



S+C Optimised Profile for Ethylene Furnace Tubes



Bahrain 13th & 14th Feb 2019_ Aurelio Muñoz San Martin

SCHMIDT+CLEMENS



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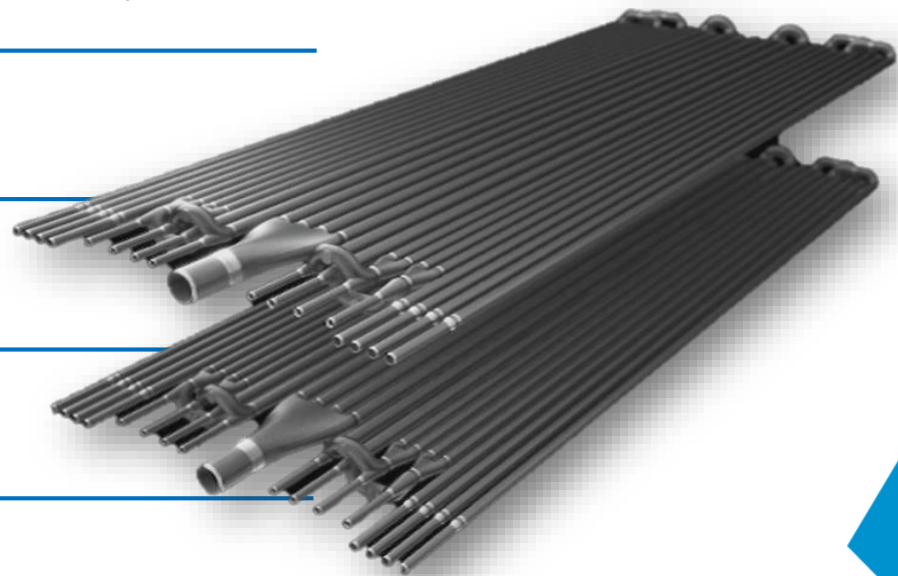
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01-COMPANY FACTS AND FIGURES.



- > Founded 1.879
- > 100% German Family Owned Co.
- > 1.000 Employees.
- > 250 Mo.€ Sales 2.018
- > 5 production Sites.
- > RD+S Oriented

S+C PRODUCTION LOCATIONS

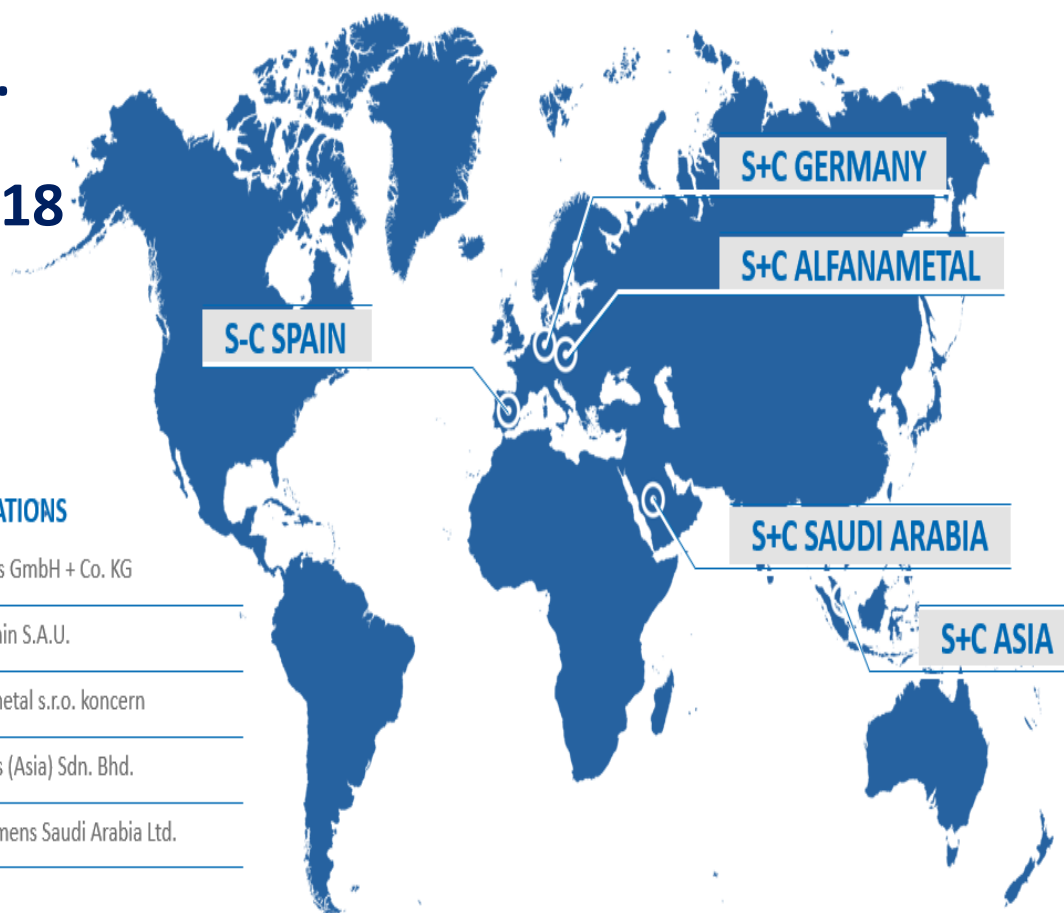
Germany Schmidt + Clemens GmbH + Co. KG

Spain Schmidt - Clemens Spain S.A.U.

Czech Republic S+C Alfametal s.r.o. concern

Malaysia Schmidt + Clemens (Asia) Sdn. Bhd.

Saudi-Arabia Schmidt + Clemens Saudi Arabia Ltd.



01-COMPANY FACTS AND FIGURES.



> 2.000 TUBES/ WEEK !



GERMANY

Schmidt + Clemens GmbH + Co. KG

The headquarters in Lindlar, Germany, is home to three S+C companies. Special steel components and systems are produced .

SPAIN

Schmidt - Clemens Spain
S.A.U.

Schmidt - Clemens Spain is located in Murieta in northern Spain and specializes in the manufacture of spun cast components for petrochemical and DRI plants.



MALAYSIA

Schmidt + Clemens (Asia) Sdn. Bhd.

Schmidt + Clemens Asia is located in Seremban/Kuala Lumpur, where it produces spun-cast components for the petrochemical industry.



02- Anti-Coke Alloy Centralloy® HTE



Due to the special composition of this alloy, a dense, compact & Inert at High Temperature Aluminium oxide layer forms during the running up of the furnace →

“SELF HEALING EFFECT”

YOUR BENEFITS

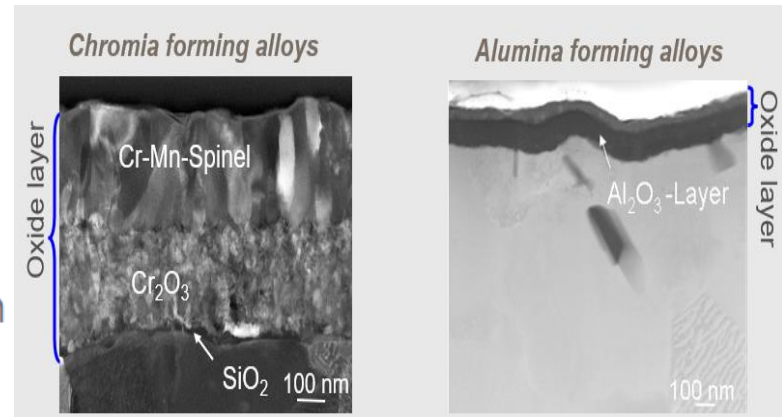
- + Less decoking
- + Longer furnace run times
- + Lower carburisation
- + Higher cracking efficiency
- + Lower energy consumption
- + Longer furnace lifetime

Chemical Composition	Mass. %
Carbon	0,45
Chromium	30,00
Nickel	45,00
Niobium	0,50
Aluminium	4,00
Iron	Balance

Schmidt + Clemens

Centralloy® HT E
MATERIAL DATA SHEET

Data Sheet for information only - April 2009, Rev. 01 - © Copyright Schmidt + Clemens GmbH + Co. KG
Schmidt + Clemens GmbH + Co. KG, Eisenbahnwerk Kasselstr. P.O. Box 1140 - 51778 Linder, Germany



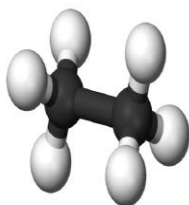
03-Optimised Profile for Ethylene Tubes



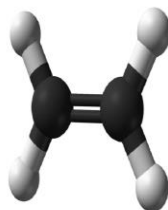
+ 80% Of heat transfer by Radiation.

+ Consequence:

- Hot areas at the “Sunny sides”
- Cold areas at the “Shady Sides”



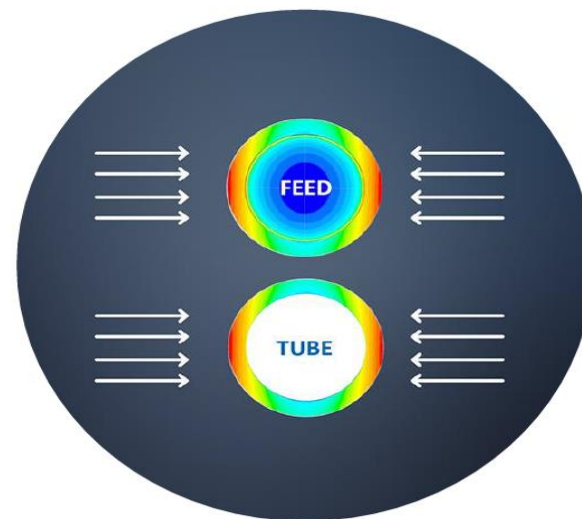
REACTANT



PRODUCT

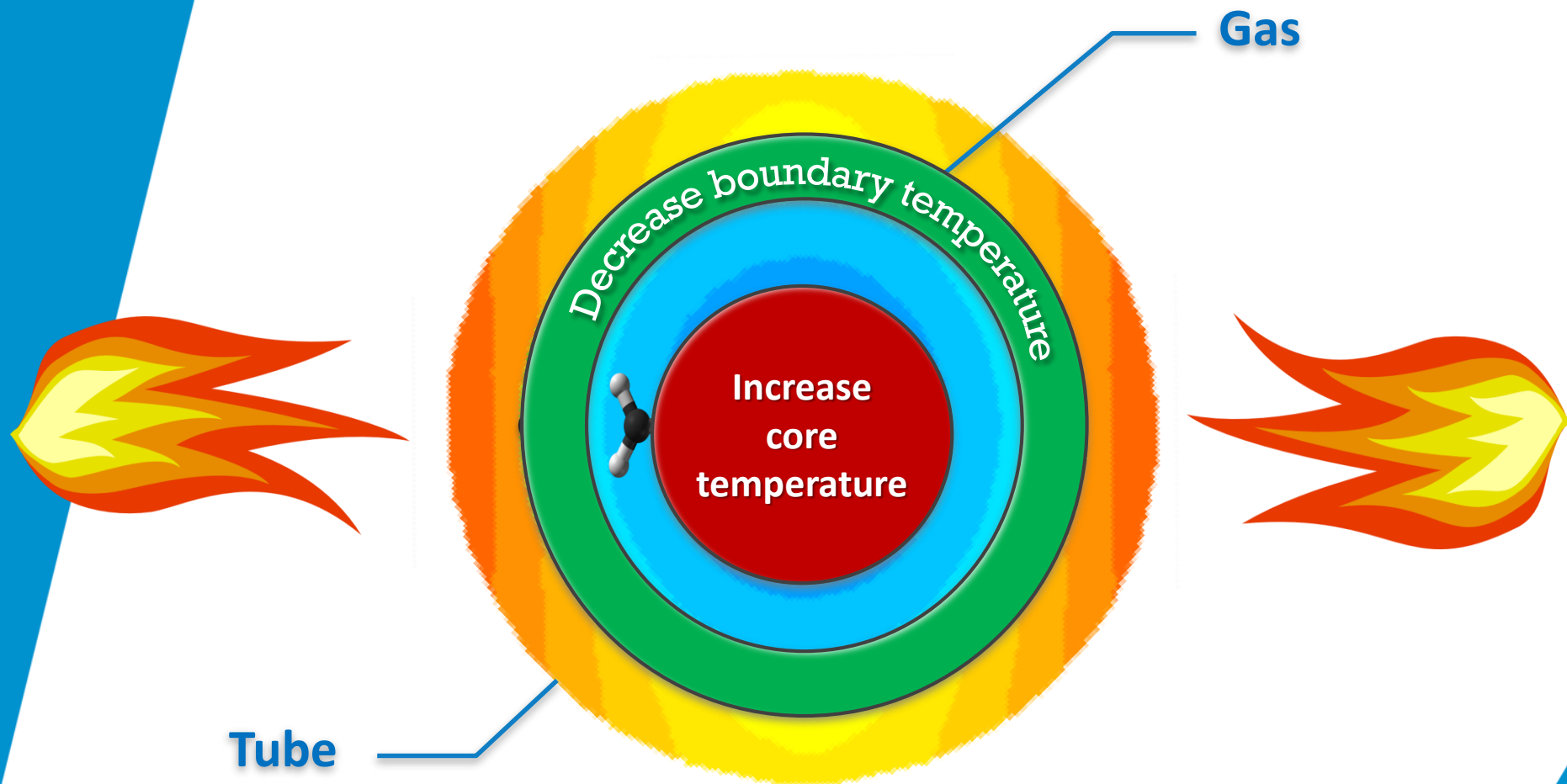


COKE



UNDER CRACKING/OVER CRACKING

03-Optimised Profile for Ethylene Tubes



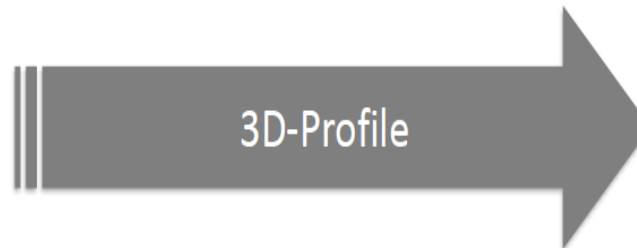
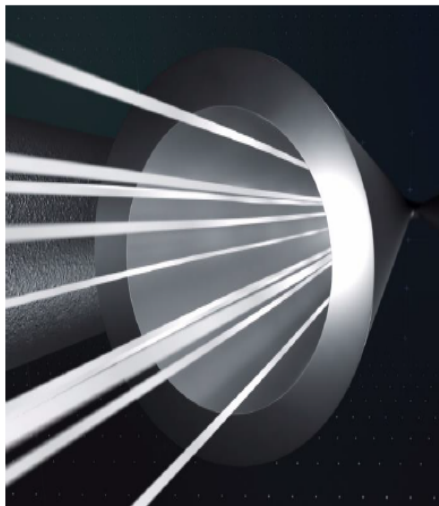
03-Optimised Profile for Ethylene Tubes



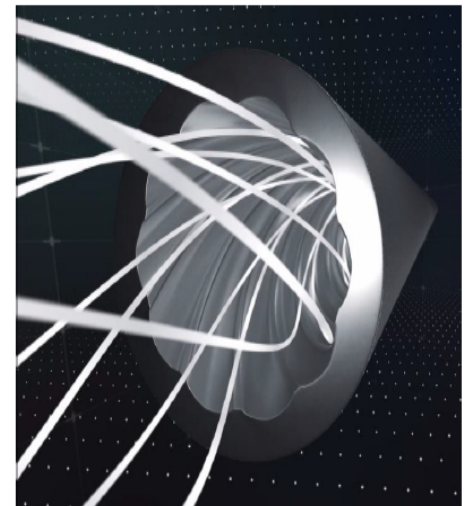
DESIGN CRITERIA

Gas Flow Manipulation

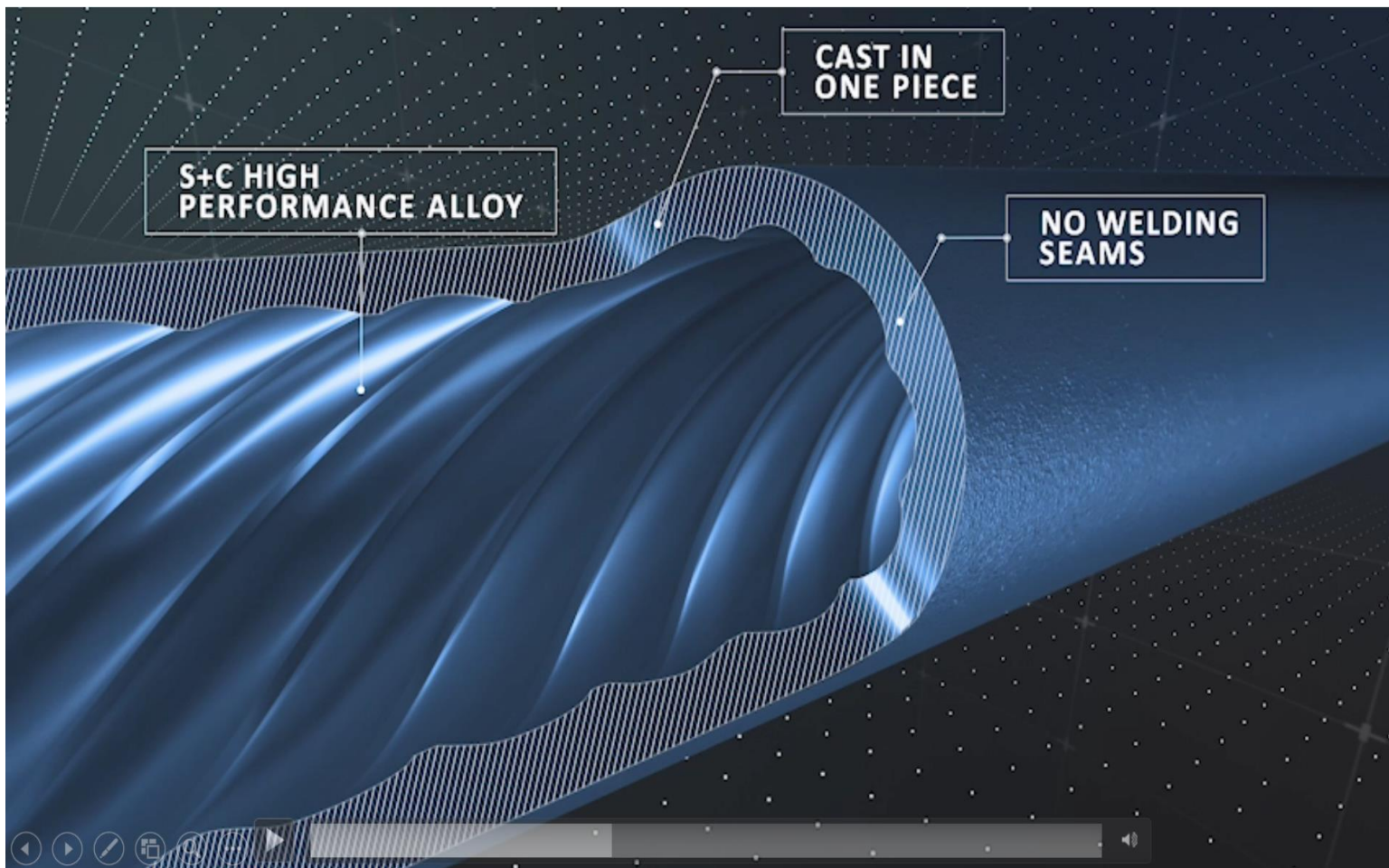
- + decreased temperature gradients
- + increased heat transfer
- + decreased wall temperature



- + low pressure drop
- + no interfacial overcracking areas
- + **feasible production method**



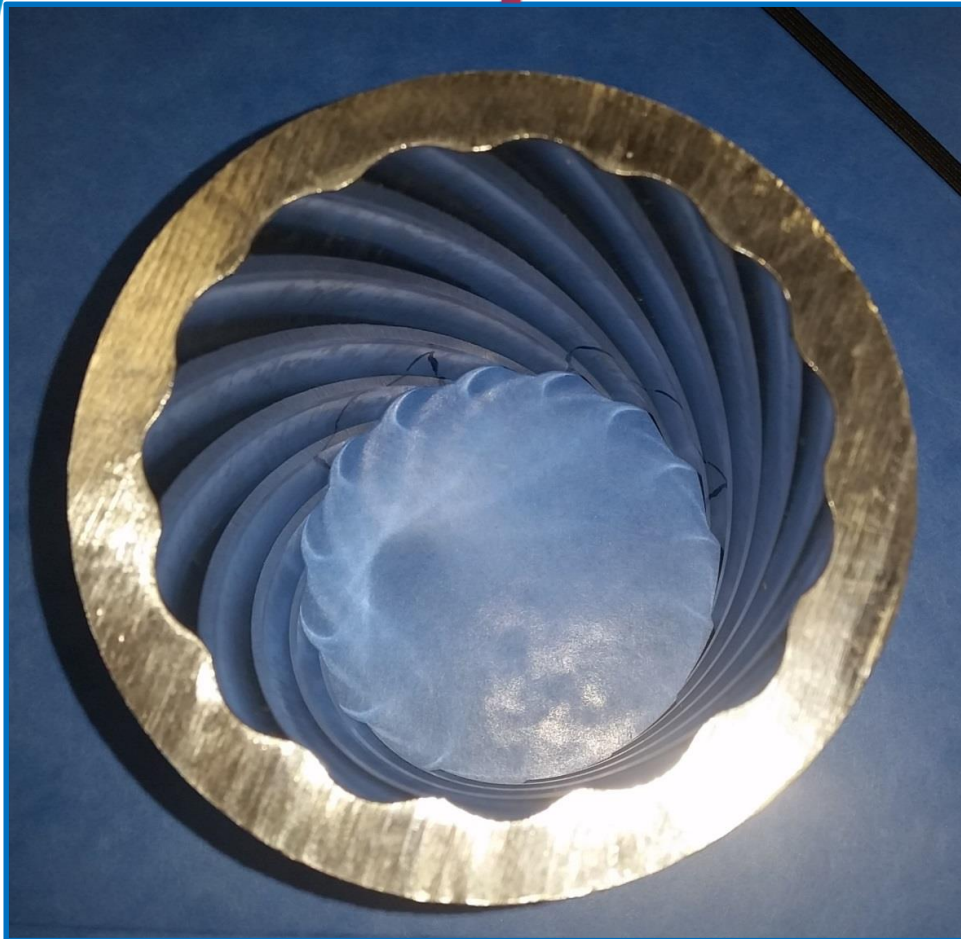
03-Optimised Profile for Ethylene Tubes



03-Optimised Profile for Ethylene Tubes



SCOPE[®]

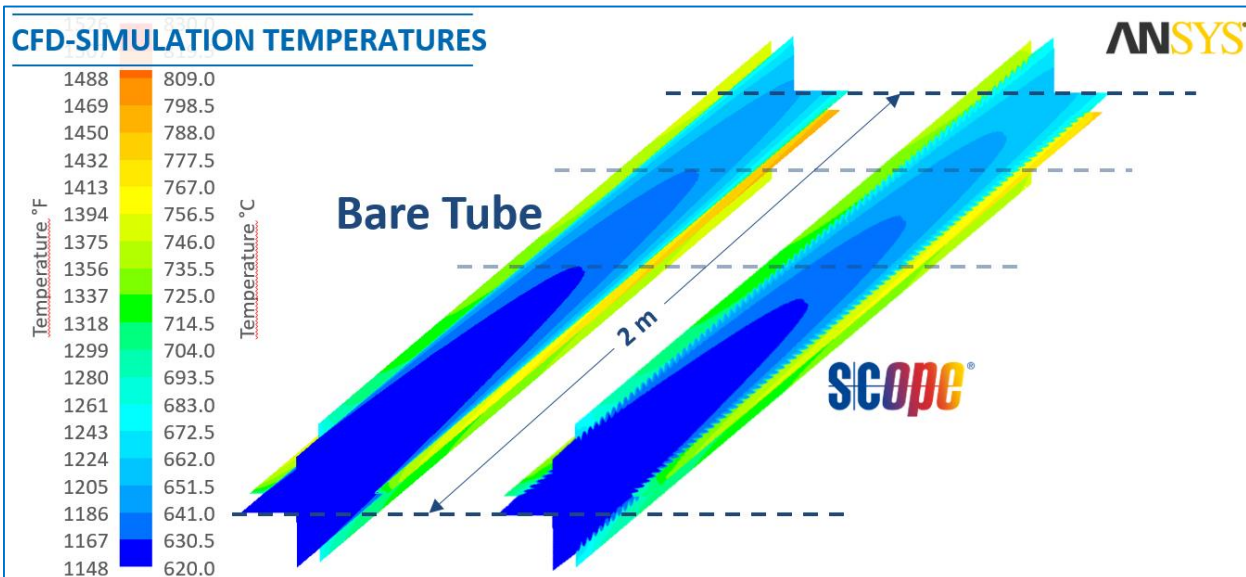
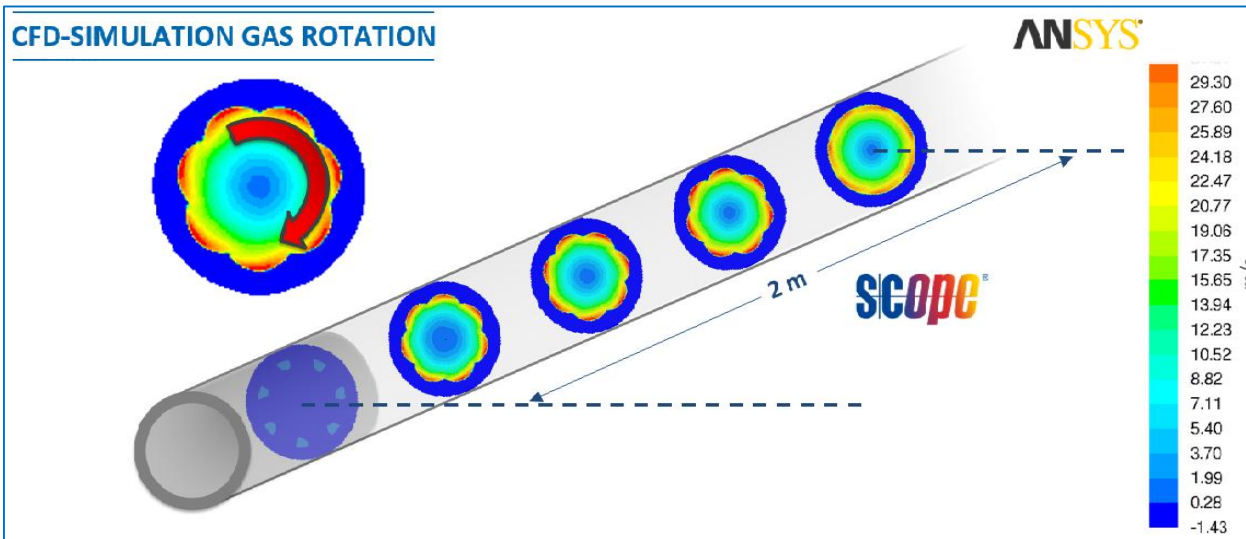


MECHANICAL MACHINING



- + high surface quality
- + cold work introduction
- + profile design flexibility
- + cost-efficient

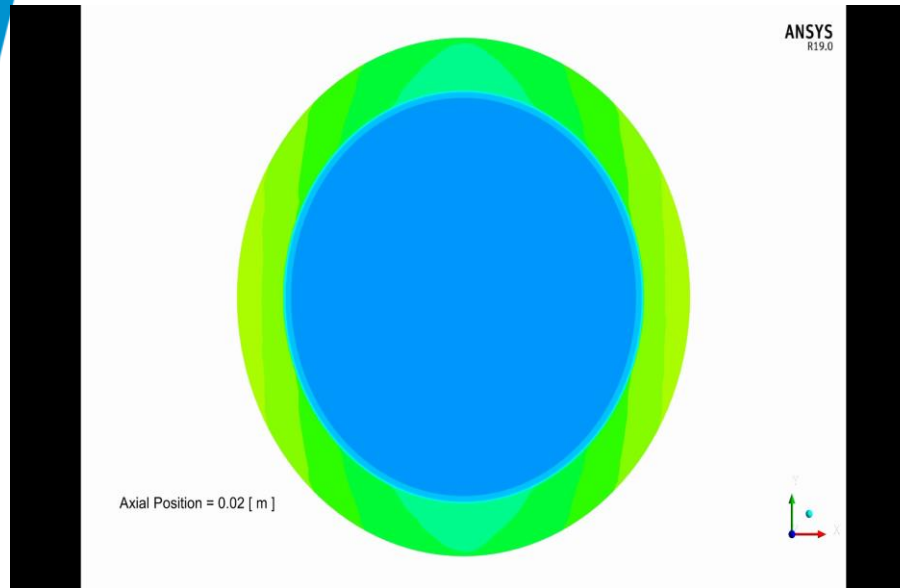
03-Optimised Profile for Ethylene Tubes



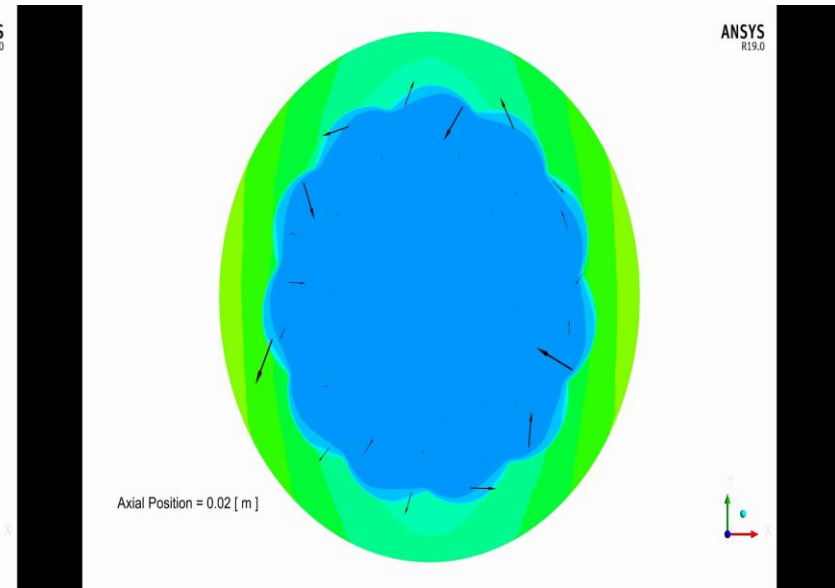
03-Optimised Profile for Ethylene Tubes



CFD-SIMULATION GAS ROTATION



BARE TUBE



scope

03-Optimised Profile for Ethylene Tubes



TAILOR-MADE DETAIL DESIGN

SCOPE[®] has been **designed** to offer the **best balance** between

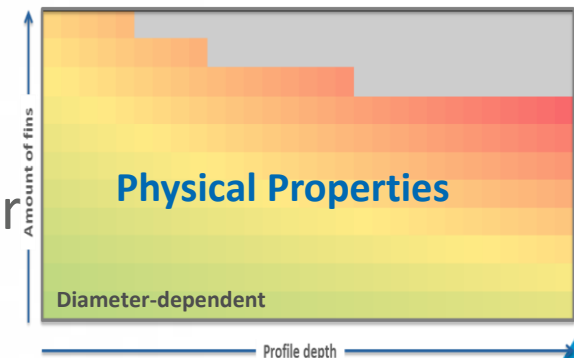
- ✓ Heat Transfer
- ✓ TMT Reduction
- ✓ Gas Temperature Balancing and
- ✓ Pressure Drop

SCOPE[®] design parameters **can be modified**,
emphasizing certain properties of SCOPE[®]

- ✓ to meet **specific furnace demands** in order
- ✓ to further **enhance process performance**



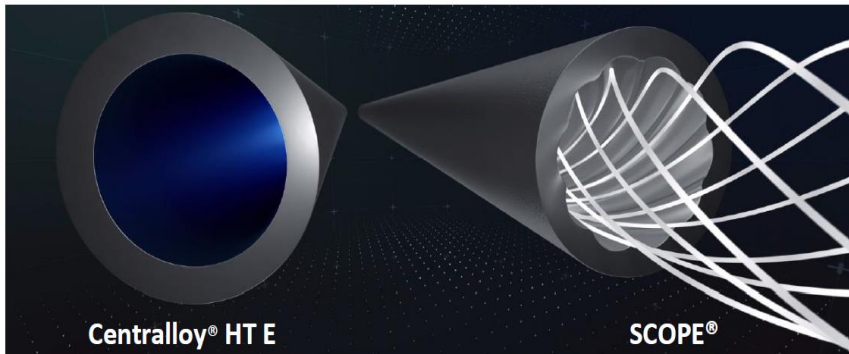
SCOPE Optimisation Heat Maps
Obtained from CFD-Simulations



04-Scope® Fusion HT E



COMBINATION OF TECHNOLOGIES

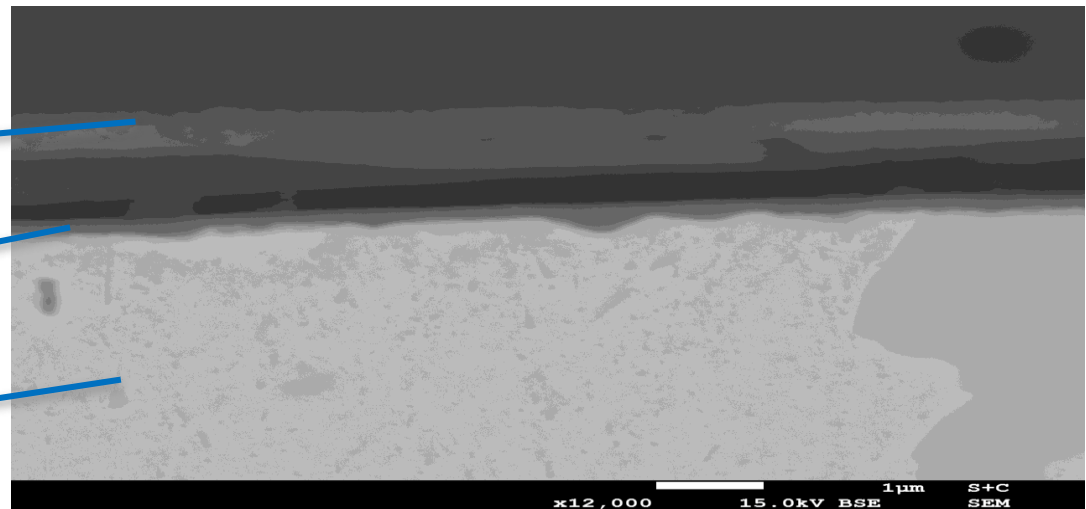
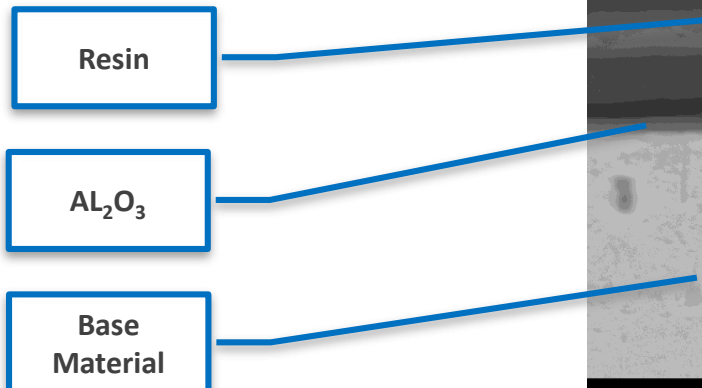
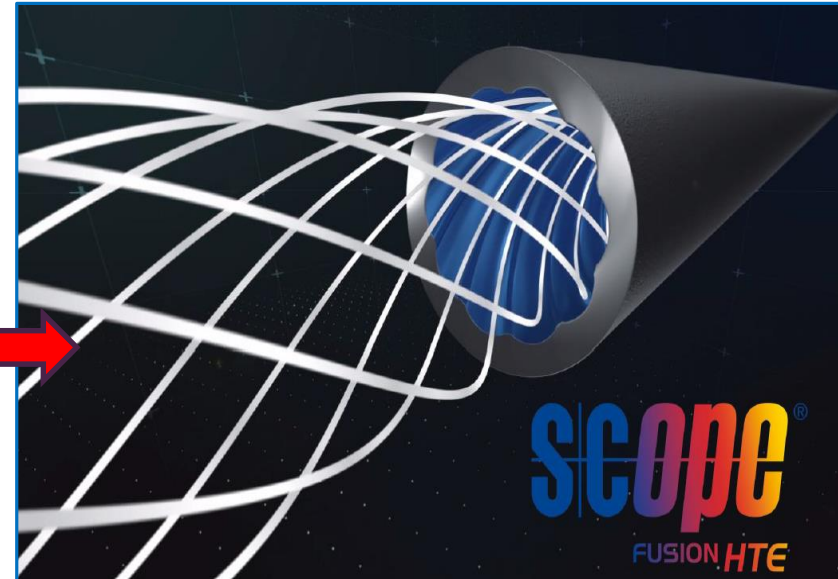


Centralloy® HT E is a material technology providing

- Anti-coking properties
- Higher tube lifetime

SCOPE® is a 3D inner profile technology providing

- Higher heat transfer
- Lower tube metal temperatures
- Gas temperature balancing

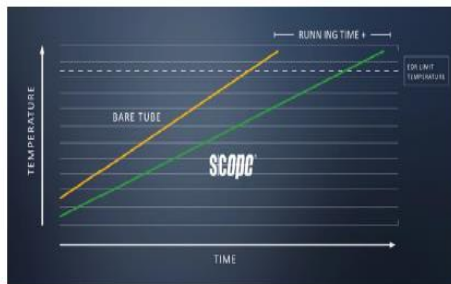


05-Benefits

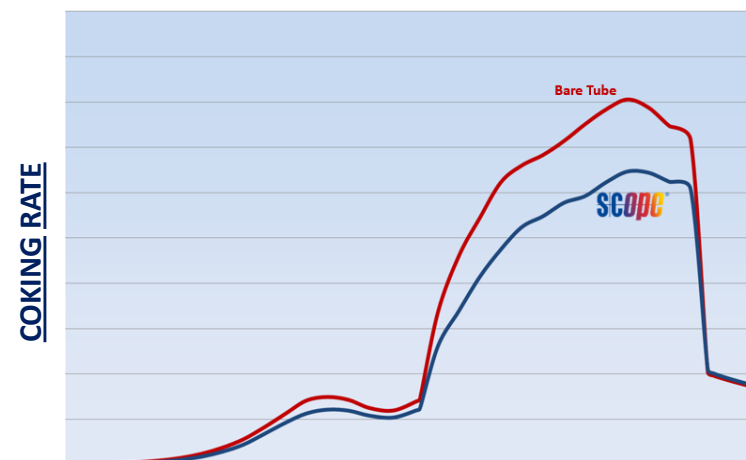
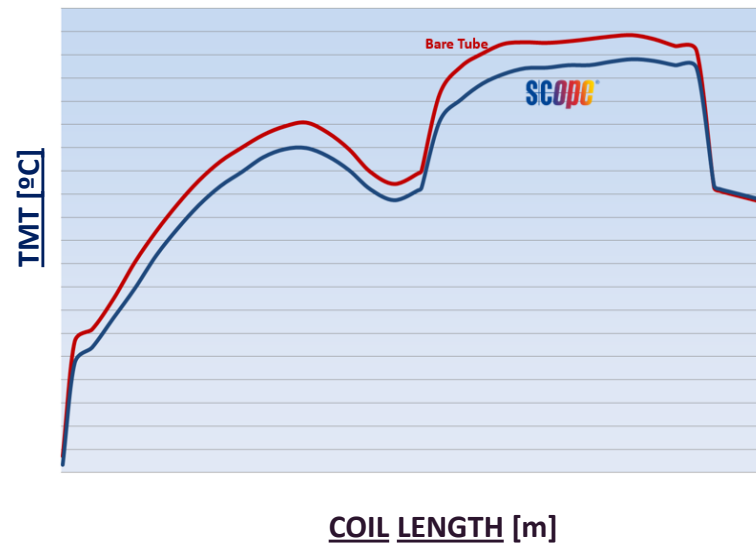
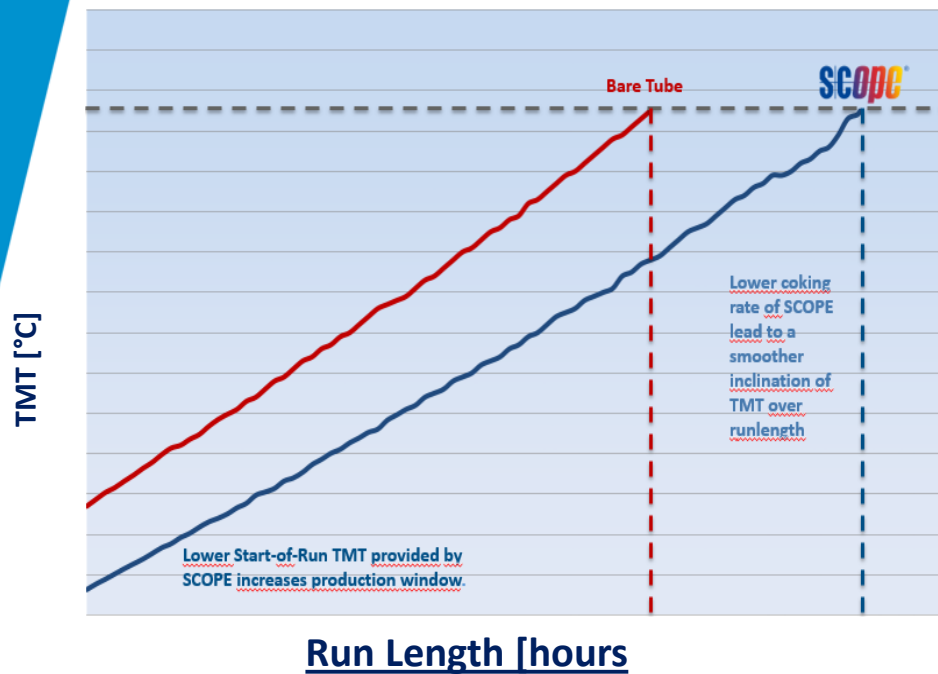
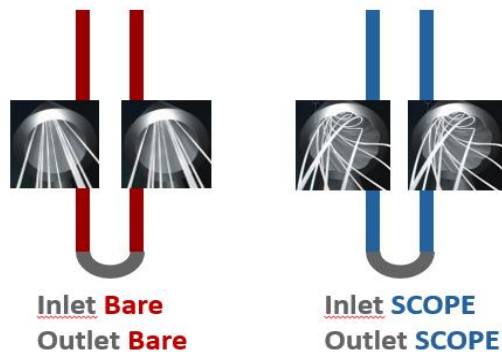


PERFORMANCE MARKS







- + **Increased run length** (lower TMT & coke formation)
by a factor of ~ 1.5 to 2
- + **Higher product selectivity** (gas temperature balancing, less over-/undercracking)
 $\sim 1\%$ more olefins
- + **Increased energy efficiency or higher feed rate/conversion** potential (higher heat transfer)
 $\sim 3\%$ fuel saving or $\sim +10\%$ feed rate or $\sim +2\%$ conversion (based on identical coking rates)
- + **Increased coil life** (lower tube temperatures, less carburization)



05-Benefits



06-References

+ R&D work on Basic Design		1999 - 2003
+ Filing of Worldwide Patents (first grant in 2005)		2003
+ Filing of Worldwide Trade Marks		2005
<hr/>		
+ Plant Installations:		
+ <i>first two coils SRT V (ECM)</i>	ET45M	02.2003
+ <i>full furnace SRT V (ECM)</i>	ET45M	10.2004
+ <i>full furnace SRT V (ECM)</i>	ET45M	12.2004
<hr/>		
+ <i>full furnace SRTV Repeat PO (MM)</i>	ET45M	12.2014
+ <i>full furnace GK2 (MM)</i>		2017
+ <i>Kellogg Millisecond (MM)</i>		2017
+ <i>full furnace GK 4 (MM)</i>		2018
+ <i>Kellogg Millisecond (MM)</i>		2018
+ <i>full furnace PC1-1 (MM)</i>	ET45M	2018
+ <i>Kellogg Millisecond Repeat PO (MM)</i>		2018
+ Demo Furnace → IMPROOF Project.		2019



06-References



Joint, Funded R&D Projects

Funding from European Union H2020 (H2020-SPIRE-04-2016)

A SPIRE project



IMPROOF



GHENT UNIVERSITY

Several of the latest technological innovations in the field of *Fouling Minimization* and *Energy Efficiency Improvement* will be demonstrated at pilot and industrial scale.



THANK YOU !



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