

A new big autoclave for transformer drying with hot air and nitrogen ignition from Italy to the USA





Brizio Basi is a globally recognized company focused on innovation in vacuum technology

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Massimo Fioravanti was born in Milan in 1967. He has been the Managing Director at Brizio Basi since 2007. Before that, he held the position of Technical Director at Alfa Metal Corporation, and Technical Specialist at Elettromecanica Santagostino.

He obtained his Master of Business Administration (MBA) degree from SDA Bocconi in 2006. He received his Degree in Mechanical Engineering from Politecnico di Milano and holds an Electro-technical Expert Diploma.

Introduction

Brizio Basi is a globally recognized company focused on innovation in vacuum technology, particularly in the transformer industry as a specialist in the drying treatment of active parts, coils, and cores.

Our products for the energy market include systems such as: vacuum ovens, vapor-phase drying, vacuum impregnation (VPI), and low-frequency heating (LFH), all characterized by quality, durability, innovation, intelligent solutions, and excellent service.

The quality of the “made in Italy” approach

Brizio Basi develops and manufactures advanced technologies for active part

drying, oil treatment and transformer filling, with systems that integrate vacuum processes, VPI technologies and dedicated impregnation solutions. These machines are designed to ensure efficiency, long life and maximum operational reliability, thanks to a fully Made in Italy approach: every system is designed, built and assembled in house, using exclusively European components sourced from Italy, Germany and other high standard countries. This production philosophy makes it possible to offer robust, intuitive, easy to install solutions designed to maintain constant performance over time.

Transformer drying specialist

Among the most recent projects stands out an autoclave for transformer drying with nitrogen, entirely designed and manufactured in Italy by the Milan company Brizio Basi, and recently shipped and installed in the United States, where it officially began operation. This is a concrete example of





Brizio Basi plant 1 and plant 2 with energy autonomy

the company's ability to develop tailor made technologies for international markets and highly complex applications.

Transformer production – market leading technology

The system is fully insulated and designed to operate under deep vacuum conditions. It features a heating jacket powered by diathermic fluid and a forced ventilation system that distributes air through strategically positioned inlets and outlets. The two vertically lifting doors, electrically moved, ensure speed and safety during loading and unloading. The dimensions are impressive: the usable diameter reaches 3,500 mm, the internal length is 6,500 mm and the maximum internal height is 3,000 mm. The autoclave body weighs approximately 28 tons without the doors, plus 8 tons for the electric trolley, rated for about 40 tons, and an additional 12 tons for the door lifting superstructures. To facilitate the use, the installation in the United States was partially made into the ground, allowing the trolley to enter directly at floor level.

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To support the system, a high-capacity vacuum group consisting of five oil sealed rotary pumps, a roots pump and a condensation system, capable of achieve a final vacuum of 0.05 mbar, was installed. The entire process is controlled by a stand-alone electrical panel equipped with an HMI interface and LAN connection, enabling remote assistance also from Italy.

One of the most innovative elements of the autoclave is the dedicated nitrogen production and management system, which significantly improves drying quality and reduces the cycle time. The

autoclave uses only pure nitrogen, generated by a dedicated unit equipped with a storage tank and an integrated dryer. The nitrogen introduced into the chamber is completely dry and fully inert.

During the process, the gas penetrates the windings and impregnated materials, encouraging the expulsion of residual moisture and replacing the internal air, thereby eliminating oxygen and CO₂. Nitrogen helps to push out the trapped humidity, which is then removed through a new vacuum cycle or forced ventilation. The inert atmosphere

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stabilizes the process, reducing thermal and chemical variations and making the drying faster, more uniform and more repeatable. The result is a quicker, cleaner and more controlled cycle, with time savings that increase productivity and achieve better insulation values for the active parts in shorter times.

The plant uses a dry hot air system and nitrogen instead of kerosene. Hot air heating uses atmospheric air (nitrogen, oxygen, etc.) to transfer heat,

while nitrogen heating (or nitrogen inert atmosphere) uses almost exclusively pure nitrogen to inert the environment, prevent oxidation and improve the quality of specific drying treatments. This method is cleaner and more reliable than air, which contains oxygen and can cause defects. The key difference lies in the absence of oxygen in nitrogen, an inert gas essential for preventing unwanted chemical reactions (such as oxide formation) during exposure to high temperatures.

After the initial hot air heating phase, the machine proceeds to a first deep vacuum phase, followed by a nitrogen injection phase with reheating at a higher temperature, and finally another deep vacuum phase to extract moisture, which can be condensed and collected in a level-controlled tank.

This cycle can be repeated several times until the windings are completely dry. The system is already operational in the United States.

With this approach, the process is clean, green and non-polluting, achieving excellent results without energy waste and performing far better than kerosene, which loses much of its efficiency in the final phase.

The system is virtuous: it doesn't consume too much energy, doesn't use methane heating, doesn't use kerosene, isn't ATEX classified and doesn't require special certifications.

The autoclave also uses innovative software with repeatable recipes that manage the interaction between pressure, temperature, heating and nitrogen injections.

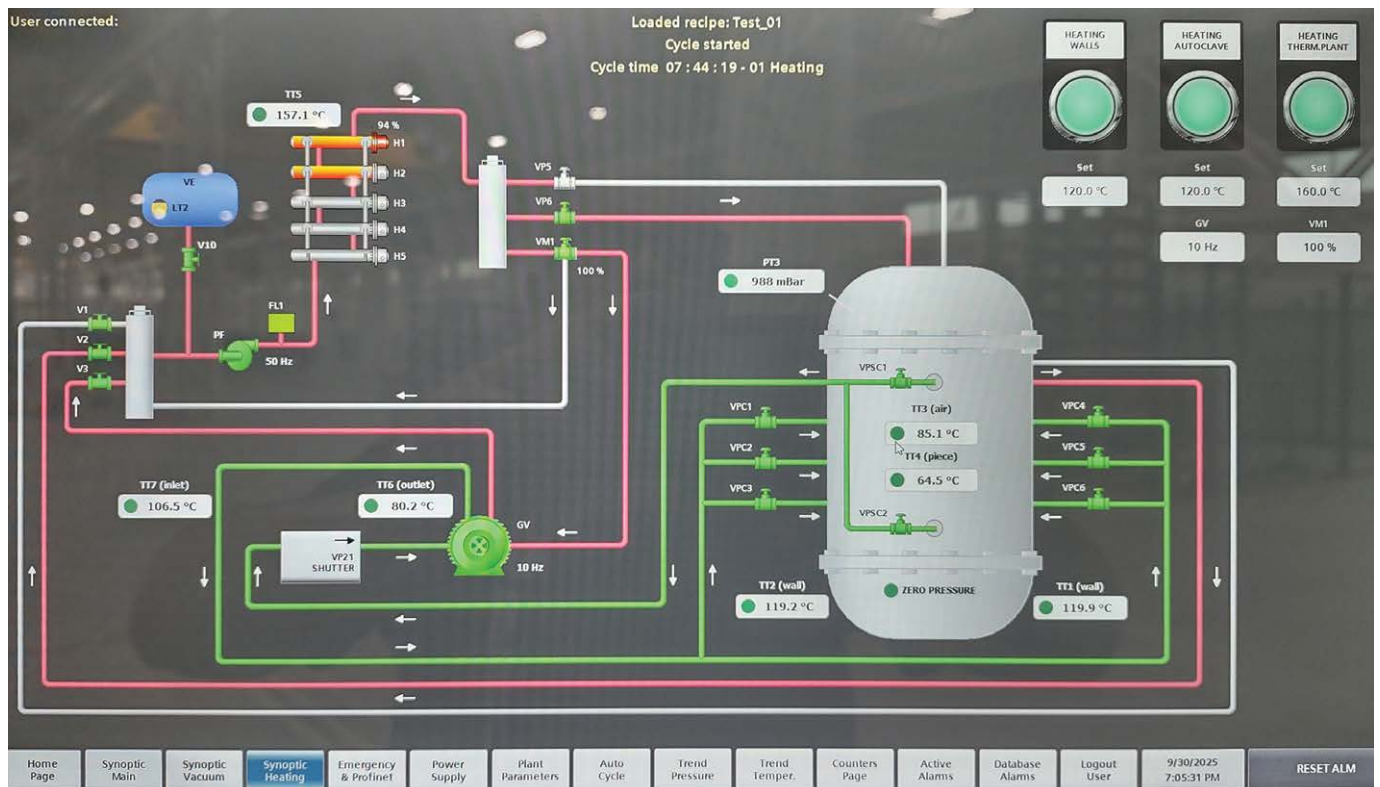
The shipment and installation of this autoclave in the United States once again confirm the company's knowhow and the importance of decades of experience in the sector. This system is a tangible demonstration of how Italian engineering, when combining expertise and vision, can establish itself as a global benchmark.

The company's history

Brizio Basi is an Italian company with a long tradition in industrial plant engineering. Founded in 1920, it has grown over time and has become an international reference point. Over the decades, it has continued to innovate while pre-

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serving its original values of technical expertise and customer focus.

The history of the company is full of unique achievements based on innovations in different fields, which help and inspire us to develop for the future. Brizio Basi is one of the first ASSOL-OMBARDA members since 1945. Assol-ombarda is the largest entrepreneurial association in Italy, nowadays a part of Confindustria, Italian Entrepreneurial Association. Between 1952 and 1954 Brizio Basi set up products subject to technological innovation in the physics experience classroom of the Leonardo da Vinci Museum of Science and Technology in Milan.

Since 1970, Brizio Basi has collaborated with ENEL for the design and construction of vacuum treatment plants for insulating oils essential for the production of transformers, switches, joints, etc.

The years from 1980 to 2000 were the period of greatest development in all sectors, from pharmaceutical industry to energy industry, when the company had over 100 people including technicians and engineers.

In 2007, Brizio Basi created the largest and most modern vacuum drying and

Brizio Basi implemented one of the biggest ever European-made VPI impregnation plants for electric motors, with a 5-meter internal usable diameter for a 6-meter effective depth

filling plant for distribution transformers for Getra. 2008 was an exceptional year, when we produced over 20 transformer oil treatment plants for ABB, Getra, Tamini but also Iran Transfo, Ansaldo Energia, etc.

After 2008, the company has continued to implement technological innovations for treatment of dielectric oils by building the first machine equipped with a computer capable of managing the treatment of the transformer completely automatically.

Between 2009 and 2010, it started the Messina 2 project with Prysmian Powerlink, a 40 km long submarine power line from the Italian mainland to Sicily. The project was completed in 2015, and it is still today the longest oil cable AC link in the world.

In 2013 Brizio Basi also renewed the production of systems for vacuuming

and charging SF6 insulating gas in MV circuit-breakers by implementing a mass spectrometer capable of managing the cycle online and automatically.

In 2014, at the request of the market for dielectric vegetable ester oil, the Green Line series of treatment plants was developed. This model is expressly designed for efficient processing even online, i.e., when the transformer is in operation. The same year at the Swiss Railways the company has installed one of the most advanced VPI impregnation systems for electric motors with epoxy and silicone resins and a vacuum oven for drying with the Vapor Phase principle, which at the same time can fill the machines. These systems, together with a renewed computerized drying oven, are completely inserted in the plant network anticipating the concepts of "Industry 4.0".

The company's global presence reflects its ability to adapt to very different production needs and to offer tailor-made solutions for complex industrial contexts

At the end of 2015, Brizio Basi received a large order for the supply of transformer oil treatment plants for Libya. The peculiarity of these machines is the power combined with the simplicity in their use, combined with the construction completely with components easily available on the international market.

In 2016, Brizio Basi studied a new 31 km long power line in the South China Sea, between the mainland and the island of Hainan, with Prysmian Powerlink. This project ended in 2019.

In 2017, Brizio Basi further innovated its flagship product for the DOV series by producing a completely automated system compliant with Industry 4.0 standard and able to estimate the duration of a transformer treatment cycle by simply analyzing the oil with the sensors on board.

In 2018, the DOV series was further innovated by introducing sensors for oxygen and 4 other dissolved gases in addition to the water. With this system, Brizio Basi intends to increase the analysis capacity of the machine during oil treatment.

In 2019, new submarine cables were activated to power grid for a tropical island in Hainan province, China.

Brizio Basi's project, in partnership with China Southern Power Grid, has allowed for the increase in the stability of the island's power grid, linking to the mainland province of Guangdong. The company was also qualified by the aircraft division of Leonardo (Finmeccanica Group) and an important order is assigned for the EuroFighter project.

Between 2019 and 2021, Brizio Basi was engaged in the design of machines

for anti-Covid19 vaccine production. In Italy, together with Prysmian Powerlink and Terna Rete Italia, the company revamped the submarine power line "Elba-Continente".

In 2022, Brizio Basi achieved the Imprintdigreen Sustainability Certification, obtaining the highest score in terms of rating, by Confcommercio (Italian General Confederation of Enterprises, Professions and Self-Employment, the largest business association in Italy). The company continues to keep important certifications such as ISO 9001, ISO 14001 and others.

The following year, for the NIDEC-ASI site in Monfalcone (Italy), Brizio Basi implemented one of the biggest ever European-made VPI impregnation plants for electric motors, with a 5-meter internal usable diameter for a 6-meter effective depth.

Brizio Basi is proud to announce its certification for inclusion in the Register of Historic Italian Companies. This recognition certifies the historical significance of Brizio Basi, highlighting its longevity and resilience in doing business since 1920.





A company museum was created in 2025: a space dedicated to the company's history, the technologies developed and the most significant milestones of its industrial journey. This commitment to preserve its heritage contributed to Brizio Basi's official recognition as an historical company, highlighting its enduring role in the Italian industrial landscape.

The transformer and electrical equipment sectors are undergoing a phase of transformation, influenced by technological change, energy transitions and geopolitical dynamics

Growing further

Over the past year, the company has expanded its workforce, adding new professional profiles and significantly increasing female representation. In parallel, over the last two years Brizio Basi has invested in its infrastructure with the purchase of two new buildings, intended for the expansion of production activities and the creation of areas dedicated to research and prototyping.

Italian technology around the world

Brizio Basi operates worldwide. Its main markets include India, Thailand, the United States, the Arab countries, Bahrain, Vietnam, Europe, China and many other strategic areas, where the company has established itself as a reliable and technologically advanced partner. This global presence reflects its ability to adapt to very different production needs and to

offer tailor-made solutions for complex industrial contexts.

Brizio Basi is also part of the NATO suppliers' network and holds several specific licenses. Experience in the military sector has contributed to high working standards and rigorous standards.

Its customer base is equally diversified: transformer manufacturers, producers of electric motors, motorcycles and vehicles, state owned companies involved in major infrastructure projects such as railways and submarine cables, as well as pharmaceutical and military organizations. What these clients share is the need for operational continuity and reliability, qualities that have always been the company's strengths.

For many of them, service and maintenance are essential: they require constant technical support, training and clear, direct communication.

Innovation is our legacy

Looking ahead, Brizio Basi expects steady growth both in technological development and global market presence. The transformer and electrical equipment sectors are undergoing a phase of transformation, influenced by technological change, energy transitions and geopolitical dynamics. Increasing attention to sustainability, the need to reduce environmental impact and the evolution of global electrical infrastructures demand increasingly advanced, reliable and green solutions. In this scenario, Brizio Basi sees a future rich in opportunities: the demand for efficient, high-quality technologies will remain strong, and the companies capable of continuous innovation will be the ones leading the market.

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