



ENERGY & RESOURCES

CORROSION INHIBITORS WEBINAR

April 2025





John Clements

With a strong background in Chemistry, including a Ph.D. from the University of Texas at Austin, he has built a distinguished career in research and development within the chemical industry. With experience at companies like Huntsman and in academia, he has specialized in applied chemistry and innovation. Since 2014, he has been working as a Senior Research Chemist at Indorama Ventures, contributing his expertise to the advancement of the industry.



Opening



Types of corrosion and inhibitors



Our portfolio



Performance tests



Opening



Types of corrosion and inhibitors



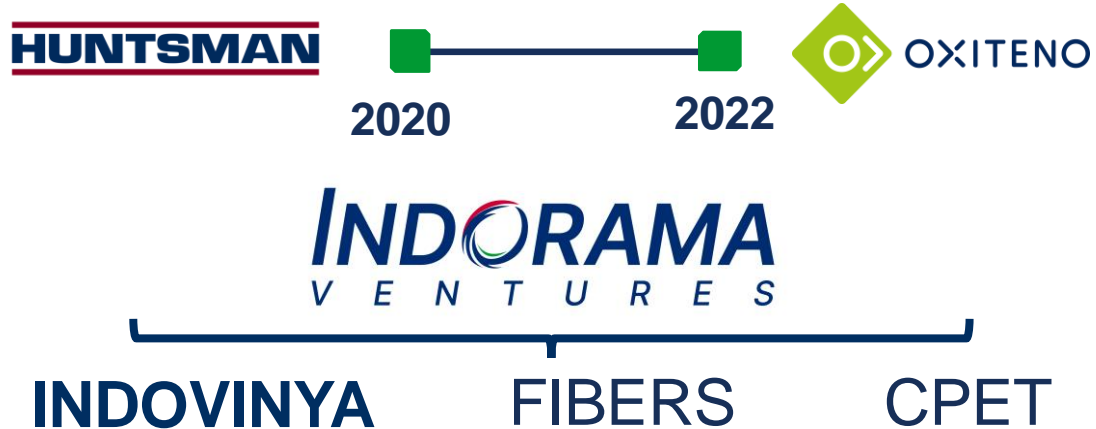
Our portfolio



Performance tests

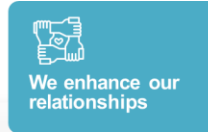


WHO WE ARE



OUR PURPOSE

Reimagining Chemistry Together to Create A Better World



OUR MARKETS



INDOVINYA TODAY

- #1 Surfactant producer in the Americas
- #1 EO Producer in the Americas
- #2 Global Ethoxylation Company
- 10 Countries
- 18 Industrial Units
- 07 Research Centers
- ~3.900 Employees
- ~2,500 Products in the portfolio





Opening



Types of corrosion and inhibitors



Our portfolio



Performance tests

TYPES OF CORROSION

SOUR (H_2S)

Origin: Sulfate-reducing bacteria



SWEET (CO_2)

Origin: CO_2 in reservoir or injected



OXYGEN (O_2)

Origin: O_2 dissolved in water



TYPES OF CORROSION INHIBITION



PASSIVATING

Not used in O&G, work best in low-salinity



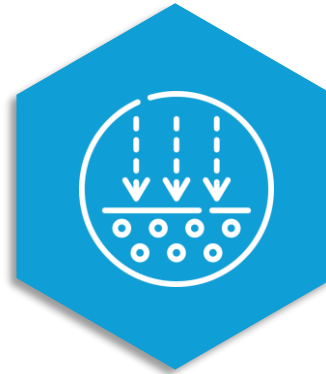
CATHODIC

Not used in production



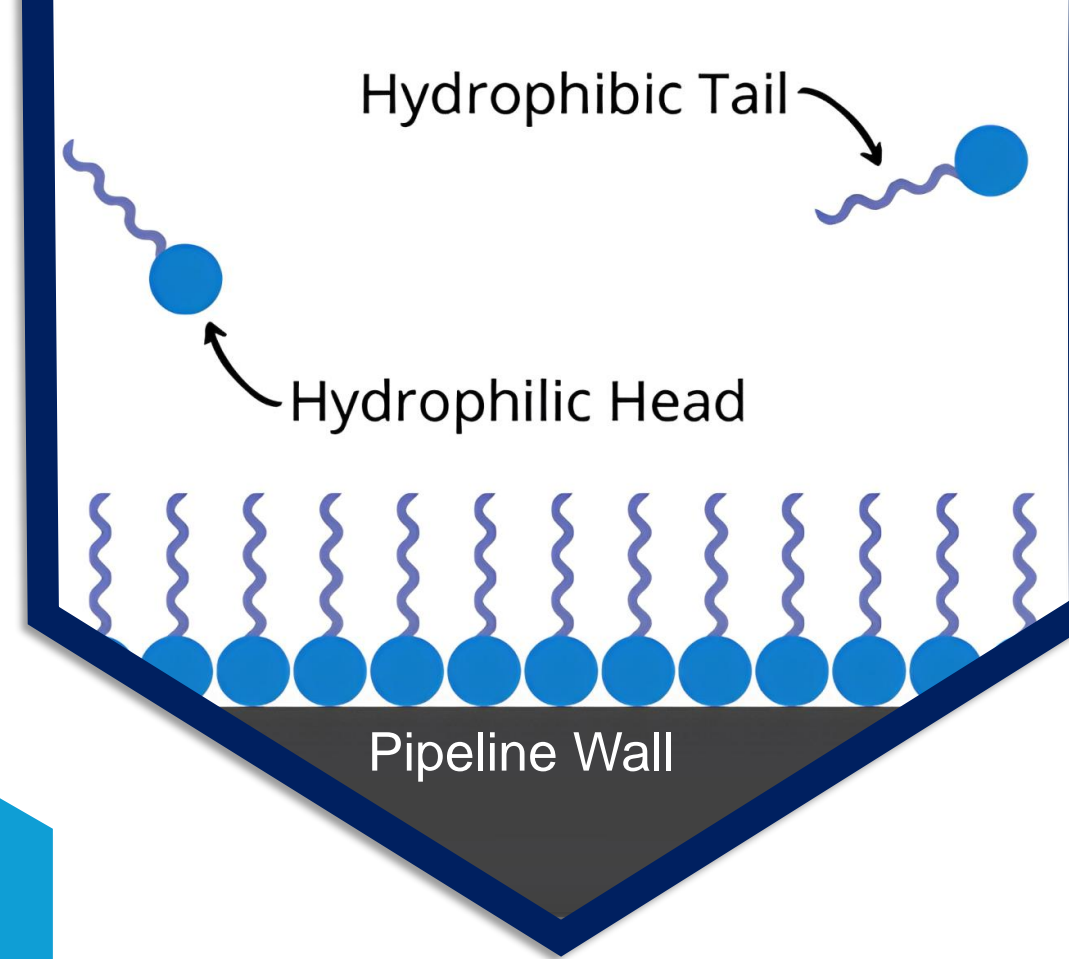
VAPOR PHASE

Organic compounds, most used in wet gas lines



FILM FORMING

Prevention of chloride, CO_2 and H_2S



CHEMISTRIES FEATURES

FEATURE	PRIMARY (Prevent or mitigate corrosion of metal surfaces in contact with corrosive environments.)		SECONDARY (Used in conjunction with primary inhibitors to enhance overall corrosion protection.)		
	IMIDAZOLINES	QUATERNARY AMMONIUM	SULFONATES	ALKOXYLATED AMINES	PHOSPHATES
Corrosion Type	All	CO ₂	CO ₂	CO ₂	CO ₂ & O ₂
Film	Concise	Concise	Weak	Weak	Concise
Mechanism	Film Forming	Film Forming	High-Intensifier	High-Intensifier	Film Forming
T (°C)	High	High	Low to Medium	High	Medium
Shear	Medium	High	High	High	Medium
Brine Tolerance	Medium	High	Low	High	Medium
Cost	Medium	High	Low	Medium	Low





Opening



Types of corrosion and inhibitors



Our portfolio



Performance tests



Corrosion Inhibitors



Secondary

ULTROIL®
CI 1000 Series

Alkoxyated Coconut Amines

ULTROIL®
CI 2000 Series

Ethoxylated Fatty Amine

ULTROIL®
CI 3000 Series

Ethoxylated Fatty Amine

ULTROIL®
CI 5000 Series

Phosphate Esters

Primary

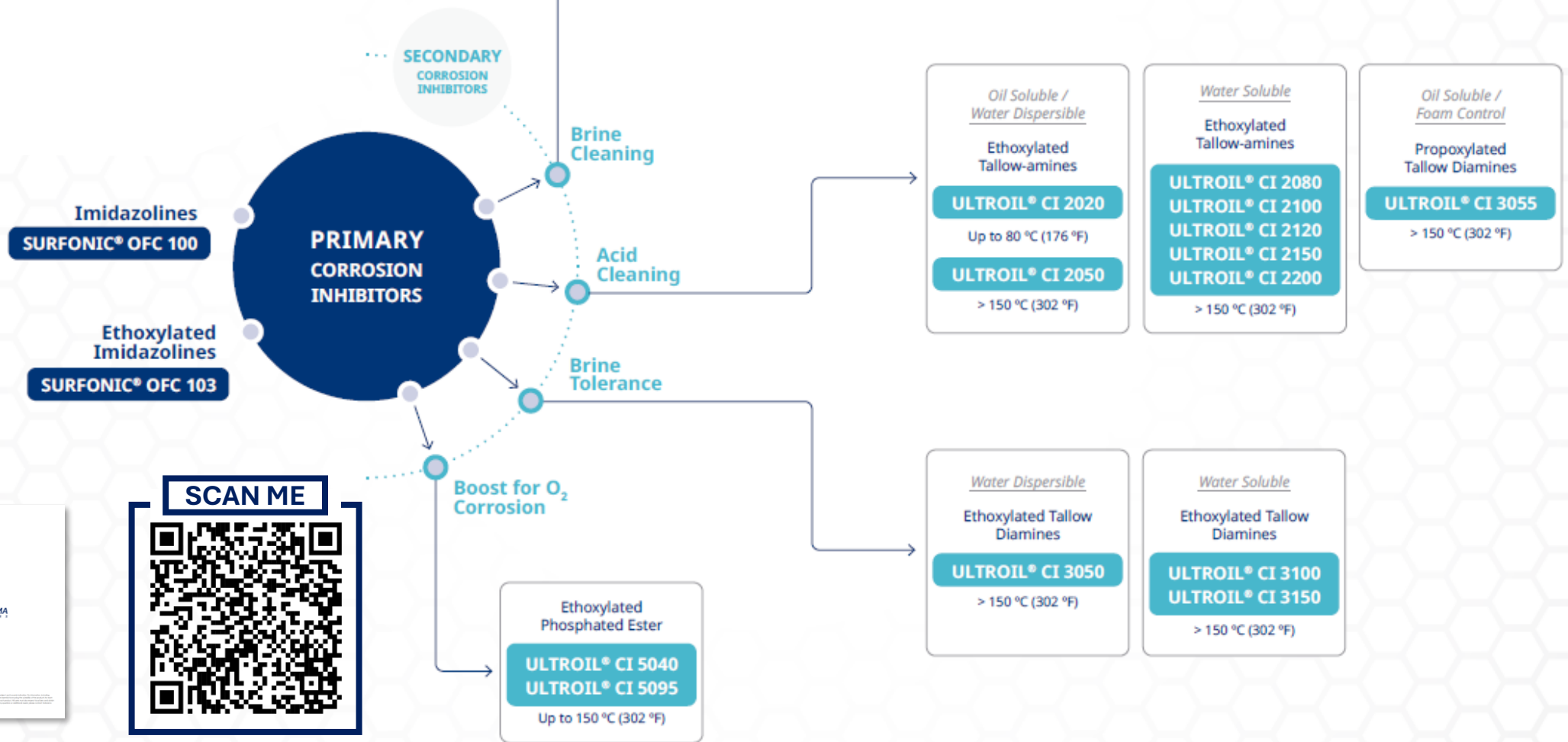
SUPERFONIC®
OFC Line

Alkoxyated Polyamine

Asset Integrity Chemicals



CORROSION INHIBITOR BROCHURE





Opening



Types of corrosion and inhibitors



Our portfolio



Performance tests

PERFORMANCE EVALUATION – BUBBLE CELL TEST

C1018 CARBON STEEL SAMPLE

Metal sample is subjected to corrosion.



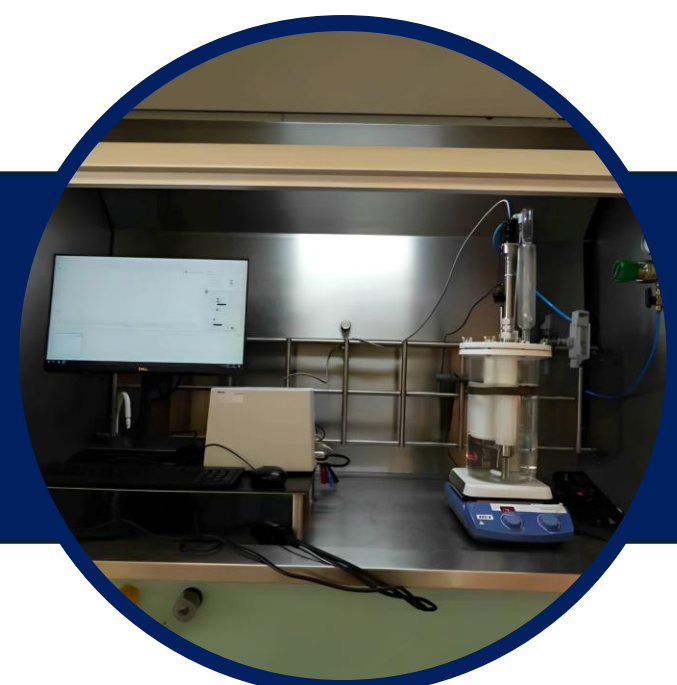
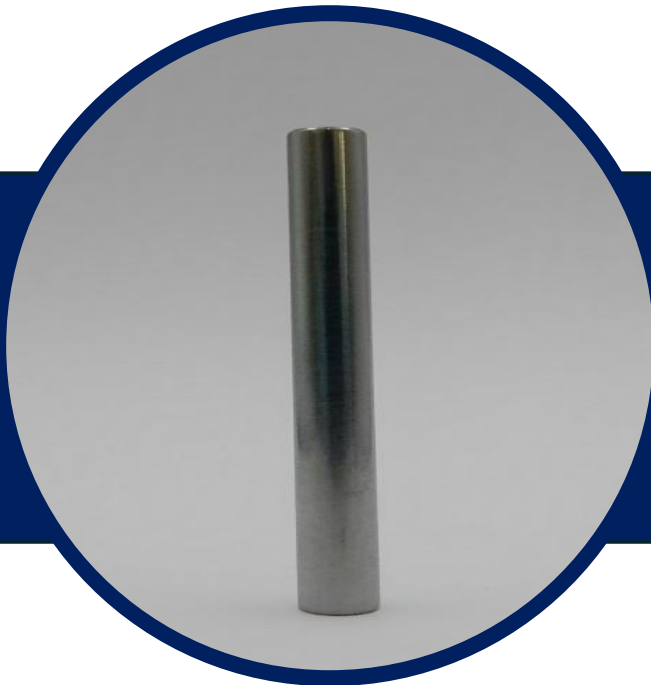
REACTION CHAMBER WITH BUBBLER

Bubbler introduces CO₂ into the liquid, accelerating the corrosion process.



MONITORING SYSTEM

Control system with a computer, which is used to monitor and record data during corrosion testing.



PERFORMANCE TESTS

PURE PRODUCTS



^a 50% of Inhibitor and 50% Solvent ; 25 °C

S = Soluble; P = Partially Soluble; I = Insoluble

PRODUCT	SOLUBILITY ^a				
	Water	Ethanol	MEG	N-Hexane	Kerosene
SURFONIC® OFC 100	I	S	S	S	S
SURFONIC® OFC 103	I	S	S	S	S
ULTROIL® CI 1020	P	S	S	S	S
ULTROIL® CI 1050	S	S	S	S	S
ULTROIL® CI 2020	I	S	S	S	S
ULTROIL® CI 2050	S	S	S	S	S
ULTROIL® CI 2080	S	S	S	S	S
ULTROIL® CI 2100	S	S	S	S	S
ULTROIL® CI 2120	S	S	S	S	S
ULTROIL® CI 2150	S	S	S	I	I
ULTROIL® CI 2200	S	S	S	S	S
ULTROIL® CI 3050	S	S	S	S	S
ULTROIL® CI 3055	I	S	I	S	S
ULTROIL® CI 3100	S	S	S	I	I
ULTROIL® CI 3150	S	S	S	I	I
ULTROIL® CI 5040	I	S	S	S	S
ULTROIL® CI 5095	P	S	I	P	P

PERFORMANCE TESTS

FINAL FORMULATION

80% Water;
3% Acetic Acid;
12% SURFONIC OFC 100 ;
4% ULTROIL CI;



^a 50% of Inhibitor and 50% Solvent ; 25 °C

S = Soluble; P = Partially Soluble; I = Insoluble

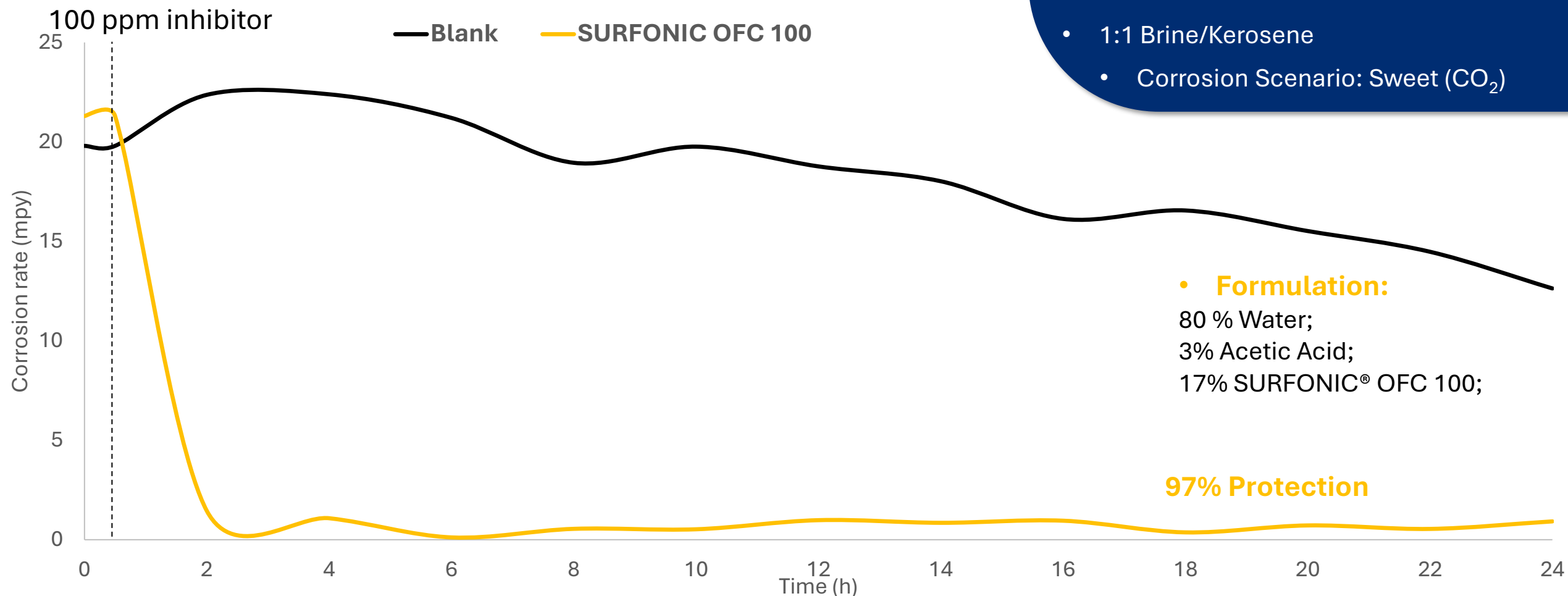
PRODUCT	SOLUBILITY ^a				
	Water	Ethanol	MEG	N-Hexane	Kerosene
SURFONIC® OFC 100	-	-	-	-	-
SURFONIC® OFC 103	-	-	-	-	-
ULTROIL® CI 1020	P	S	I	P	S
ULTROIL® CI 1050	P	S	I	P	S
ULTROIL® CI 2020	P	S	I	P	S
ULTROIL® CI 2050	P	S	S	S	S
ULTROIL® CI 2080	P	S	I	P	S
ULTROIL® CI 2100	P	S	I	P	S
ULTROIL® CI 2120	P	S	I	P	S
ULTROIL® CI 2150	S	S	I	P	S
ULTROIL® CI 2200	S	S	I	P	S
ULTROIL® CI 3050	P	S	I	P	S
ULTROIL® CI 3055	P	S	I	P	S
ULTROIL® CI 3100	P	S	I	P	P
ULTROIL® CI 3150	S	S	I	P	P
ULTROIL® CI 5040	-	-	-	-	-
ULTROIL® CI 5095	-	-	-	-	-

PERFORMANCE TESTS

SURFONIC® OFC 100 - Corrosion test 24 h

TESTS CONDITIONS

- Temperature 60 °C
- 1000 ppm NaCl Brine
- Carbon Steel CO1018
- 1:1 Brine/Kerosene
- Corrosion Scenario: Sweet (CO₂)

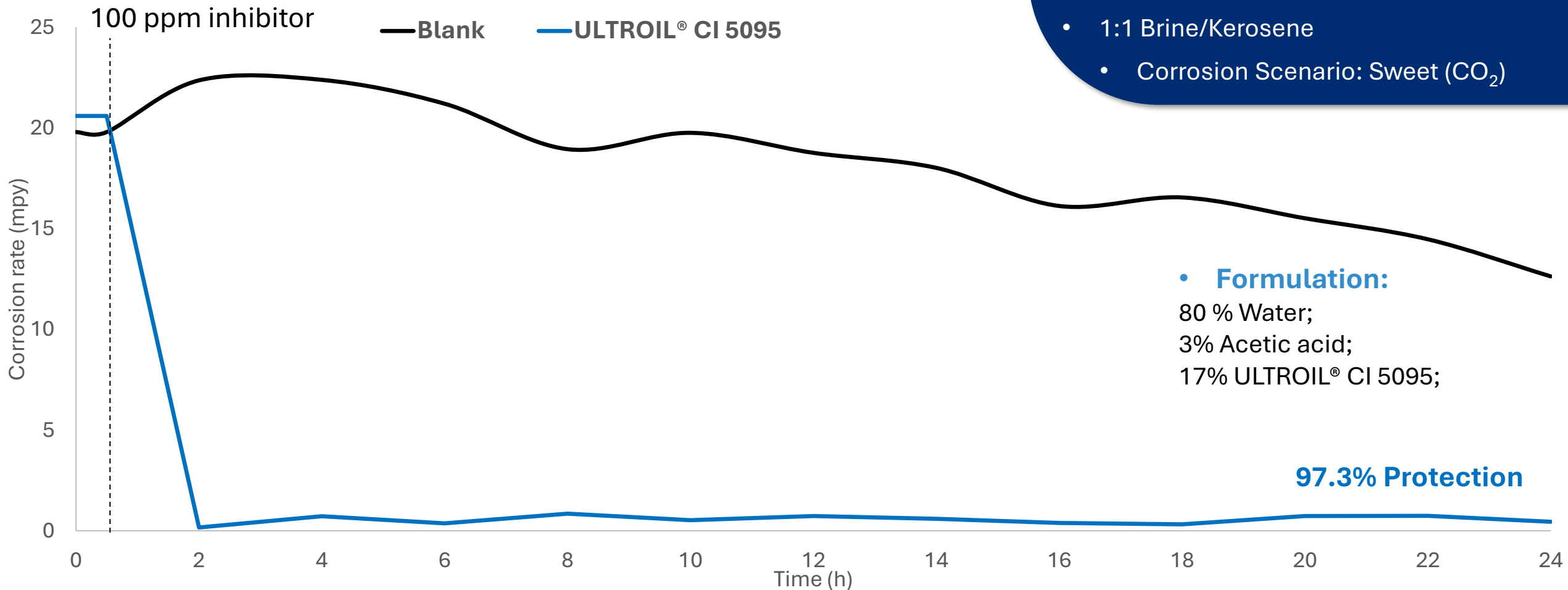


PERFORMANCE TESTS

ULTROIL® CI 5095 - Corrosion test 24 h

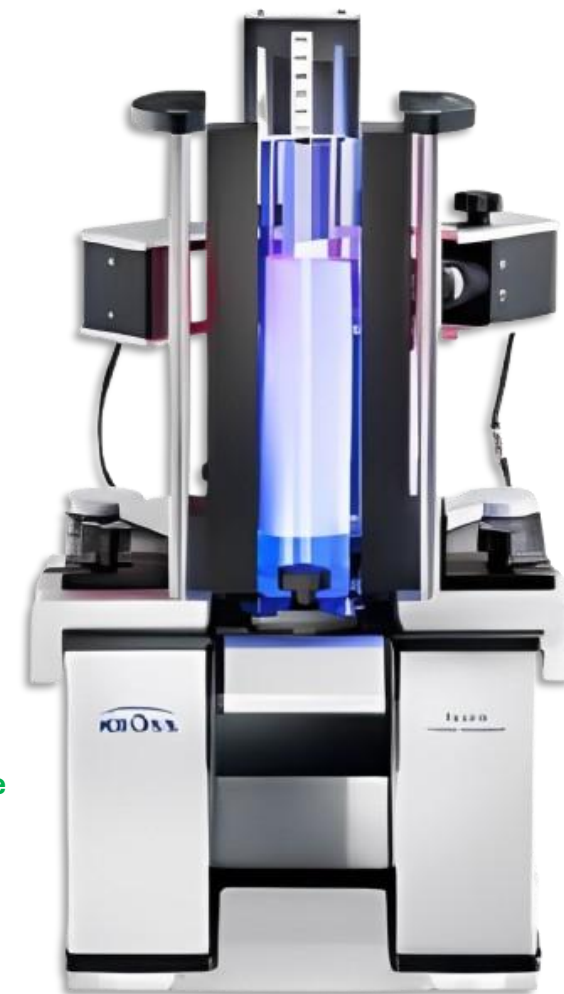
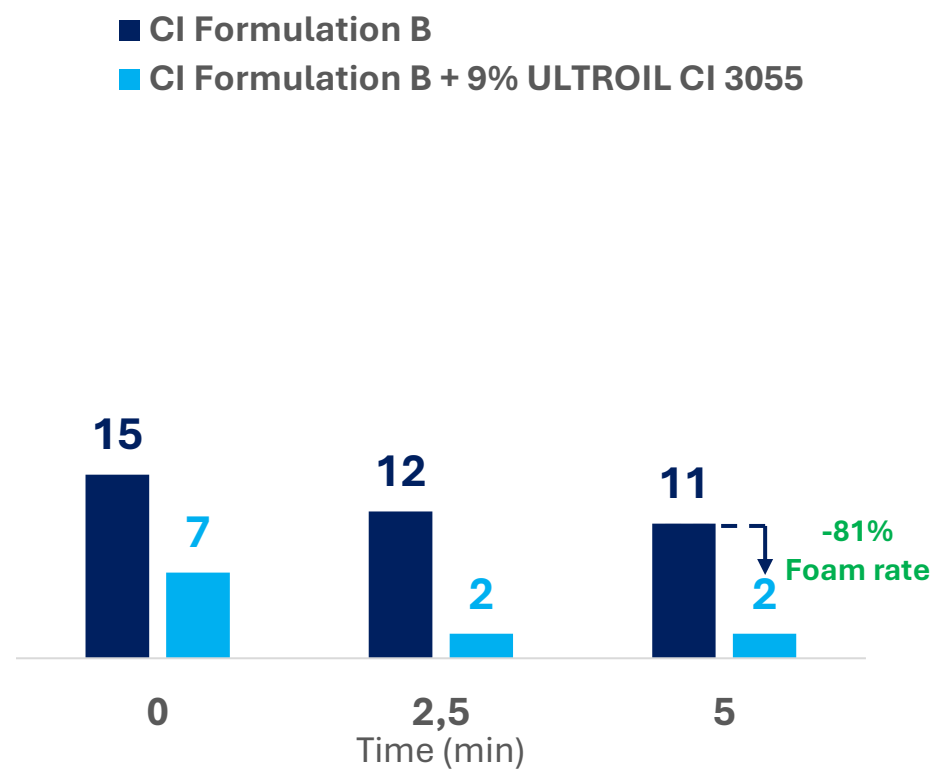
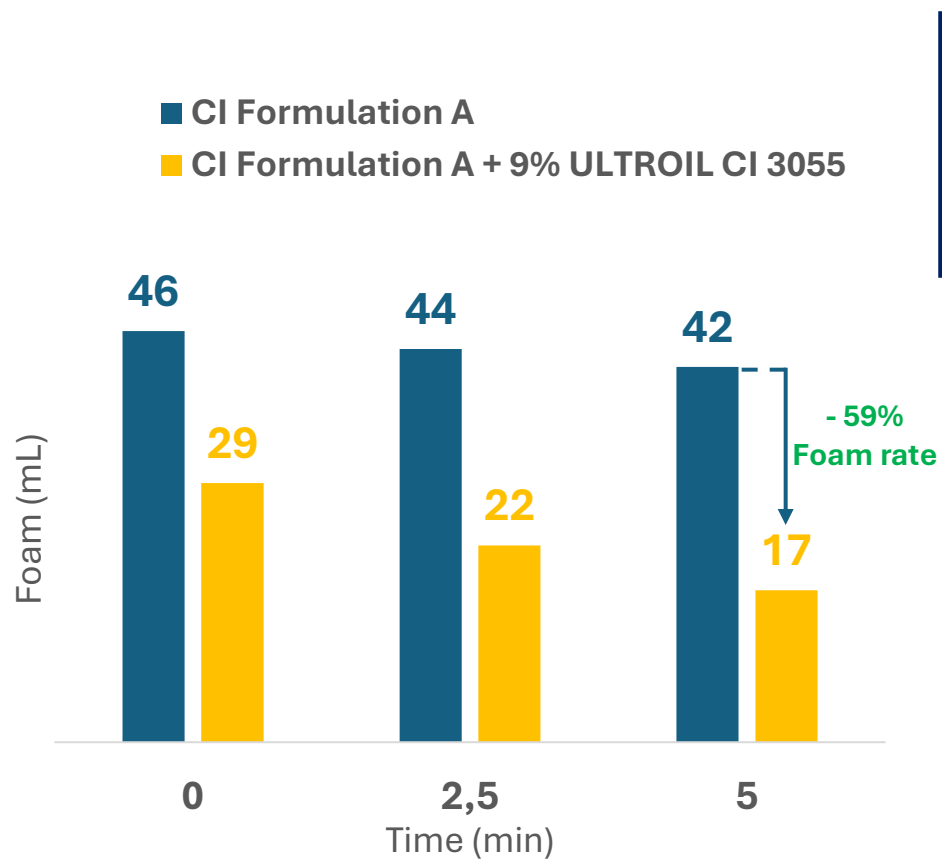
TESTS CONDITIONS

- Temperature 60 °C
- 1000 ppm NaCl Brine
- Carbon Steel CO1018
- 1:1 Brine/Kerosene
- Corrosion Scenario: Sweet (CO₂)



PERFORMANCE TESTS

ULTROIL® CI 3055 – Foam test



PERFORMANCE TESTS

Primary VS Primary + secondary blended

Products	Corrosion rate (mpy)	Performance (%)
OFC 100	3.32	86,00%
OFC 103	5.93	75,00%
CI 5095	0.27	98,90%
CI 5040	0.12	99,50%

TESTS CONDITIONS

- 100ppm inhibitor
- Tests performed at 60 °C
- Carbon Steel CO1018
- Corrosion Scenario: Sweet (CO₂)

- **Formulation 1:**

80 % Water;
3% Acetic Acid;
17% Primary CI

- **Formulation 2:**

80% Water;
3% Acetic Acid;
13% SURFONIC® OFC 100 ;
4% Secondary CI

PERFORMANCE TESTS

Primary VS Primary + secondary blended

Products	Corrosion rate (mpy)	Performance (%)
OFC 100	3.32	86,00%
OFC 103	5.93	75,00%
CI 5095	0.27	98,90%
CI 5040	0.12	99,50%
CI 2050	3.41	86,00%
CI 2120	3.02	87,20%
CI 2020	1.68	92,90%
CI 2080	1.51	93,60%
CI 1050	1.28	94,60%
CI 3055	0.93	96,10%
CI 2200	0.83	96,50%
CI 3050	0.72	96,90%
CI 2150	0.39	98,40%
CI 3150	0.32	98,60%
CI 2100	0.30	98,70%
CI 1020	0.23	99,00%
CI 3100	0.19	99,20%

Reduced corrosion rates

TESTS CONDITIONS

- 100ppm inhibitor
- Tests performed at 60 °C
- Carbon Steel CO1018
- Corrosion Scenario: Sweet (CO₂)

• Formulation 1:

80 % Water;
3% Acetic Acid;
17% Primary CI

• Formulation 2:

80% Water;
3% Acetic Acid;
13% SURFONIC® OFC 100 ;
4% Secondary CI



INDORAMA
VENTURES

Thank you

Energy & Resources team