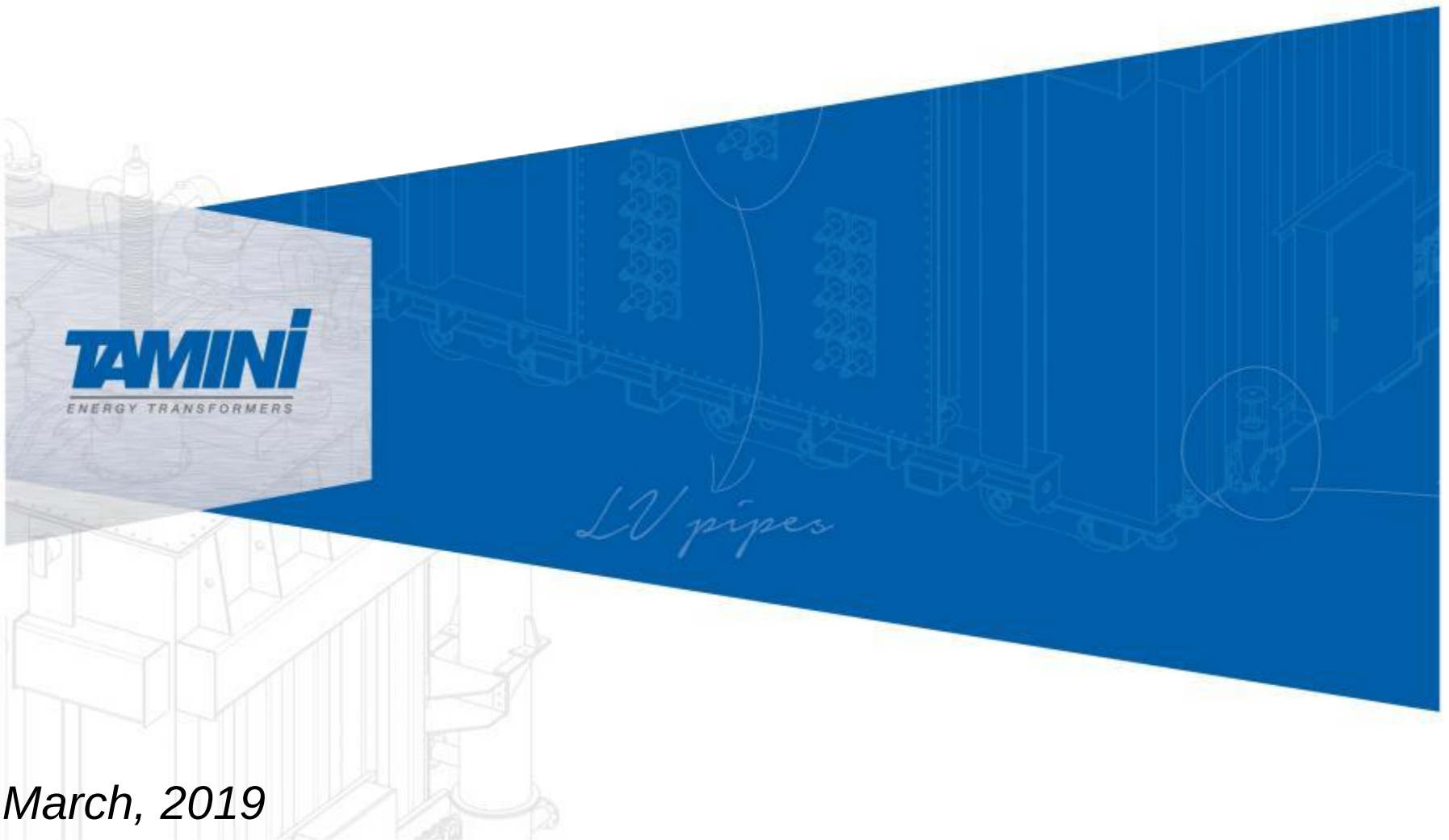
Company Presentation



March, 2019

Company History

1916
- Tamini starts its activities in Milan, producing small oil immersed transformers

1961
- Production is moved to the new Melegnano premises

1988
- Acquisition of Novara-based Verbano Trasformatori S.r.l.

1991
- The Company acquires former OEL facilities in Legnano

Since 1916:

A Century in Energy Applications

1995
- Acquisition of Veneta Trasformatori Distribuzione S.r.l. (now V.T.D. Trasformatori S.r.l.), based in Valdagno (Vicenza province)

2015
- The Group finalized the business combination with TES Transformer Electro Service S.r.l., based in Ospitaletto (Brescia province)

2000
- The Group establish a commercial entity for the North American market, Tamini Transformers USA

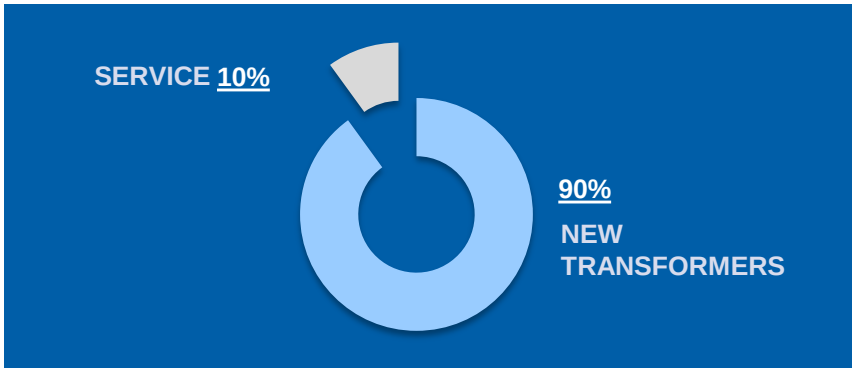
2006-2010
- In 2006 the Group started a €20m investment plan to revamp the Legnano plant

2014
- The Group has been acquired by Terna Group

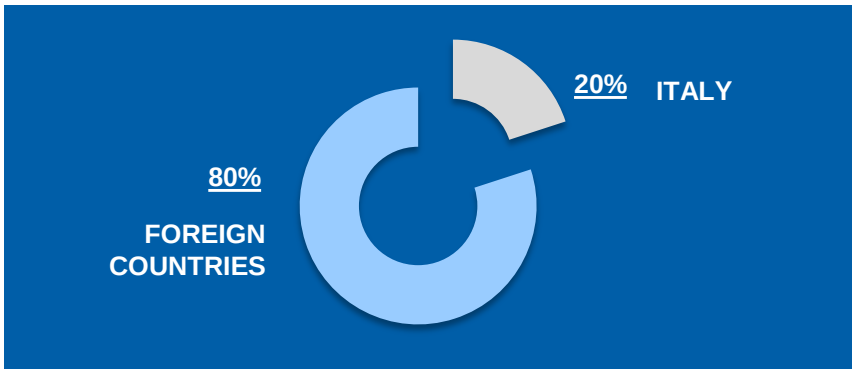
Company Profile (1/5)

Tamini: a Group with **a century of experience and activity,** with a **leadership position** in the market for **special** and **power transformers.**

REVENUES PER TYPE OF BUSINESS



REVENUES PER TRANSFORMERS DESTINATION



PRODUCTS LINES REVENUES

60% *of revenues*

POWER PRODUCTS

- POWER TRANSFORMERS AND AUTOTRANSFORMERS FOR TRANSMISSION AND DISTRIBUTION NETWORKS
- GSU TRANSFORMARS FOR PRODUCTION PLANTS
- PHASE-SHIFTERS
- SHUNT REACTORS

PRODUCTS LINES REVENUES

40% *of revenues*

SPECIAL PRODUCTS

- FURNACE TRANSFORMERS
- SPECIAL TRANSFORMERS AND REACTORS FOR INDUSTRIAL APPLICATIONS
- RECTIFIER TRANSFORMERS

Company Profile (2/5)

Main References

POWER TRANSFORMERS

REACTORS AND FURNACE TRANSFORMERS

RECTIFIER TRANSFORMERS

Company Profile (3/5)

Main References. Power

	POWER	MOBILE	ATR	REACT	PST	SERVICE
Terna			✓	✓	✓	✓
enel	✓					✓
endesa	✓		✓			✓
CEPS					✓	
elia						
ESB	✓			✓		
SCOTTISHPOWER	✓			✓		
SONELGAZ	✓	✓	✓			
e·on		✓	✓			

Company Profile (4/5)

Tamini Transformers around the World

Company Profile (5/5)

Specific solutions for each market segment

Industrial plants

Sea

Conventional production plants

Renewables plants

Mining

Traction

Oil & gas

Power distribution

Tamini Product Portfolio (1/2)

The Group has developed a broad range of products such as step-up transformers, autotransformers and shunt reactors with ratings up to 700 MVA and HV value up to 550 kV.

POWER PRODUCTS

- GSU (Generator Step-Up) transformers for power plants.
- Power transformers and autotransformers for transmission and distribution network.
- Shunt reactors.
- Phase shifters for the control of Active/Reactive.

GSU Transformers

Power: up to 900 MVA

Voltage class: up to 550 kV

Network Transformers and Autotransformers

Power: up to 900 MVA

Voltage class: up to 550 kV

Mobile substation Transformers

Power: up to 50 MVA (three-phase) Voltage class: up to 245 kV

Shunt Reactors

Power: up to 200 MVAr

Voltage class: up to 550 kV

Phase-shifting Transformers

Power: up to 1,800 MVA

Voltage class: up to 550 kV

Distribution and Dry-type Transformers

Power: up to 40 MVA

Voltage class: up to 170 kV

Tamini Product Portfolio (2/2)

INDUSTRIAL PRODUCTS

- Furnace transformers up to several hundreds MVAs (360 MVA is the maximum existing EAF transformer - *manufactured by Tamini*).
- Rectifier transformers for any application and rating.
- Step-down transformers for industrial applications.
- Special transformers and reactors for industrial applications: iron and steel industries, electrochemical plants, aluminum smelters, non-ferrous metal refining, railway, etc.

Furnace Transformers	Rectifier Transformers	Step-down Transformers	Series Reactors
			
Power: up to 360 MVA *Voltage class: up to 230 kV*	*Power: up to 150 MVA* *Voltage class: up to 220 kV*	*Power: up to 300 MVA* *Voltage class: up to 400 kV*	*Power: up to 286 MVAr* *Voltage class: up to 72 kV*

Wide product range, with leading position in the electric arc furnaces market.

Tamini Facilities (1/2)

Efficient production thanks to a first-class production platform, a capable workforce supported by the proven R&D team and the highly flexible/customized product portfolio.

- Production: **5 specialized factories.**
- Service and After-Sales: a fully quality compliance **worldwide network.**

LEGNANO (MI)

- Headquarter
- Power R&D Department
- **Large Transformers**
  (up to 550 kV and 900 MVA)
- **PST**
  (up to 550 kV and 1800 MVA)

OSPITALETTO (BS)

- Industrial R&D Department
- **Large Transformers**
  (up to 420 kV and 400 MVA)

NOVARA (NO)

- **Shared winding shop for TAMINI group factories**

VALDAGNO (VI)

- **Low-Mid Size Transformers**
  (up to 170 kV and 40 MVA)

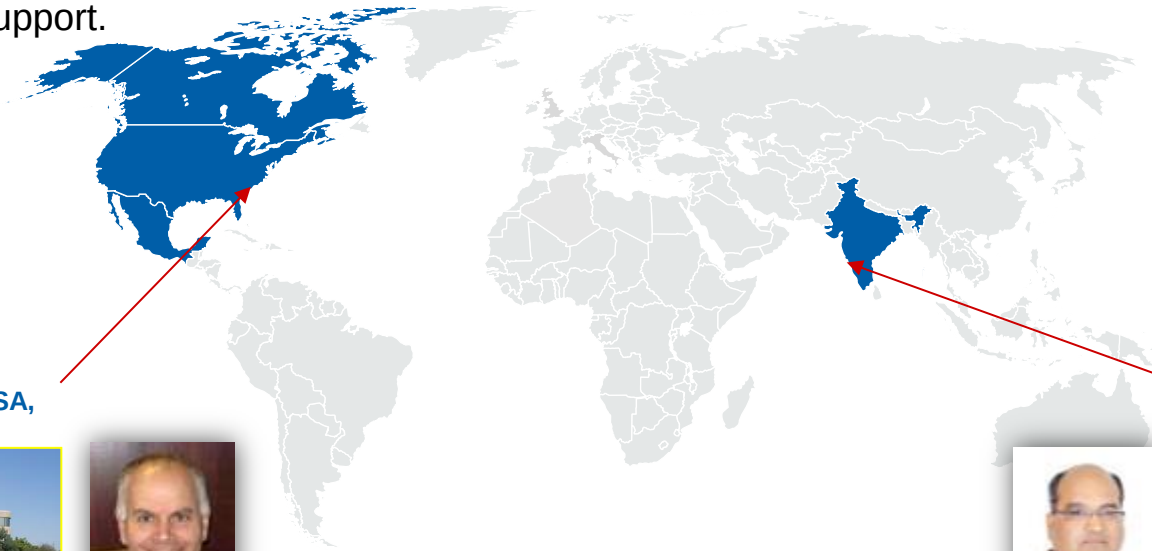
RODENGO SAIANO (BS)

- **Service and After-Sales**

Tamini Facilities (2/2)

Branches and Agencies

- Follow-up of commercial proposals, maintaining contacts with customers and fostering technical relationships.
- Assisting in solving technical issues and finding technical solutions to help customers to make the right choice.
- Service support.



TAMINI Transformers USA, LLC

Gary M. Urso
g.urso@tamini.com

SEWICKLEY
PENNSYLVANIA

TAMINI Trasformatori India Private Limited

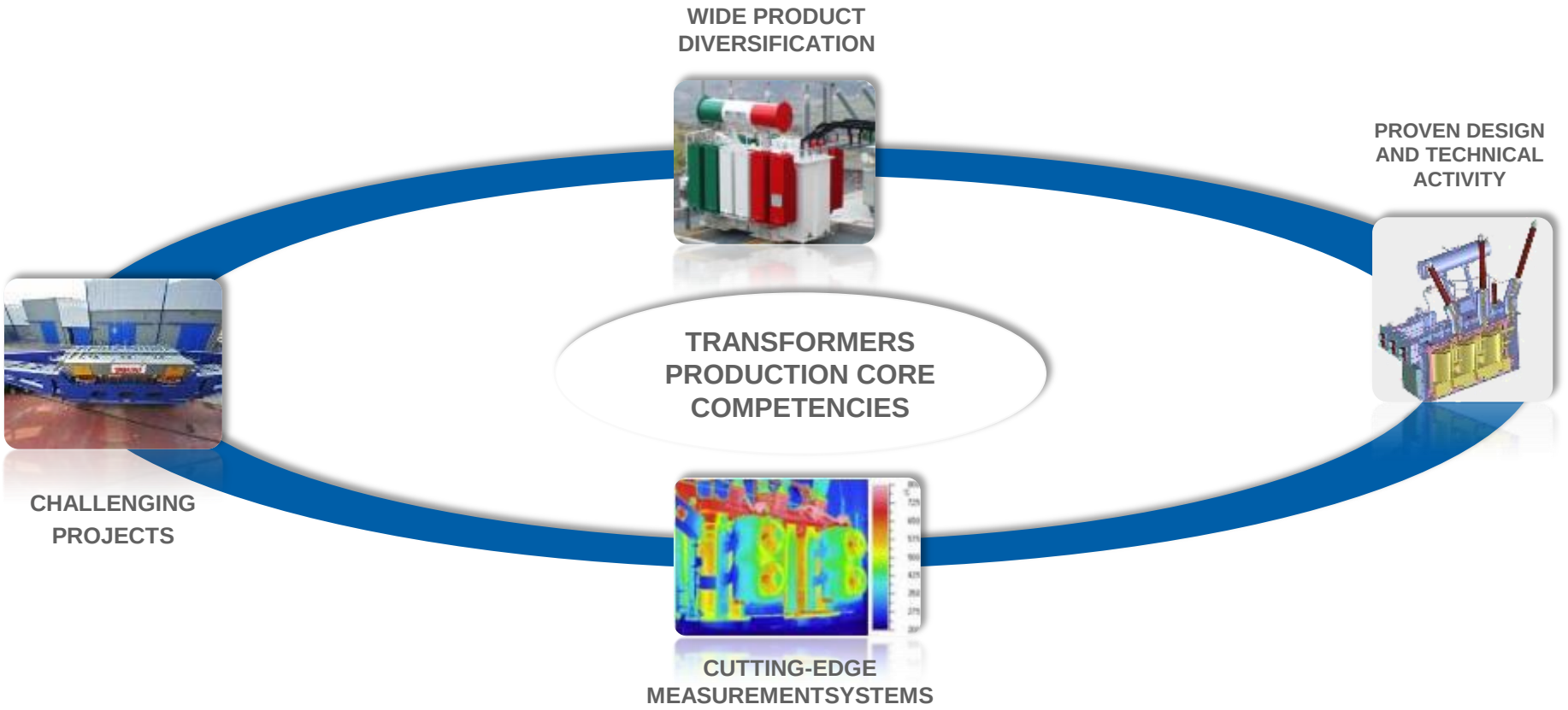
Dhiraj Budhiraja
d.budhiraja@tamini.it

PUNE - MAHARASHRTA
INDIA

Widespread and flexible commercial network thanks to dedicated employees, strategic commercial branches and over than 25 qualified agents worldwide.

Technological Excellence (1/4)

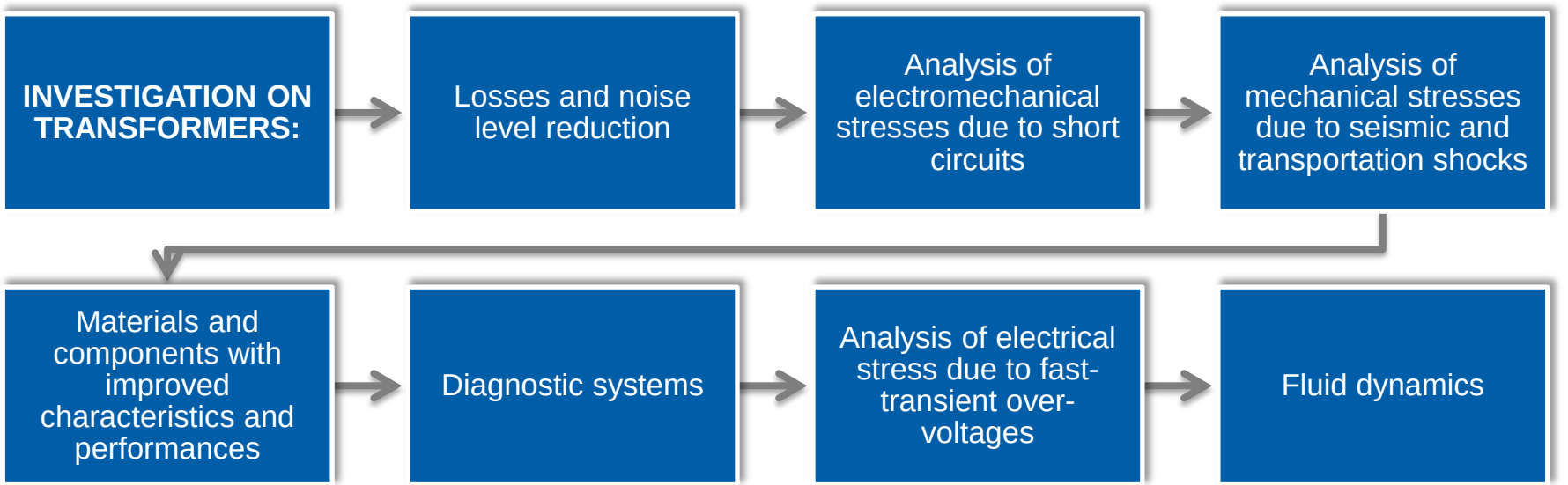
- We are well perceived by the market especially for their engineering skills, capabilities and response times, with internal engineers and technicians providing customized solutions.
- Design expertise and reliability are some of the key differentiation factors.
- Considerable expertise and know-how in the design of tailor-made equipment, proven by a quality control and international standard certifications.



Technological Excellence (2/4)

Internal Engineering – R&D Team

The goal of the research and development activity is to achieve the best quality/price ratio of the Tamini products by continuous improvement of design criteria and manufacturing and testing facilities.

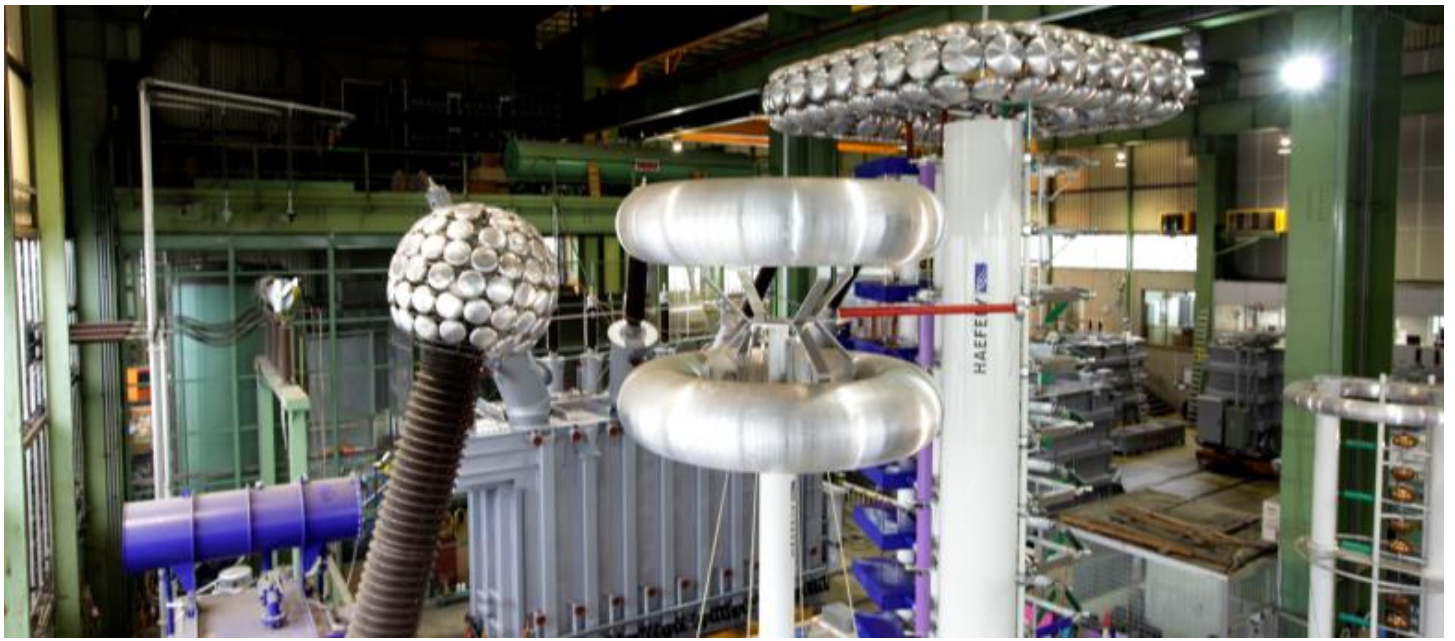


Technological Excellence (3/4)

Expertise and reliability

Technological Excellence (4/4)

- QA procedures are carried out and certified according to ISO 9001-2015 Standards. QC is performed at every step: engineering, production cycles, procurement, testing and on site installation.
  All Tamini factories have their own testing facilities suitable for routine, type and special tests in accordance with IEC or IEEE (ANSI) and any other worldwide recognized Standards (ASA, CSA,BSS, SEV etc.). They definitely complie with the most updated international legislation for safety and environmental protection.



Certifications

ISO 9001, ISO 14001, OHSAS 18001

CERTIFICATO N.
CERTIFICATE N. **9101.TAMI**

TAMINI TRASFORMATORI SRL
VIALE CADORNA 56A - 20025 LEGNANO (MI)

ISO 9001:2015

CERTIFICATO N.
CERTIFICATE N. **9191.TAM2**

TAMINI TRASFORMATORI SRL
VIALE CADORNA 56/A - 20025 LEGNANO (MI)

ISO 14001:2015

CERTIFICATO N.
CERTIFICATE N. **9192.TAM3**

TAMINI TRASFORMATORI SRL
VIALE CADORNA 56/A - 20025 LEGNANO (MI)

VIA SERIOLA 74 - 25035 OSPITALETTO (BS)
VIA SERIOLA 122 - 25035 OSPITALETTO (BS)
VIA TREPOLA 117/119 - 25035 OSPITALETTO (BS)

BS OHSAS 18001:2007

THE INTERNATIONAL CERTIFICATION NETWORK

CERTIFICATE

CISQ/IMQ has issued an IQNet recognized certificate that the organization:

TAMINI TRASFORMATORI SRL
VIALE CADORNA 56A – 20025 LEGNANO (MI)
NOVARA (NO) - OSPITALETTO (BS) - VALDAGNO (VI)

has implemented and maintains a

Quality Management System

for the following scope:

Design, manufacturing, service, revamping of SV and UHV power transformers and autotransformers, special transformers, reactors, distribution transformers by means of windings production, drying heat treatments, phase assembly on the core, tap yoke assembly, drying treatment of the active part, tanking, vacuum treatment, oil filling and circulation, accessories assembly and final testing

which fulfills the requirements of the following standard:

ISO 9001:2015

Issued on: **2018 - 04 - 29**
Expires on: **2021 - 04 - 29**

This attestation is directly linked to the IQNet Partner's original certificate and shall not be used as a stand-alone document

Registration Number: IT - 579

Alex Stoichitoiu
President of IQNET

Ing. Claudio Provetti
President of CISQ

THE INTERNATIONAL CERTIFICATION NETWORK

CERTIFICATE

CISQ/IMQ has issued an IQNet recognized certificate that the organization:

TAMINI TRASFORMATORI SRL
VIALE CADORNA 56-56 - 20025 LEGNANO (MI)
VIA SERIOLA 74 - 25035 OSPITALETTO (BS) VIA SERIOLA 122 - 25035 OSPITALETTO (BS)
VIA TREPOLA 117/119 - 25035 OSPITALETTO (BS) VIA GASDOTTO 6-8 - 36078 VALDAGNO (VI)

has implemented and maintains a

Environmental Management System

for the following scope:

Design, manufacturing, service, revamping of high voltage and extra-high voltage power transformers and autotransformers, special transformers, reactors and distribution transformers by means of windings production, drying heat treatments, phase assembly on the core, tap yoke assembly, connections assembly, drying treatment of the active part, tanking, vacuum treatment, oil filling and circulation, accessories assembly and final testing

which fulfills the requirements of the following standard:

ISO 14001:2015

Issued on: **2018 - 09 - 14**
Expires on: **2021 - 10 - 19**

This attestation is directly linked to the IQNet Partner's original certificate and shall not be used as a stand-alone document

Registration Number: IT - 101258

Alex Stoichitoiu
President of IQNET

Ing. Claudio Provetti
President of CISQ

THE INTERNATIONAL CERTIFICATION NETWORK

CERTIFICATE

CISQ/IMQ has issued an IQNet recognized certificate that the organization:

TAMINI TRASFORMATORI SRL
VIA SERIOLA 74 - 25035 OSPITALETTO (BS)
VIA SERIOLA 122 - 25035 OSPITALETTO (BS)
VIA TREPOLA 117/119 - 25035 OSPITALETTO (BS)

has implemented and maintains a

Health and Safety Management System

for the following scope:

Design, manufacturing, service, revamping of high voltage and extra high voltage power transformers and autotransformers, special transformers, reactors and distribution transformers by means of windings production, drying heat treatments, phase assembly on the core, tap yoke assembly, connections assembly, drying treatment of the active part, tanking, vacuum treatment, oil filling and circulation, accessories assembly and final testing

which fulfills the requirements of the following standard:

BS OHSAS 18001:2007

Issued on: **2018 - 01 - 19**
Expires on: **2018 - 09 - 14**

This attestation is directly linked to the IQNet Partner's original certificate and shall not be used as a stand-alone document

Registration Number: IT - 112181

Alex Stoichitoiu
President of IQNET

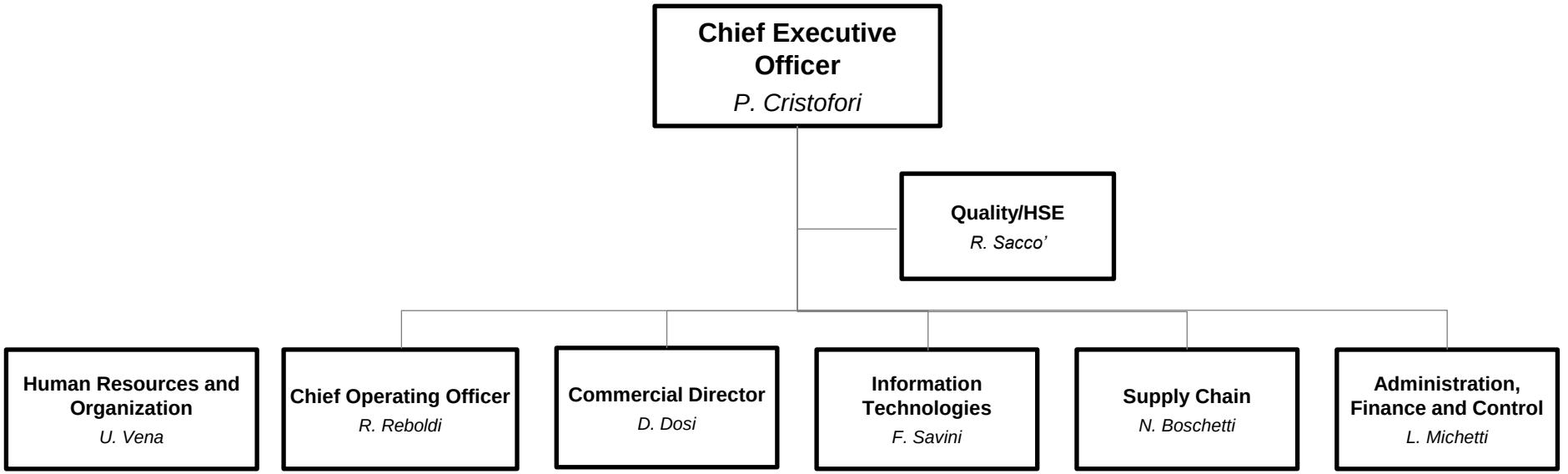
Ing. Claudio Provetti
President of CISQ

Green Autotransformer.

The uniqueness of this Autotransformer consists of it has been designed for the use with ester fluids (commonly known as vegetable oils).
Compared to conventional mineral insulating oils, ester fluids have the following main great advantages:

- Higher “flash point” temperature, from 130-140° C of mineral oil to more than 300° C of vegetable oils;
- Higher dielectric permittivity, from εr = 2.2 to εr = 3.2;
- Higher viscosity, from 7÷10 mm2/sec to 30÷40 mm2/sec;
- Higher water solvency power;
- Higher biodegradability.

Organization – Key Management



Case Histories

POWER TRANSFORMERS

310 MVA GSU Transformer using aramid enhanced cellulose paper

When Tamini got a request for three 310 MVA, 220 kV GSU transformers to be installed in hot climate installation in a refurbished power plant in Egypt, the consideration was made for the new enhanced paper Nomex® 910, a new aramid enhanced cellulose paper, 130° C thermal class.

The installation was in a hot climate area, and the units were expected to operate continuously close to their nameplate ratings.
Although the specified rated winding temperatures were reduced to accommodate for the expected high ambient temperatures during the year, the insulation of thermal class of at least 130 was still required. As the most economical option, the aramid enhanced cellulose paper was selected for conductor insulation.

This new insulation system enhances reliability and ensures extended life of the transformer.

POWER TRANSFORMERS

VOITH HYDRO - Power Transformer 250 MVA, 230/16 kV

POWER TRANSFORMERS

TECHINT/SCANDALE – Power Transformer
553 MVA, 403/19/15,75 kV

POWER TRANSFORMERS

LANDSVIRKJUN – N.4 Power Transformer 50 MVA, 220 kV
for a Geothermal Power Station in North Iceland

POWER TRANSFORMERS

Substation Transformer 120 MVA, 275/33 kV
Scottish Power - Whitelee Windfarm (GB)

MOBILE TRANSFORMERS

TOSHIBA T&D - Power Transformer 40 MVA, 220/63 kV
for a mobile substation in Algeria

SHUNT REACTORS

TERNA - Three-phase Shunt Reactor 200 Mvar, 400 kV

PHASE SHIFTING TRANSFORMERS

TERNA - PST 1.800 MVA, 400 kV (± 17.5)

AUTOTRANSFORMERS

Green Autotransformer

Green Autotransformer filled in with vegetable oil Cargill FR3:
250 MVA, 400 kV / 135 kV ± 10%, 50 Hz, OKDF.

FURNACE TRANSFORMERS

EAF Transformer 100 MVA and LF Transformer 20 MVA for a new steel plant in Indonesia.

SMS Group has definitively commissioned an electric steel plant with efficient environmental technology at PT Gunung in Bekasi, West Java province, Indonesia. The melt shop features an ARCCESS electric arc furnace and a ladle furnace designed to produce 1.2Mt/yr of steel.

This has been an important achievement also for the integrated TAMINI and TES, which have supplied a EAF Transformer 100 MVA and a LF Transformer 20 MVA. The design and the manufacture were assigned in 2013 to our manufacturing plant of Ospitaletto (Brescia).

Since the Furnace Transformers had a key role in the melting process, the joined TAMINI and TES supplied personally the supervision of transformers' erection and commissioning, focusing their own efforts.

FURNACE TRANSFORMERS

ATAKAS - EAF Transformer 360 MVA - 34500/1680-1600-1100 V
The biggest EAF Transformer in the World

FURNACE TRANSFORMERS

JINDAL - EAF Transformer 220 MVA - 33 kV
LF Transformer 40 MVA - 33 kV

FURNACE TRANSFORMERS

MOBARAKEH STEEL - EAF Transformer 140/168 MVA - 63 kV

FURNACE TRANSFORMERS

JINDAL - EAF Transformer 137 MVA - 33 kV
Series Reactor 27,6 Mvar, 33 kV

SERIES REACTORS

PASARGAD - Three-phase EAF Series Reactor 46,95 Mvar - 34,5 kV

RECTIFIER TRANSFORMERS

Combined Type Test
between FRIEM Rectifier
(80kA-510Vdc-12 pulse)
and
TAMINI Rectifier Transformer
(53,8 MVA, 63000/373 V)

The test was performed by feeding, with sinusoidal wave shape at 50 Hz, the transformer connected to the rectifier at the HV terminals. The transformer was connected to the rectifier, whose controlling system was also tested by the PLC (Program Logic Control) to simulate the working conditions at the installation site. The test procedure has been developed together by Friem and Tamini.

The general project covers the requirements for the design and construction of 2 Rectifier Transformers (1 fixed unit and 1 mobile/spare unit) for electrolysis process of the zinc electro-winning plant in Canada.

RECTIFIER TRANSFORMERS

FATA - Rectifier Transformer - 124 MVA, 132000/1140 V

POWER TRANSFORMERS

For Industrial Applications

A Three Phase Power Transformer with primary voltage of 330 kV has been successfully manufactured and tested.
The secondary voltage is 33 kV and the rated power is 125 MVA; the transformer is ONAF cooled and equipped with OLTC.
Final tests were overcome under the supervision of the costumer, the Byelorussian Steel Work company, to which we had already supplied two 82 MVA Power Transformers and a 104,5 MVA EAF Transformer.

POWER TRANSFORMERS

For Industrial Applications

DANIELI - Power Transformer for Industrial Application
160/190 MVA, 230/33, kV

POWER TRANSFORMERS

For Industrial Applications

SIEMENS - Single-phase Power Transformers, 25 MVA - 220/27,5 kV
for the new Algerian railway line

TRACTION TRANSFORMERS

RFI - Three-phase Traction Transformers, 5,75 MVA - 126 kV
for the Italian railway line

LARGE TRANSFOMERS TRANSPORT

4 PSTs 850 MVA, 420 kV (± 30), travelled on the River Elbe in the 2016.

At Hradec u Kadan, a small village located not far from Prague, 4 PSTs (Phase Shifting Transformers) designed and manufactured by Tamini have been installed and commissioned in the 2016, as a result of a significant order placed by CEPS, the Czech Republic TSO.
The project has been strategically important for the power grid infrastructure of the country. The 4 PSTs effectively optimize the energy transmission from Germany, reducing the risk of blackouts and ensuring the continuity and efficiency of the network service.

The PSTs started from our plant in Legnano (the first one in November 2015) to be board on a ship at Chioggia Seaport (Venice).
The transformers arrived in Rotterdam in 15 days, where they were loaded on barges and, through waterways, they reached the River Elbe. From the port of Lovosice the PSTs were transported by truck to the ultimate destination.

LARGE TRANSFOMERS TRANSPORT

TERNA - PST 1.800 MVA, 400 kV (± 17.5) on board

SERVICE

190/209 MVA EAF Transformer inspection, root cause analysis, repair and re-installation.

Arvedi Group is one of the most significant European steelmaking realities. Its manufacturing nucleus is composed of four companies, located in northern Italy at the centre of a highly concentrated market for steel consumption.

The Arvedi's EAF Transformer, 190/209 MVA - 33 kV, went out of service during its operation due to an internal fault of the plant. The Tamini Team was urgently called and hired for the repair, to avoid a long production downtime. Considering the emergency of the situation, the request of Arvedi was to get a reliable assessment of the failure, perform an internal inspection, repair the damages and get back the unit in operation in a very reduced delivery time.
The transformer was moved to the workshop in Ospitaletto thanks to an exceptional load transport, it was repaired (after the damages identification), it was re-tested, shipped back to the Arvedi plant and re-installed.

The activity has been rapidly carried out with the support of the engineering department and the transformer has been put again in service in only 13 days from the date of failure, allowing the restarting of the plant operation and reducing the losses caused by the halt in production.

TAMINI

ENERGY TRANSFORMERS

STAY TUNED!

www.tamini.it