



**POWER CONVERTERS SINCE 1950**

**Clorosur Technical Seminar**

For over 70 years FRIEM is a leader in the global electric energy converter market. In 1950 Mr. Angelo Pagliai endowed the foundation of FRIEM and today it is headed by the third generation of the shareholders which proofs an important continuity into FRIEM history.



- **Head quarter:** Segrate (Milan) – Italy
- **Founded in:** 1950
- **Product Application:** Power conversion unit
- **Employees:** ≈ 120
- **Turnover:** ≈ 34,5 M€ (2021)
- **Budget** 38,5 M € (2022)
- **Quality Certification:** ISO9001 ISO14001 ISO45001
- **Facilities:** 11000m<sup>2</sup> AREA  
 3800m<sup>2</sup> PRODUCTION  
 2000m<sup>2</sup> OFFICES  
 3 Testing Labs for High Currents

2020



starts to operate FRIEM Latam Eireli, a new FRIEM's subsidiary in Latin America.

2021



FRIEM, one of the top 4 worldwide players in the high power rectifiers for the heavy industry, is also an important player in the energy transition, holding a central position in the green hydrogen supply chain.

2022



FITEC enters with a minority share, intended to speed up FRIEM's growth and investments focused on Green H2.

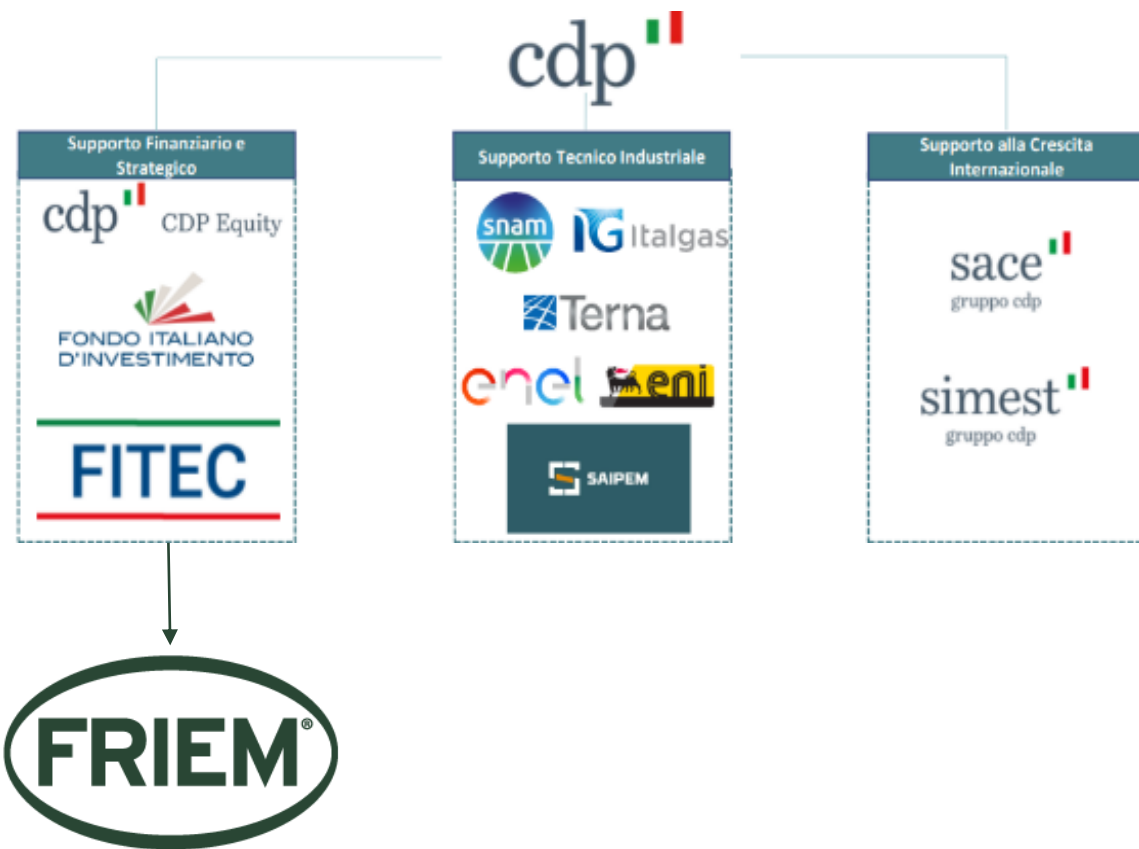
2022



FRIEM acquires DynAmp (USA), international leader for High DC Current measurement systems, a leading electrical technology provider for electro industry.

# New strategic shareholder

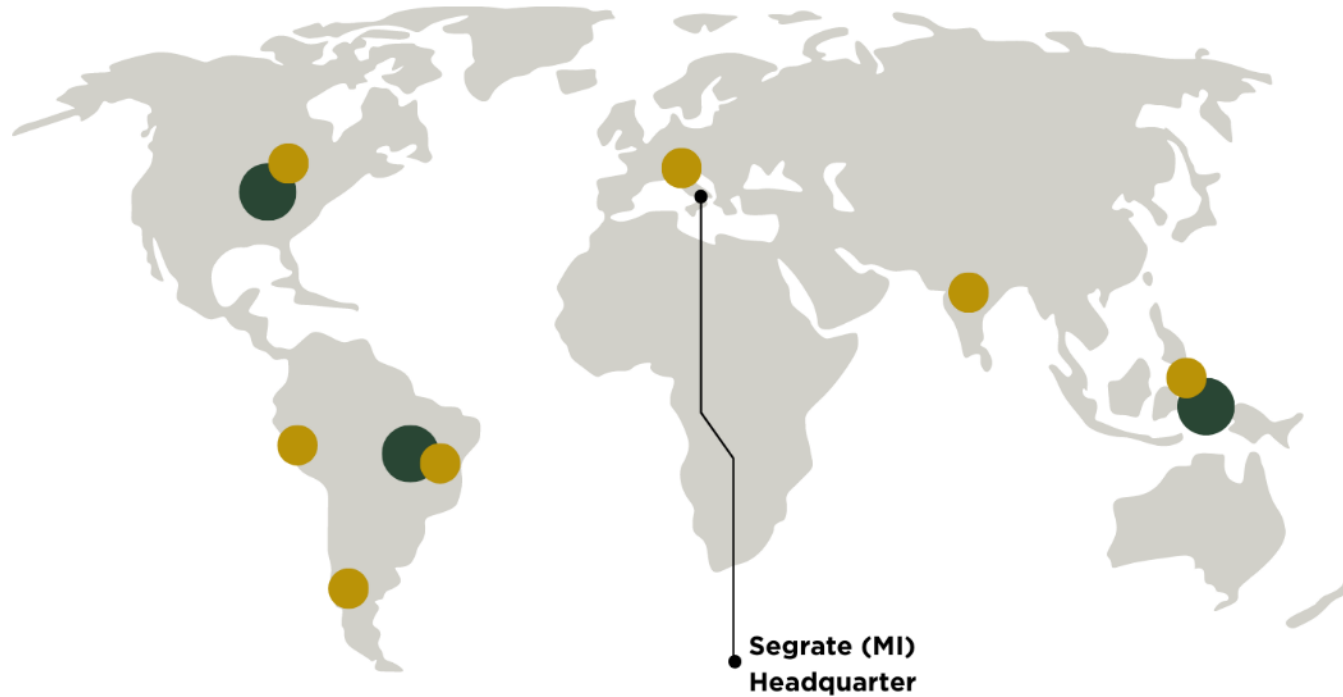
Cassa Depositi e Prestiti (CDP), through CDP Equity – FITEC became shareholder of FRIEM from April 2022 (with a minority stake). CDP is the Italian sovereign fund which, through **CDP Equity - FITEC**, invests on companies with high national/strategic interest level, choosing only one company per sector.



## FITEC's mission

Invest **growth capital in Italian innovative SMEs and VC-backed scale-ups** to support their technology development & expansion plans both in existing & new markets.

# Global reach



## #7 SERVICE CENTRE

FRIEM (Milan, Italy)  
 FRIEM America (Chicago, US) FRIEM  
 LATAM (San Paolo, Brazil) FRIEM Asia  
 (Jakarta, Indonesia) FRIEM India (New  
 Delhi, India) FRIEM Peru (Lima, Perú)  
 FRIEM Chile (Santiago, Chile)

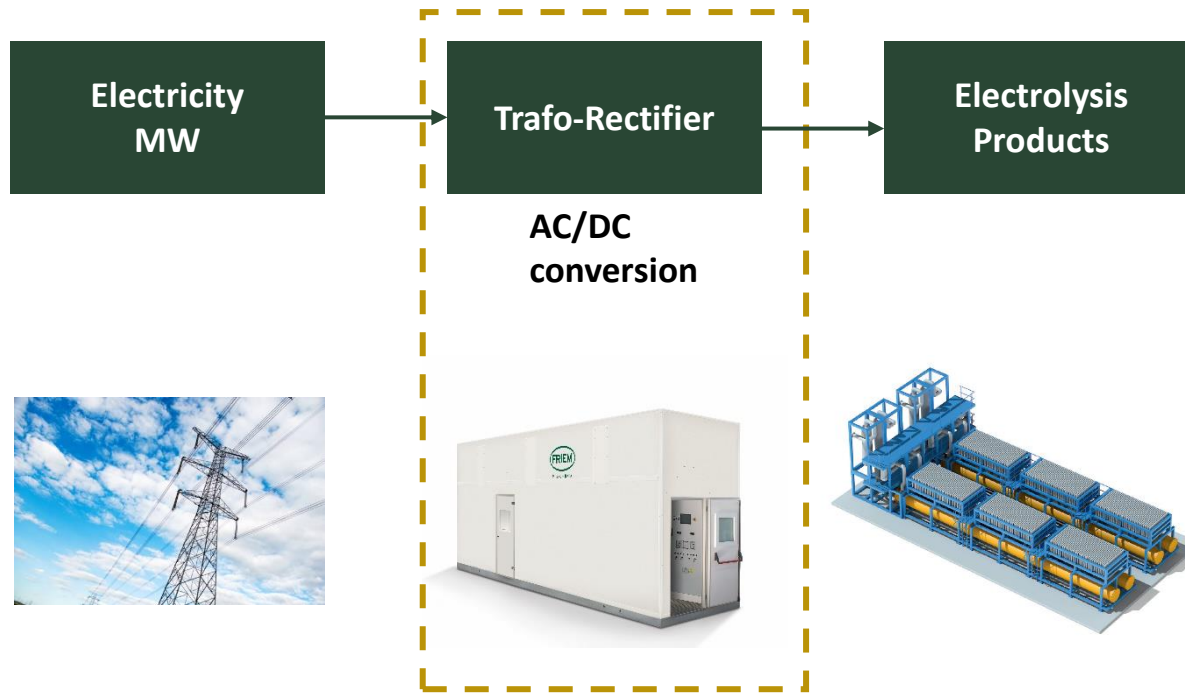
## #3 SUBSIDIARIES

FRIEM America, Chicago, US  
 FRIEM LATAM, Atibaia  
 (San Paolo), Brazil  
 FRIEM Asia, Jakarta, Indonesia

# 5 Continents # 27 Countries # 24 Sales / After sales Reps

# We support the heavy industry

## General Block Diagram of DC power supply in processes using electrolysis



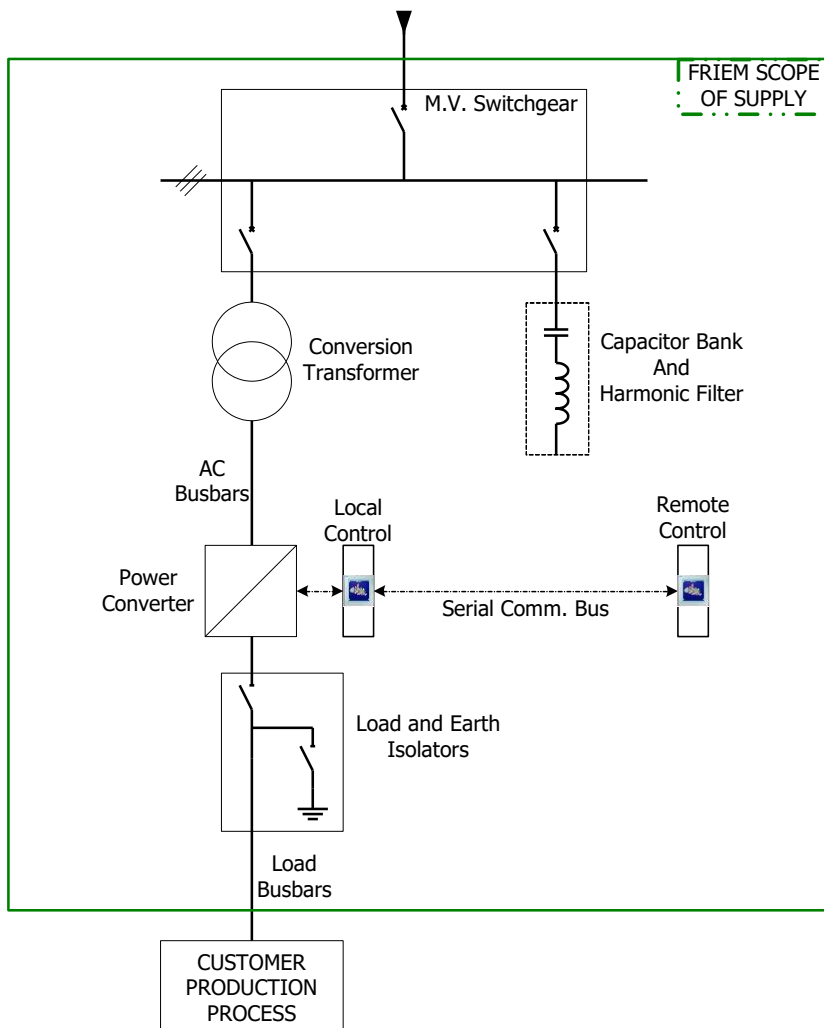
with our high current rectifiers

- Chlorine and hydrogen electrolysis
- Copper, Zinc, Nickel, Molybdenum
- Aluminum
- Graphite
- Steelmaking

Suitable for every electrolyzers brand

# Scope of Supply

The Power Section design grants high efficiency and reliability for all the plant's life

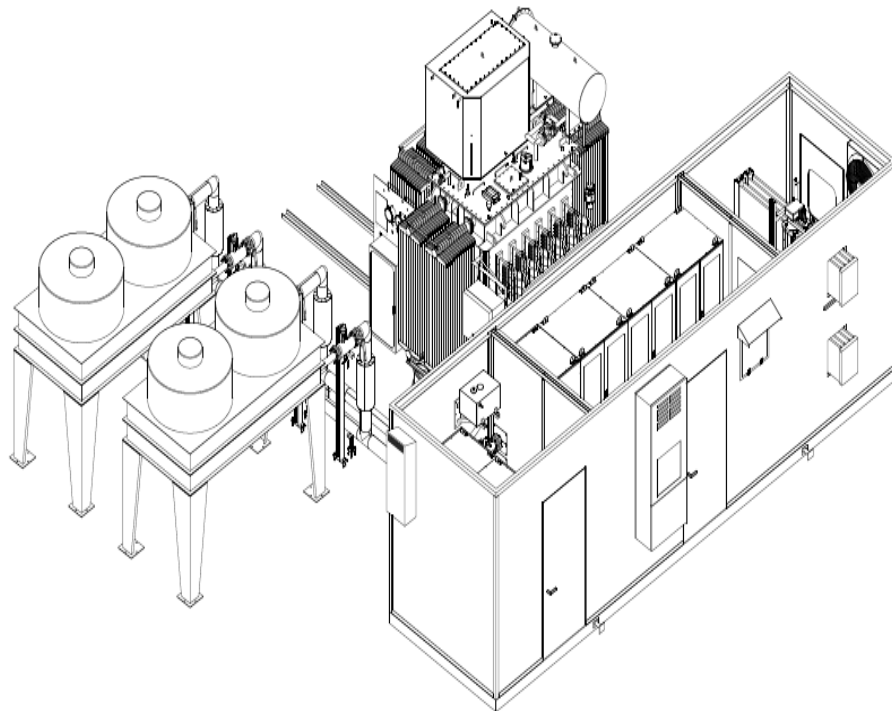


Complete Rectifier Unit from the H.V. switchgears to the Cell

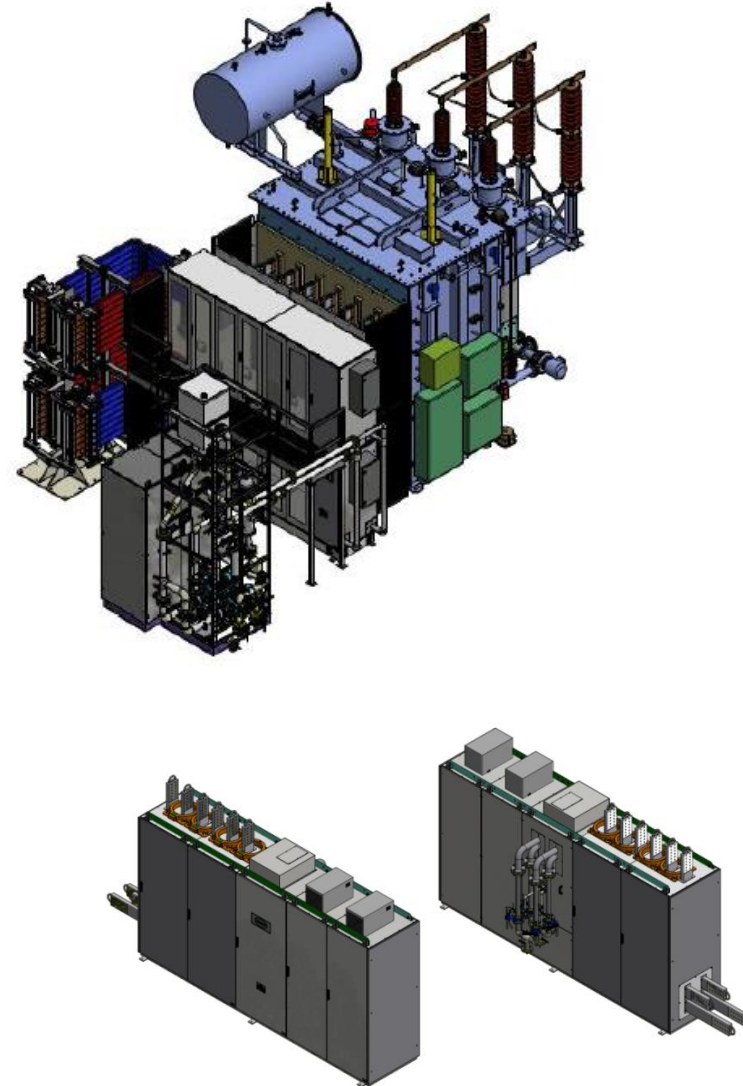
- DC Current: up to 180 kA
- DC Voltage: up to 2000 V
- DC Power: up to 160 MW
- M.V. Switchgears
- Rectifier Transformers
- Power Converters
- High Current Busbar Systems
- DC Current Measurement Systems
- DC No load and On Load Isolators
- Outdoor Container
- Capacitor Banks and Harmonic Filter Systems

## Special design for Rectifier Application

- Modular Design: flexible solutions
- Integrated Solution: reduced space, easy and fast installation and start-up
- Installation: Indoor or Outdoor
- Containerized Solutions



# Power Rectifier Unit



# Power Rectifier Unit





# Power Rectifier Unit



# Power Rectifier Unit



# Power Rectifier Unit



# Service People

ITALY

Milan



- N. 1 Service Manager
- N. 1 Service Specialist
- N. 4 PLC Engineers
- N. 6 Commissioning Engineers
- N. 1 Service Technical Coordinator
- N. 1 Service Sales Coordinator
- N. 1 Service Sales Engineer
- N. 2 After Sales & Spare Parts Assistant

USA

Chicago



- N. 1 FRIEM Area Manager
- N. 2 Skilled Service Engineer

BRASIL

San Paolo



- N. 1 FRIEM Area Manager
- N. 1 Commercial/Accounting Assistant
- N. 1 After Sales and Spare Parts Assistant
- N. 2 Skilled Service Engineer

PERÙ

Lima



- N. 2 Skilled Service Engineer

CHILE

Santiago



- N. 1 Senior Advisor (High Current Rectifiers)

INDONESIA

Jakarta



- N. 1 FRIEM Area Manager
- N. 1 Commercial/Accounting Assistant
- N. 1 After Sales and Spare Parts Assistant
- N. 2 Skilled Service Engineer

INDIA

New Delhi



- N. 1 FRIEM Area Manager
- N. 1 Commercial/Accounting Assistant
- N. 1 After Sales and Spare Parts Assistant
- N. 2 Skilled Service Engineer

AUSTRALIA

Coming soon



- N. 1 Skilled Service Engineer

# After Sales Continuous Support

## FRIEM delivers top-tier service support to its customers:

- Unique Service Management for all business line to increase efficiency;
- 24/7 support for industrial customers to minimize shutdowns;
- Feedbacks mechanism to monitor performance;
- Proactive service diagnostic to create business opportunities
- Remote service: Local OEM Partnership, 24/7 Service Assistance from remote;
- Augmented reality (Smart Glasses);



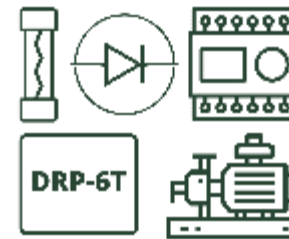
MAINTENANCE  
CONTRACTS



SERVICE  
CONTRACTS



SPARE PARTS



REVAMPING



# Reference List for Chlor-Alkali Application

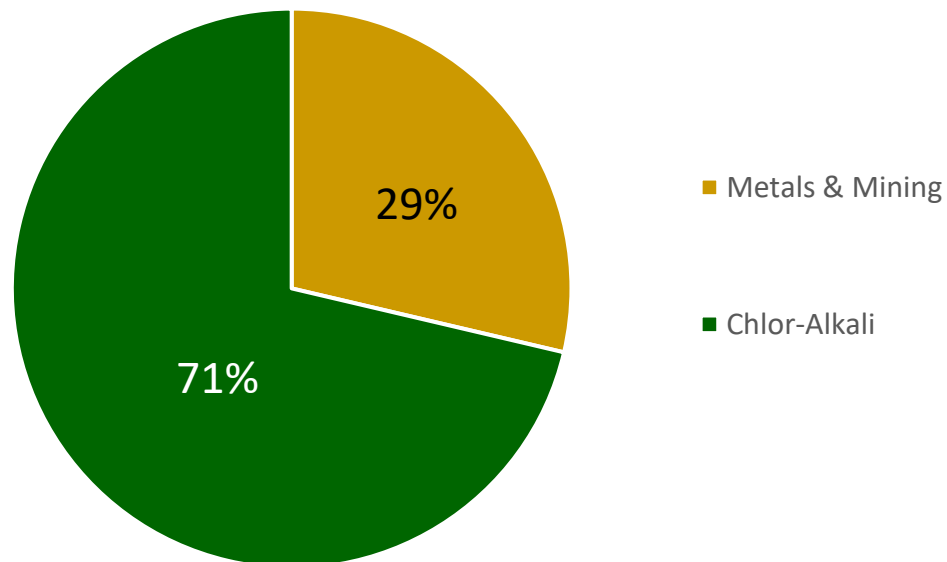
## Worldwide

- 321 Chlor-Alkali application sites (+44% of total customers)
- 507 units installed

## Latin America

- 50 application sites
- 87 units installed

## Applications Latin America



# Reference List for Chlor-Alkali Application

Application	Customer Location	Plants	Units
Chlor Alkali	Argentina	5	8
	Brazil	18	37
	Chile	3	3
	Colombia	4	5
	Ecuador	1	1
	Mexico	8	15
	Peru	6	8
	Puerto Rico	1	2
	Tobago	1	4
	Uruguay	2	2
	Venezuela	1	2
			50



# Reference List for Chlor-Alkali Application

Year	Customer Location	DC Voltage [V]	DC Current [A]	Qty	Application
2003	Peru	171	60.000	1	Chlor Alkali
2003	Argentina	407	40.000	2	Chlor Alkali
2005	Argentina	385	16.500	1	Chlor Alkali
2006	Mexico	430	34.000	2	Chlor Alkali
2007	Colombia	440	32.600	1	Chlor Alkali
2007	U.S.A.	475	17.400	2	Chlor Alkali
2007	Tobago	584	17.400	4	Chlor Alkali
2011	Colombia	440	32.600	1	Chlor Alkali
2011	Peru	650	35.000	1	Chlor Alkali
2011	U.S.A.	586	16.000	1	Chlor Alkali
2013	U.S.A.	308	20.000	1	Chlor Alkali
2013	Mexico	410	17.140	2	Chlor Alkali
2013	U.S.A.	476	2x17.400	2	Chlor Alkali
2013	Brazil	86	4.300	3	Chlor Alkali
2013	Peru	176	12.000	1	Sodium Hypochlorite
2013	Brazil	171	75.000	4	Chlor Alkali
2013	Brazil	310	15.300	1	Chlor Alkali
2014	Colombia	620	20.000	1	Chlor Alkali
2014	Brazil	230	60.000	2	Chlor Alkali
2015	Canada	510	80.000	2	Zinc
2017	U.S.A.	346	17.400	2	Chlor Alkali
2017	Argentina	240	4.500	1	Sodium Hypochlorite
2017	Brazil	86	4.300	1	Chlor Alkali
2017	Canada	510	80.000	1	Zinc
2017	Mexico	263	20.000	1	Chlor Alkali
2017	Brazil	50	18.000	1	Copper
2017	Chile	265	5.000	2	Copper

2018	Canada	1120	22.000	12	Aluminium
2018	Ecuador	158	17.400	1	Chlor Alkali
2018	Peru	171	30.000	1	Chlor Alkali
2018	Canada	600	24.000	2	Lithium
2019	U.S.A.	685	25.000	1	Chlor Alkali
2019	Brazil	120	4.500	3	Chlor Alkali
2019	Chile	320	50.000	1	Chlor Alkali
2019	Brazil	240	5.000	1	Chlor Alkali
2019	Canada	110	45.000	1	Graphite
2020	Canada	510	80.000	1	Zinc
2021	U.S.A.	380	20.000	3	Chemical plant
2021	Canada	1120	22.000	1	Aluminium
2021	U.S.A.	220	180.000	1	Graphite
2021	Peru	165	23.958	4	Copper
2021	Brazil	140	17000	1	Chlor Alkali
WIP	Brazil	325	17500	1	Chlor Alkali
WIP	Brazil	325	17500	1	Chlor Alkali
WIP	Brazil	250	15500	2	Chlor Alkali





# Trusted partner for Chlor-alkali application

Mr. Daniele De Palo

Sales Eng. Europe & South America

[daniele.depalo@friem.com](mailto:daniele.depalo@friem.com)

+39 345 5968931