEX and OPEX
- ✓ Compact equipment size



Our technologies typical characteristics



Improved yield due to shorter residence time



Smaller footprint

ABB and Coolbrook

Collaborative partnership to reduce emissions in industrial markets

Benefits of our unique partnership



VALUE PROPOSITION

Simplify integration and accelerate uptake of transformative technology that will significantly reduce greenhouse gas (GHG) emissions from the heat intensive industrial processes through electrification

FOCUS SEGMENTS

Steel, Cement, Lime, etc. (RDH) Chemicals and Petrochemicals (RDR) Greenfield and Brownfield



We can cut industrial CO2 emissions by up to 30%

Coolbrook RDR + RDH, electrification

Chemicals + Petrochemicals

- Electrification of steam cracking
- H2 and methanol production from natural gas or biogas
- Etc.

Iron + Steel

- Pre-heating of air to blast furnace
- Provision of heat for H2 based reduction process
- Heating for hot rolling and casting, coking, sintering, etc.

Cement and lime

- Pre-heating for clinker production
- Replacement of burning fossil fuels with electric heating in kilns

Other

- Melting of glass
- Heating for aluminium oxide production
- End of life treatment of waste and residues
- Etc.



Large-scale pilot plant in the Netherlands – December 2022

Main targets of the large-scale pilot project

01 Demonstrate the use of RotoDynamic Heater (RDH) technology for hightemperature process heating with inert gases, such as: air, nitrogen, methane, steam, CO2

02 Demonstrate the RotoDynamic Reactor (RDR) technology and its reliability for hydrocarbon cracking to stakeholders in the petrochemical industry

Validate modelling (fluid dynamics) and design parameters and to establish basis for first customer projects



03

E-motor capacity 800 kW



Technology Scale-up and Commercialization



Ramp-up of organization

March 9, 2023 CERAWeek 2023 2023 ABB. All rights reserved. TRL: Technology Readiness Level (

TRL

9

Commercial Launch (50 MW)

(2025-)

Commercialization and Scale up



Decarbonising heavy industry in gigaton scale – ABB and Coolbrook



March 9, 2023

