

Giuseppe Angelantoni: the origins of the future



ACKNOWLEDGMENTS

*The book “Giuseppe Angelantoni: the origins of the future”,
published for the ninetieth anniversary of the Angelantoni Group,
is a multi-voice tale devoted to the genius
and hard work of Giuseppe Angelantoni.
It includes his main innovations and patents
in the refrigeration technology sector
from 1932 until today,
and takes a look at the present
and future of the Angelantoni Group.
It is a collection of contributions not only by Cesare,
Gianluigi and Annalisa Angelantoni,
by M. Giuseppina Malfatti (Cesare’s wife),
Roberta Molho (Gianluigi’s wife),
Renata Molho (journalist and essayist)
and by Fabio Mantovan (photographer), but also by
some collaborators of the Angelantoni Group.
The book is enriched with an extensive set of photographs
and documents from the Company’s historic archive
and from the family archives.
Our thanks go to IGU (Industria Grafica Umbra)
for their competent collaboration.*





Giuseppe Angelantoni: the origins of the future

Cover photo:
Giuseppe Angelantoni, 1992 - © Fabio Mantovan

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PREFACE

In the spring of 1932, Giuseppe Angelantoni started out on his own long road to create a business in refrigeration technology.

At the time, he probably had no idea that 90 years later, his name would be synonymous with world leadership in many fields of the industry and of research into industrial refrigeration engineering, simulated environmental test chambers and space simulators, thin film coating technology processes and in low and ultra low temperature refrigeration equipment for the biomedical, pharmaceutical and hospital sectors.



Plant in Villa San Faustino (Massa Martana).





A difficult path, but one that has proved extremely successful, aiming to achieve an extensive social project which perhaps inspired his work from the start. It meant bringing employment opportunities from Milan to Massa Martana which he, a farmer's son, had to move to Milan to find. Contrary to what happened in the sixties, it involved bringing work where there was labour and talent and not vice versa. An idea, a dream, a commitment that he managed to achieve with the support of his family, the work of his children and the help of all his employees and collaborators over this long period.

Today, 90 years later, the futuristic plant in Villa San Faustino, a suburb of Massa Martana, has been added to the industrial complex on top of the hill of Cimacolle in Massa Martana (photos on previous pages). Both are the visible testimony to the success of his enterprises and his social project.

Over 320 people work in the plants and offices at the headquarters, in daily contact with the offices in Milan and Binasco (Mi), with another 80 people in 5 subsidiaries or controlled companies in Italy and in other countries (France, Germany, India and China), taking the name of Angelantoni throughout the world as one of the symbols of Italian business and talent.

A LONG JOURNEY

When we celebrated our 70 years of business twenty years ago, we decided to reform the way we do business to ensure a stronger Company, which was better prepared for the challenge of the new millennium that had just begun.

It became imperative to expand and globalise the company given the limited resources of the Italian market. However, we were not prepared to lose the essential features of a small company, such as its creativity, flexibility, its innovative approaches to problem solving, its good Customer service, competency and passion, as well as its intimate knowledge of the products and their technology.

We decided, therefore, to embark on a plan of growth for external and internal lines. The first one was based on our partnership with other small Italian and foreign entrepreneurs, who wanted to develop like us and with us. Our motto became: “We don’t want to buy companies, we want to acquire partners”. This process led to the initial results, although we hope other more important ones will come in the near future, especially if we manage to overcome all the problems that have arisen in the world, such as the Covid-19 pandemic and the war between Russia and Ukraine.

The second, and perhaps the most important, is based on innovation, on maintaining values of creativity and on training our collaborators not merely on specialist topics, but also on the concepts of business culture. This is the only way we will be able to value the talent we will have to make scouting in order not to remain mediocre. We will have to focus on training, as this is the true value and real heritage of our enterprises: on our human resources. We must increase the value not only of our employees, but also of those members of the Angelantoni family who intend to work in the company. We shall, therefore, have to continue to focus on our young people, on their creativity and dynamism and on their way of looking at and interpreting the future. We must not, however, forget those who were once young. Their experience is invaluable!

Twenty years later, we want to be considered as a Group that boasts a powerful, yet slimline, flexible organisation with production companies that depend on Angelantoni Industrie Holding.

Thus, each company can remain independent with close connections with its own customers and focus on their specific requirements by specialising in their own product and/or market. This way, the risk is evenly distributed and the holding merely provides the technical, managerial and service know-how as and when required.

Therefore, we try to achieve pre-set objectives of growth on the international markets by using economies of scale and expertise common to the entire Group.

Lastly, the choice we made 20 years ago has revealed to be a great success and gives us good reasons to continue along the same path. By increasing our governance skills we will have the opportunity to manage more complex and more complete systems in the future.

We therefore wish to thank all our employees and collaborators and extend our gratitude to our partners, customers, suppliers and the banking world that have chosen to support us and develop with us.



Cesare Angelantoni
Honorary President
Angelantoni Industrie



Gianluigi Angelantoni
Executive President
Angelantoni Industrie

OUR FAMILY COMMITMENT

Our family, the principal company shareholder, will soon have to make major and important choices to consolidate the work of Giuseppe Angelantoni. We children, together with his grandchildren, have seized this heritage and tried to extend our traditional business activities. At the same time we are pursuing new business models and applying the well-known “core” technologies, even in different areas, such as in the sector of Sustainability and Renewable Energies.



Giuseppe Angelantoni with his wife Olga and the family, 1992.

Innovation has become our mantra not only as regards our organisation and processes, but also our products with a focus on technological breakthroughs not merely incremental changes.

Our father often said that innovation is like a cyclist pushing the pedal. It serves not only to go further, but also to maintain balance.

We will also have to focus on developing not only our internal lines, but also via acquisitions and/or mergers. Therefore, innovation and creativity will not be enough and we will also have to be able to adopt a risk culture that is nothing more than the innate business culture of Italian small and medium entrepreneurs.

We hope the path we will take will be a success for at least another 90 years and provide us with the right motivation to continue our father's work way back in 1932.



Annalisa Angelantoni
CEO of ARE
Angelantoni Real Estate

INTERVIEW WITH GIUSEPPE ANGELANTONI IN 1992

He is a kind gentle man but one can feel he has firmly exercised authority for years in the old style of bygone days, yet with great respect for his work; with clear ideas and a determination that has earned him the esteem and affection of his collaborators.

His story is like a fairytale: he lost his father at a very young age, he was a worker, then unemployed with a need to reinvent his life far from home.

Would you like to tell me how your adventure began?

“Round about 1929-30, at the time of the Great Depression, I found myself without a job like many other workers. I was a mechanic. I worked for a couple of years servicing the first refrigeration systems made at that time.

When I realised it could work, in 1932 I bought a motorbike with a little seat behind for my tools and set up my own business.

I gradually purchased some machinery and began to produce domestic and commercial refrigerators. In 1935, I also began to make compressors, which proved intuitive.

In 1939, I founded a company with my father-in-law, who had a Bakelite moulding laboratory, but this was a failure as we couldn't agree. We separated after 15 months and I bought a piece of land which was for many years our Milan headquarters”.

And when did you move to Umbria?

“That came many years later around 1967-68 during the period of great social and cultural change. I moved to Massa Martana where I was born”.



Who gave you the ideas?

He pulls a face and gives a modest shake of his head. "I did. I have always enjoyed thinking up new solutions. I joined a compressor to a diesel engine and the result was a refrigerated road transport truck, like the ones in use today".

A modest, simple acknowledgment of a true revolution in industrial transport. We know you patented many projects, for which prototypes were made without resulting in production as they were too avant-garde. Designed ahead of market demand.

What about the competition?

"Well, it was very strong: I remember when we were making ice-cream counters. The season began in February-March and five or six of us found we were offering the same kind of product. Payment over five years. Yes, naturally with guarantees and bills of exchange, but still over five years".

What were the hardest times?

"During the war we converted all our production into war material. They were certainly not enjoyable times".

What were the times of greatest satisfaction?

"Probably the Padua Trade Fair in 1950, where we were the first to introduce refrigerated trucks. It was an enormous success. Or in 1961, in Milan, when we introduced the first refrigerator in Europe to go below -100°C (-104°C) using traditional compressors".

And your first dealings abroad?

"With Palestine, almost immediately, before it became Israel. Then Turkey with the 'Frigomec', one of my patents for modular refrigeration units".

How did you get the idea of producing climatic chambers?

"I saw a similar machine that had been installed in Terni, made of wood. It reproduced various climatic conditions. Of course it wasn't as precise as today's. The instruments were approximate, as were the requests. The first climatic chamber was sold to a public sector body, the Centro della Motorizzazione [Bureau of Public and Private Transport] in Rome. It had to test car licence plates. This was in the early 50s".

What about the vacuum? Such a modern concept...

“We worked with another company from Milan to produce freeze-drying systems that require refrigeration and vacuum. This was a major step, because our expertise was more in the refrigeration line and that meant a moment of expansion for us. We then went on producing vacuum chambers until 1988 when we entered in the high vacuum for space simulators”.

One last question: any projects for the future?

He laughs at himself and talks of his age of 88, but this is just convention. He actually wants to see his company become increasingly successful and his bright eyes give away his enthusiasm and his desire to get on with things.

“Have a rest, now it’s all in my children’s hands”.

Our conversation took place in the garden of his home: a 17th century convent near Massa Martana.

Giuseppe Angelantoni passed away two years later, as well as only a few months later also his beloved son Oreste, Managing Director of Angelantoni Scientifica.

Renata Molho

Il Sole 24 Ore

GIUSEPPE ANGELANTONI: GENIUS AND RIGOUR

THE STORY OF AN ENTREPRENEUR OF TIMES GONE BY

Giuseppe Angelantoni, a visionary, a pioneer, an emblematic representative of Italian creativity through and through. The story of his debut is more like the scenario of a Neo-Realist movie: the beginning of the twentieth century, a rural setting, Massa Martana, Umbria. The second-born and brother of Arnesia, Oreste, Nunziatina and Eleonora, at the age of seven Giuseppe had to leave school. In fact, after the death of his father, Cesare Angelantoni on 29 March 1911, his mother, Carmela Ambrogi, found herself in a very difficult economic situation and was forced to make a painful choice. She asked her brother for help and Giuseppe began to work as a farm hand on the nearby estate in San Fidenzio belonging to his uncle Vittorio, a farmer. Later, he went to help another uncle, Tommaso, in Restore, still in the Municipality of Massa Martana, where he once again supervised grazing and all its respective activities. In September 1917 during the First World War, his uncle Tommaso remained alone to look after the farm after the death of his unique son, who had been called to arms. As a result, Giuseppe had to make big sacrifices and suffer a great deal as he took it all over until 1919. From 1920 he worked as a casual labourer: he helped to construct Massa Martana's aqueduct and also cut wood in Calvi dell'Umbria to make sleepers for the railway line.

Giuseppe loved to tell the tale of when, as a young boy, "he had eaten too many truffles". The black truffle has always been a prized delicacy from the Martani Mountains and Umbria in general (the "black diamond"), that sometimes reaches inaccessible prices for the majority of people. However, for Giuseppe and many others living in poverty like him and working in the woods, the truffle found by their inseparable dogs was a precious (and often unique) condiment to rub over the stale bread that was baked once a week. So, Giuseppe never ate any truffles ever again, as

he had “eaten too many” and they reminded him of not such happy times when he lived in poverty.

As he had also had to look after horses during those years, he had become a discreet horseman. So when he was called up for military service in 1924, he was sent to the “Cavallegeri di Alessandria” regiment in Florence. However, as the firstborn without a father he was discharged early in 1925. At this point, he wanted to find a better job: a return to Massa Martana would mean working the land again, so he decided to leave for Milan, where his younger brother Oreste and a few fellow countrymen had already moved. He found temporary lodging in the guest house run by the Bestetti family, an inn with accommodation at No. 256 Viale Monza.



Giuseppe Angelantoni as a soldier in Florence, 1924.



Giuseppe Angelantoni with some of his fellow comrades, 1924.



Milan, Precotto before the Second World War.

This was in Precotto, north of the city: he was to live in this district until he married.

NEW HORIZONS

In Milan, Giuseppe found work in some mechanical companies and at the Falck Steelworks. However, in 1927, on the advice of a friend and arms fellow, he found work at a well-established company, “Gaetano Barbieri”. operating in the refrigeration sector. Founded in 1896, since 1925 the Company begun to produce the first systems to preserve fruit and vegetables in Romagna region. Giuseppe specialised as a “pipe masker” and was awarded the special licence that allowed him to bend and weld refrigerator pipes and to use the most important refrigerant of the time, but also extremely hazardous for man and for the environment, sulphur dioxide. At the time, there were no connections or corner pipes, so pipes were filled with sand, heated, and bent hot by brute force and then welded. All this required experience and a certified exam.



Giuseppe Angelantoni, 1933.



Giuseppe on a construction site in the 30s.

It was a crucial opportunity for Giuseppe Angelantoni's future. As mechanical assembler, he was able to take part in the installation of some of the most important refrigeration systems in the food sector and to learn the application techniques of artificial refrigeration in detail, travelling on his motorbike throughout Italy and Germany. His notes specifically highlight not only the systems for the General Markets in Rome, but also various installations in Piombino, Ancona, Macerata, Bovalino, Paestum, Amalfi, Massa Carrara, Cervia and Piana di Sorrento. He succeeded in coordinating - or running alone - the work to install these industrial refrigerators.

In 1929, he worked with Barbieri's representative in Milan. However, when the Great Depression came, he found himself unemployed and had to wait until 1930 for a new job at "Aeromeccanica Marelli". In 1931, he moved to "Anonima Lombarda Pompe Klein", which at that time had a plant in the area of Precotto, where Giuseppe lived and where he had made some close friends and acquaintances.

However, in 1932, he decided to become self-employed and relied on his beloved motorbike (his “first company”) equipped with a large tool box that replaced the rear seat. It was one of his friends, who ran a refrigerator repair business to convince him to take this big step and who, one Saturday, invited him to “give him a hand” with an urgent call-out he had to finish. This sudden event led him to start the same job renting a basement in Precotto, the area that had now become the centre of his work and his social life. Apart from the war years, he remained there until 1968, when he returned to Umbria.



New Imperial Motorbike Model 23, 1932.

Thus, Giuseppe began to repair and install refrigeration systems in the catering and food retail sectors, where he gradually acquired a clientele and fame as a refrigeration specialist. He also met his wife in Precotto: on 6 June 1935, he married Olga Lorenzi, daughter of a small entrepreneur, who would later become his partner.



Giuseppe and Olga Angelantoni on their wedding day, 1935.

Edgardo Lorenzi, was a master constructor of Bakelite moulds. However, his technical skills were not backed up by any commercial skills, in which Giuseppe, on the contrary, was very talented. Therefore, in 1938 the two men decided to establish a company, “OLA” (Officine Lorenzi Angelantoni). The company rapidly developed, but the partnership between them proved problematic so, in 1939, Giuseppe decided to devote himself to working in the refrigeration sector on his own.

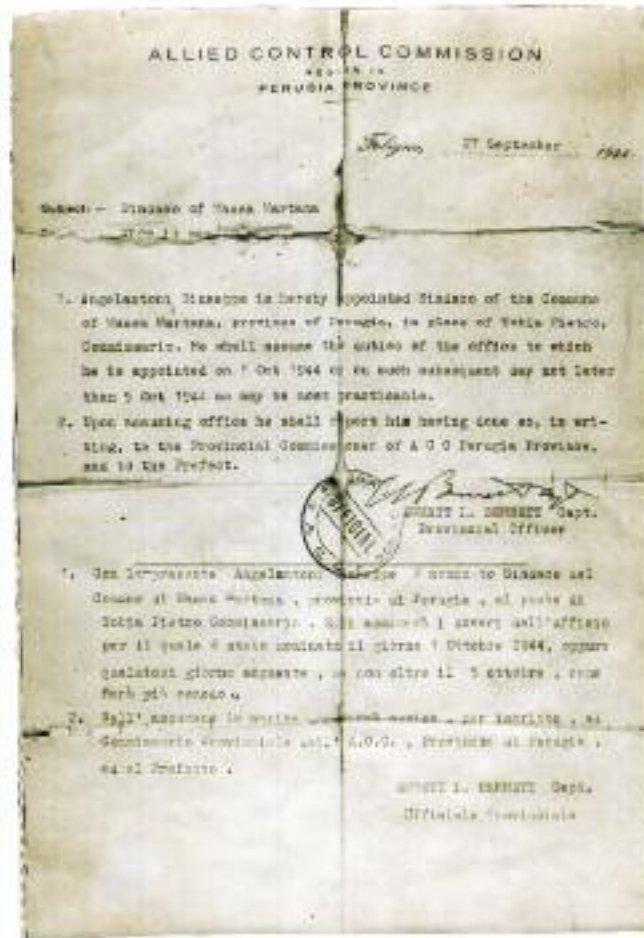
The following year in 1940, at the outbreak of the Second World War, Giuseppe left Milan and moved back to Massa Martana with his entire family, his wife and children Angela, Cesare and Oreste, with the addition of Gianluigi who was born in Todi in 1944.

However, he continued to follow his Milan company with his father-in-law’s help, even though business had dropped as a result of the war. He regularly returned to Milan before making the long, risky journey, which could even last three days amidst mined roads, bombardments, collapsed bridges and all kinds of dangers. He used a little open top van (today’s pickup), for which Franco Pannuzzi, son of a fellow countryman from Massa Martana, vulcanised the tyres and repaired the frequent punctures that could often occur over 20 times in a single journey. Franco would remain close to Giuseppe and the Angelantoni family for his entire life to become an excellent refrigeration engineer too.

DOMINATING REFRIGERATION

When the Allies passed through towards the end of the war, Giuseppe Angelantoni was elected Mayor of his birthplace, a role he took very seriously for two years with great impartiality. On his return to Milan he went back to his business and purchased a new workshop in Via Soffredini 45 (again in Precotto), where he worked on an important job for the Ministry of Defence to repair and service all the military trucks and refrigerated vehicles.

This experience led to the invention, subsequently patented, of an automatic refrigeration system to install on trucks and, more specifically, refrigerated trailers to transport foodstuffs: numerous trailer manufacturers would use it in subsequent years. Angelantoni developed the assembly of refrigeration systems that were also intended for applications in the industrial sector besides the food sector. During this



Appointment as Mayor of Massa Martana.

period, he was registered in the Ministry of Defence's official List of Suppliers, a qualification which enabled him to take part in all the tenders in Italy to supply and install cold rooms down to -20°C in the military barracks, where meat was supplied in those days as frozen beef hindquarters from Argentina. "Giuseppe Angelantoni sas", as the company was called in the post-war era, was also awarded the supply of refrigeration systems for 40 refrigerated trucks to transport frozen meat, again for the Ministry of Defence. Truck traffic was so intense that the space inside the plant of Via Soffredini was insufficient and although the local police understood the reasons for the breach of regulations, they often fined Angelantoni for the vehicles parked outside the workshop in the no parking zone...

Giuseppe Angelantoni was also registered in the official INPS List of Suppliers in order to participate in tenders for refrigeration chambers to be installed in various he-



Refrigerated truck with trailer, 1949.

frigoriferi *Angelantoni*

AG

refrigerating equipments for
commercial and industrial plants

cold stores, slaughterhouses, dairies,
ice making plant, hospitals,
chemical industries, freeze-drying,
food industry, industrial appliances

ANGELANTONI compressing units in a large cold store

Refrigerator systems catalogue, 1970.

althcare centres throughout Italy. The corporate, organisational structure developed and improved with this new business, together with the work for the military barracks. Thus, new work opportunities also arose in the cities where various projects were contracted out.

As the business developed it became necessary to extend the space, so in 1952, the year his daughter Annalisa was born, Giuseppe purchased the plant in Via Livraghi 4, Milan, once again in Precotto. With a surface area of over 3,500 m², it remained the company's historic headquarters until 1995. Here, in addition to the departments for compressor fitting and mechanical refrigeration system assembly, he designed joinery and carpentry departments, in which to produce doors not only for refrigeration



The new plant in Via Livraghi, 1952.

chambers and cabinets, but also for special oak refrigeration bodywork. The memory of the furnishings produced for the bar in the Settebello train, which began running in 1952, was a proud moment.



Electrical multi-unit trainset ETR 300, Settebello.

In the new plant Giuseppe developed the construction of compressors and, thanks to his profound knowledge acquired in refrigeration engineering and his acute commercial know-how, he began to collaborate with the Milan company, “Brizio Basi”, leader in manufacturing high vacuum pumps, which had begun to supply and install freeze-drying systems for the pharmaceutical industry. The refrigeration engineering components in a freeze-drying system are approximately 40%. As a result, Angelantoni became a significant partner in the supply of these systems. These job developed considerably as the demand rose for the production of various pharmaceutical products, such as antibiotics and other drugs of high, intrinsic economic value.



Pre-freezer for freeze-drying with a detail of the condenser.

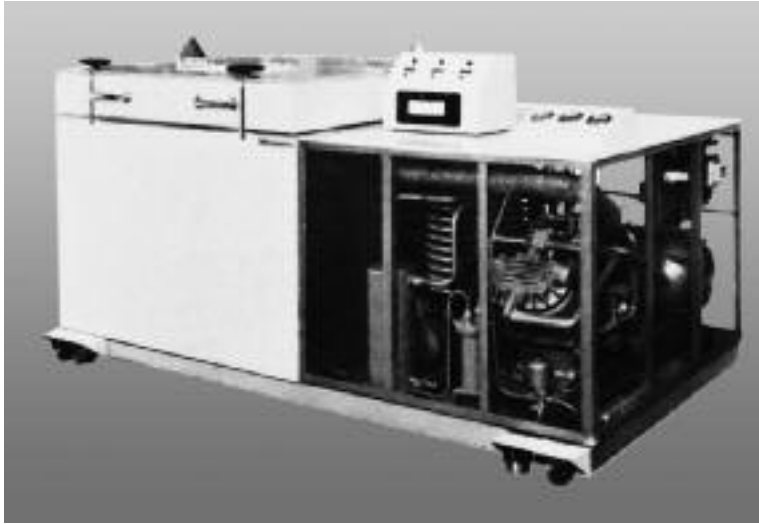
This collaboration enabled him to become well-known in the pharmaceutical sector and he developed work to improve and research similar applications in other industrial sectors, with which he built up commercial and marketing relationships. Therefore, the name Angelantoni as a specialist in refrigeration continued to grow.

Among the significant applications developed and patented in the new plant were the two-stage compressors and a one-piece refrigeration system, with all its components pre-assembled in the factory, ready to be connected to the mains supply without having to assemble on-site: a system that nowadays would be defined as a plug-in.



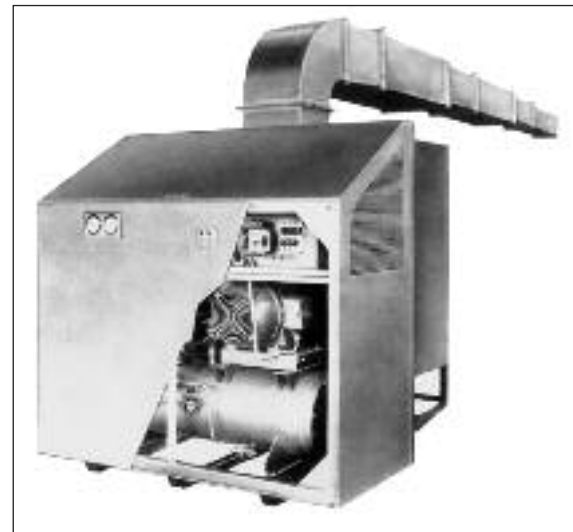
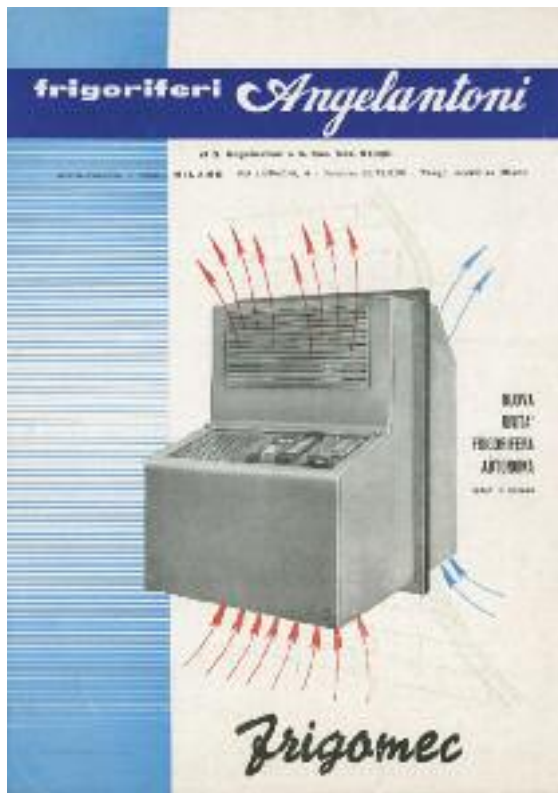
Two-stage piston compressor, 1958.

The two-stage compressor enable operational conditions at a very low temperature to be reached and is a necessary instrument for use in temperatures ranging from -20°C to -60°C . Giuseppe Angelantoni introduced this type of compressor, mounted on a multi-stage refrigeration system, the so-called “cascade” (the first produced in Europe), at the 1961 International Refrigeration Congress in Padua. This was a serum and vaccine freezer that reached -104°C with mechanical systems, without using cryogenic fluids. This was the evolution of the test chamber at -60°C , designed in 1954 for the Motorizzazione Civile [Italian DVLA] in Rome and would also be a prelude to future expansion in the field of the design and construction of test



-104°C refrigerator unit, 1961.

equipment and systems. These chambers enabled the simulation of environmental conditions - temperature, humidity, pressure and light - on our planet and in the surrounding atmosphere: in a word, the climatic chambers would be the product par excellence in the company's future expansion.



10 HP Frigomec.

Front page of Frigomec illustrative brochure.

The one-piece refrigeration system was designed and manufactured in 1957, the year the European Common Market was established; this is why Giuseppe Angelantoni named it Frigomec. This pre-assembled and pre-tested refrigeration system was ready to be installed in one piece on the wall of a refrigeration unit, with the evaporator-cooler inside and the condensation group outside, like the modern air conditioner.

This project could have involved a specific production plant, but it would not be mass produced. Giuseppe sacrificed this project in favour of other priorities and to develop other sectors. Nevertheless, the creative originality of the system has been widely developed recently by specialised manufacturers. Another patent was created in the same prosperous period: a refrigerated display case with electrically rotating shelves, which some cake shops continue to use today.



Giuseppe Angelantoni with his children, Christmas 1961.

SOCIAL ENGINEERING AND ROMANTICISM

1955 marked another important milestone: the two older sons, Cesare and Oreste, joined the company. They worked side by side with Angela, the firstborn, who had already begun to help her father with company management. Cesare, newly qualified in electrical engineering, followed his father in the commercial and technical business. He would complete his studies in 1961, graduating in Business and Economics. Oreste, on the other hand, who was already involved in promoting sports activities, began to supervise production and staff relationships.

In 1961, “Frigoriferi Angelantoni Srl” was created, an operation that transformed Giuseppe’s limited partnership (Sas) into a joint stock company, to enable the family



Angela Angelantoni.

to become part of the corporate structure. This proved once again to be a far-sighted initiative, on which to base the desired future development of the company and strengthen not only its position on the market, even abroad, but also its relationships with customers and suppliers. And from 1961 onwards, various family events brightened the life of Giuseppe and his wife, Olga: Angela's wedding in 1962, who moved with her husband, Enrico Orsini Federici, medicine doctor, to Perugia; Cesare's marriage with Maria Giuseppina Malfatti in 1964 and lastly, Oreste with Ornella Orsini Federici in 1966. These were followed in 1974 by Annalisa's marriage and in 1976, Gianluigi married Roberta Molho. Thus, Giuseppe became grandfather



Giuseppe's nine grandchildren, from right to left: Cristina, Isabella, Eleonora, Francesca, Antonella, Paola, Beatrice, Federica and Marco.

to Cristina and Francesca, Isabella, Eleonora and Paola, Antonella and Beatrice. These grandchildren were followed by Federica and Marco.



Giuseppe Angelantoni with friends from the Pro-Loco local tourist board.

His extremely busy life in Milan did not prevent him from keeping in constant contact with his home town, especially since his two elder sons were now part of the company. In Massa Martana, he was surrounded by the affection of his family, friends and connections, who respected his entrepreneurial success and enjoyed an atmosphere full of memories and close bonds. It was his home town, the town he loved and would never forget. During these regular visits, he took part in the social life of the town and, in 1962, he was offered the presidency of the Pro Loco, founded



San Pietro sopra Le Acque, his beloved home.

in 1960 by a Roman journalist who had moved to Massa Martana. He remained a generous, enlightened President until 1973.

However, another major event occurred in 1964. As a result of cash problems, the Municipality of Massa Martana put up for auction an ancient, 17th century convent, named San Pietro sopra le Acque. Giuseppe was inspired by personal memories (he experienced his early and only school years right here) and was probably guided by a farsighted vision for the future use of the property complex. He took part in the auction and won the property. The site, set half way up a hill amidst the green Umbrian countryside, included the former convent building with various annexes and a century-old oak wood of spiritual harmony. Giuseppe restored it over time and renovated it as his home, perhaps with the idea of moving to Massa Martana in the future.

The year 1968 indelibly marked Giuseppe Angelantoni's life and established the peak of his entrepreneurial vision. This was the year of the masterpiece of "social



The construction begins of the ACS plant in Cimacolle, Massa Martana, 1968.

engineering”: he left the company in Milan, telling his sons a lie («I’m retiring to Massa Martana»). Actually it was soon revealed when the bulldozers started to work on his family estate in Cimacolle in Massa Martana. This was where the structure rose for the new company Giuseppe wanted to create: Angelantoni Centro Sud - ACS.

This was the first step towards achieving the dream he had held on to since his arrival in Milan at the age of twenty: to transfer the work to a rural economy where there was a wealth of labour and talent instead of transferring men to where the work was. The rule had always been the latter, especially in central and southern Italy. This was his dream becoming a social project with the training of young people in refrigeration technology in the workshop, while Giuseppe supervised supplies and installations, and exploited his specific know-how and growing fame.

Meanwhile in Milan, company management was entrusted to Cesare who, together with Oreste, transformed and reorganised the structure by employing managers,



-70°C refrigeration system for antibiotics production.

signing international commercial agreements and promoting strategies of expansion in the markets of corporate interest. The various corporate businesses were consolidated into three main product categories: equipment and systems for environmental simulation, i.e. test chambers; equipment and systems for healthcare, research in the hospital and pharmaceutical sectors; and lastly, refrigeration systems for industrial processes, specifically in the pharmaceutical, chemical and petrochemical sectors. As production in the old plant in Milan expanded, the new Umbrian company was identified as supplier of some of the main components, especially the sheet metal bodywork and electrical panels. As a result, ACS grew by creating specific production departments and keeping the local system installation business.

Once production spaces of the expanding company in Milan had reached saturation point without any possibility of expanding into adjacent areas that were all already built up, the idea emerged of transferring the plant outside the city, as many other Milan companies had already begun to do. The venture proved advantageous, as land prices in the hinterland or nearby provincial towns were low and the investment was covered by selling the area in the city, as its value for residential use had risen considerably.

BACK TO THE BEGINNING TO IMAGINE THE FUTURE

Under these circumstances, instead of opting for the Milan hinterland, Giuseppe found it natural to suggest his children to move a part of the production to Massa Martana, where he was working already. They chose the test chamber sector, as they believed it had great potential for expansion. The move took place in 1977, when his third son, Gianluigi, joined the company and took charge of the transfer and of developing production, by moving with his family to Massa Martana. Over the next few years, both national and international business activities expanded considerably and the ACS logo (which now stood for “Angelantoni Climactic Systems”) and the name of Massa Martana appeared in many countries in the world. Over time, ACS became the family jewel and conquered the markets of the most important industrial countries becoming the second manufacturer in Europe. Since 1988 onwards, it was one of the top three world manufacturers in the aerospace sector with its design and construction of the space simulators.



The new ACS plant in Massa Martana.

In 1982, the successful transfer of its test chamber production to Umbria led to the decision to also move production of a second category of products dedicated to the healthcare, hospital and pharmaceutical sectors. It led to the establishment of “Angelantoni Scientifica” (AS), headed by Oreste, who moved from Milan to Massa Martana, as Gianluigi had done previously.

This initiative also found fertile ground for expansion and turned into an ever-increasing success: AS became a leading company on the national market of “scientific” refrigeration and the name of Angelantoni appeared in the major hospitals, healthcare structures and pharmaceutical companies in Italy. A major role in this sector was played by the youngest child, Annalisa, who became the responsible for the commercial activities of Angelantoni Scientifica in Milan.

Cesare remained in Milan at the historic headquarters where Giuseppe Angelantoni’s entrepreneurial adventure began. He continued the industrial activities of the company which, in the meantime, had been renamed “Angelantoni S.p.A.” (AG, the founder’s initials) and developed special projects and supplies of refrigeration systems in various industrial sectors. Thus, the name of Angelantoni became synonymous



Oreste Angelantoni.

with refrigeration engineering. Its role gained acceptance in 1998, when it designed and constructed the system to preserve the Similaun Mummy, the famous archeological find now housed in Bolzano, and which can be viewed through a special conservation chamber, unique example in the world.

After 1982, Giuseppe Angelantoni's managerial commitments were reduced by his sons so he was able to proudly appreciate his two new creations ACS and AS in the hands of Gianluigi and Oreste and follow from afar the affairs of the Milan AG in the hands of Cesare with great satisfaction. Nevertheless, he took part daily in the events and expressed his opinions and suggestions with his natural simplicity, a legacy probably of the past, when as a child, as we have seen at the start of this long story, he had to go straight from his school desk to taking care of sheep and horses. His gift of



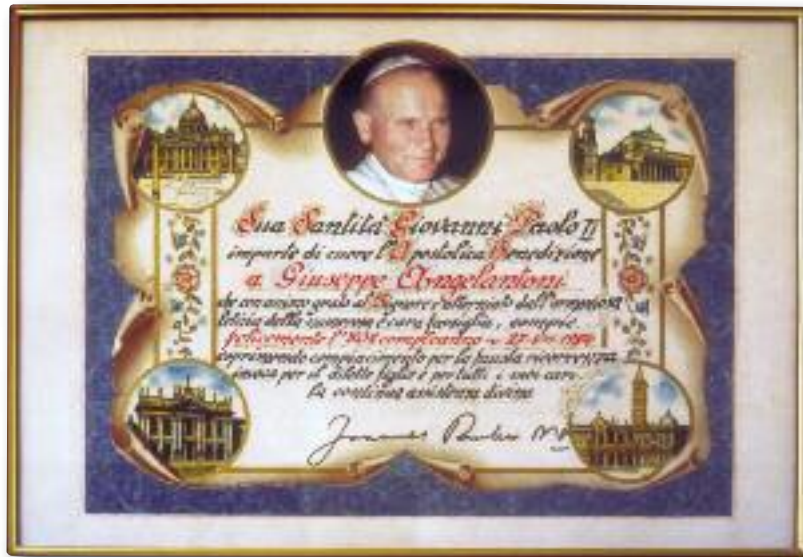
Angelantoni Scientifica office block and plant in Massa Martana.

simplicity should not be mistaken for modesty, which would not have worked side by side with his genius and the entrepreneurial ambition which he achieved when he finally returned to Massa Martana.

Giuseppe Angelantoni passed away on 30 April 1994. He rests in the family chapel in the cemetery in Massa Martana together with his wife Olga and his children Angela and Oreste. Those who knew him remember not only his keen entrepreneurial qualities, but also his personal attributes that made him unforgettable. First and foremost among these was his rigour in his business activities: he was demanding of all his collaborators and above all of himself. The same rigour shown in his presidency of Massa Martana's Pro Loco and similarly when he went to hear Mass at the Sanctuary of Collevaenza every Sunday. Rigour which waned in the discussions with his playmates during those unmissable card games at the Bar Centrale, where Giuseppe spontaneously enjoyed the pleasure of belonging to his local community.



Giuseppe Angelantoni meets Pope John II, 1984.



He had also a great heartedness, hidden by his thrift at home and work and in his social life style was perhaps a legacy from the hard life he spent in his youth which did not permit him any luxuries under any circumstance and he was far from being vane. He broke those rules twice: his passion for fast cars breached the defences and rules of thriftiness he had imposed on himself and the pleasure of spending a few days to relax and rejuvenate at the thermal baths of Montecatini. Giuseppe was also very proud of being awarded the honour of “Commendatore” of the Italian Republic, a title which was soon in common use among the citizens of Massa Martana, as they began to call him “commendatore”. Then, in 1978 he was also appointed “Cavaliere” of the Italian Republic.



Giuseppe Angelantoni in Montecatini, 1976.



In 1978, Giuseppe is awarded the honour of Cavaliere of the Italian Republic.

Lastly, although he was not one to show his feelings, his love for his birthplace unfailingly shone through in the events of his daily life and work. The ancient convent of San Pietro sopra le Acque is visible testimony of that love. This historic heritage was for many years his home and today has been restored into a well-known and much appreciated resort and spa. Together with his workshops it remains a monument in his memory, visible to those who look out over the belvedere to the south of Massa Martana, which the town dedicated to his name.

There is one last, but not the least important point to complete our portrait of Giuseppe Angelantoni. This was the role played by his wife, Olga, who remained at his side for almost 60 years and who with her attentive presence and efficient management of their family, gave him the serenity he needed to realise his projects and achieve his success. Generous in her rapport with others and in her relationships linked to her husband's business, her house was open to all with a well-laden table.



The dedication plaque on the Belvedere in Massa Martana, 2014.

Born in Sesto San Giovanni of a father from Reggio Emilia and a mother from Milan, with a Lombard upbringing, she was a blend of her father's rigour and the gentleness of her mother, who died when Olga was still very young. Toughened by



Olga, his wife.

family events and by her work in her father's business, she married when she was only twenty years old. She got to know the Umbrians during the period of evacuation to Massa Martana during the Second World War and when, in 1968, Giuseppe moved there, although she regretted having to leave her city, she followed him without question and considered Umbria as her homeland. Reserved in her ways and feelings, she was very distressed by the almost simultaneous death of her husband and son, Oreste, a pain that accompanied her until her death in 2006.

SAN PIETRO SOPRA LE ACQUE

GIUSEPPE ANGELANTONI'S DREAM

One spring day - I had just become part of the big family - Giuseppe Angelantoni invited me and other family members to visit an enchanting place he had just purchased. It was the ancient Franciscan convent of San Pietro sopra Le Acque, surrounded by meadows and crowned by a thick wood of hundred-year old oaks. At first, I was struck by the name "Super Aquas" which evoked holy, spring water, a miracle in a land that was often arid. I was also struck by the site, half way up the sunny slop of the hillside, which I imagined to have always been devoted to meetings



San Pietro sopra Le Acque.

with God. There was a church with a small bell gable, the adjoining convent and other utility buildings leaning against it. It was all surrounded by a wall which was broken by the path to the church, marked by the tiny shrines along the Way of the Cross and by a fountain with water flowing from a mannerist mask, the same water that pilgrims and faithful people found so propitious.

That day, the blinding sun made everything shine. One could smell the perfume of the violets and cyclamens hidden among the flashes of green meadows around the buildings or at the foot of the trees. The sun also highlighted the wounds of the ancient complex. However, my father-in-law's radiant face dominated everything. He was happy to have achieved his dream, to have all for himself and for his family a place he had loved from when he was a boy, as he was born close by and had attended the elementary school here. He was also happy to achieve his dream of stone, with a close link to his Massa Martana and symbol and metaphor of his well-earned entrepreneurial and social success and rise to fame.

Thanks to Giuseppe Angelantoni's passionate care and the not indifferent financial commitment, the ancient convent gradually began to look like the manor house where the entire, numerous Angelantoni family could meet every summer and mark every special occasion. All of us of every generation remember with nostalgia and affection the Christmas parties, communions and weddings that took place here, together with the festive balls in the courtyard.

My father-in-law often asked me to talk to him about the history of his San Pietro and the following piece is a summary of one of my old studies and is my tribute, which I dedicate to him with daughterly affection.

M. Giuseppina Malfatti Angelantoni

SAN PIETRO SOPRA LE ACQUE: A BRIEF HISTORY

The church of San Pietro sopra Le Acque [St. Peter on the Waters] and the adjoining convent of the Reformed Friars Minor hold a special place in the historic/artistic context of the area around Massa Martana, not only for their age and for the beauty of the site, but also for some of the works of art they house. The place was given the name “On the waters” as it had always had plenty of spring water. Unfortunately, no exhaustive documentation has so far been discovered that reconstructs the history of this complex, as the historic sources only begin to speak of SAN PIETRO SOPRACQUA at the time the church was rebuilt and the convent was



San Pietro sopra Le Acque.

founded in the early decades of the 17th century. During this period, all the area around Massa Martana depended entirely on Rome and was flourishing fairly well after Massa had split from Todi. This very strong bond with Rome led to positive repercussions for our two buildings with generous funding for the style used to decorate and furnish the church and convent.



San Pietro sopra Le Acque: the church.

A note written in 1717 tells us that in the year 1614 a very old, derelict abbey church, mentioned in a document of 1275, was knocked down in order to construct the current church of St. Peter.

The tiny ancient church stood on the site of the forecourt and portico in front of the façade of the current church, presumably facing east-west. Some engraved slabs discovered on-site by the writer lead us to believe it stood at right angles to the church that exists today.

Written accounts of the time, referred to in the aforementioned note, speak of major drainage work of the woody land with plentiful water before the church was built.



San Pietro sopra Le Acque: the square in front of the entrances to the church and convent (top photo) and the frescoed portico.

The Roman Cardinal, Marcello Lante, then bishop of Todi, was a major sponsor and supporter of all the work for the church and brought a Franciscan community to St. Peter.

People from Massa Martana, Todi and Lombardy worked on the construction site. The latter also controlled the water and cleared the wood on the northern boundary of the complex.

Given the size of the convent, we can imagine that the church of St. Peter conducted intense pastoral and missionary work according to the Rule of the Reformed Franciscan Order for the community in the area around Massa Martana.

The 18th century saw a reduction in the number of Friars in the community, as everywhere in the Catholic world, and the order was eventually suppressed during the Napoleonic rule and finally abolished in the second half of the 19th century in compliance with the strict, anticlerical rules of Unified Italy. The church and convent complex was split into a state-owned part (the church) and a municipal part (the convent).



San Pietro sopra Le Acque: cloisters and convent interior.

Without documentary support, it is difficult to reconstruct the older history of this settlement. However, some archeological finds can help us. These are the three holes dug in the natural tuff bastion bordering the north of the complex. The first, to the west, around the entrance and in the interior chisel work, shows a similarity with the Etruscan tombs in the area around Viterbo. The second is undoubtedly an Etruscan/Roman colombarium with niches to place the ashes of the dead, similar to others found around Massa Martana. The third cave to the east, on the other hand, has an entrance which resembles the structure of a Mithraeum and also has traces of a wall sculpture, which could possibly be the cosmic cloak of the god Mithras.

During the last renovation works for the complex a very poor Roman Capuccina tomb, completely lacking any grave goods, was discovered in the meadow to the east of the convent. Studied by the Archeological Superintendency of Perugia, it could indicate the presence of a necropolis aside a “domus rustica”. However, this unusual and pleasant place, with a wood full of water on an open and sunny slope, together

with persistent sacred and magical memories, make us think of the presence of a “fanum” that existed before the agricultural complex in a strongly Romanised, pagan territory, where evidence of other temples can still be seen. As in other examples, it could have been transformed into a Christian hall or small ecclesia with cenoby, places which, with the spread of Benedictine monasticism, became monasteries and abbeys.

The current church was built between 1614 and 1624 in the late Roman Mannerism style, with a single nave, a simple wooden chancel and richly carved walnut cabinets in the sacristy. The church still houses works and furnishings of certain historic and artistic value, including first and foremost, the large canvas by Andrea Polinori from Todi, portraying “The handing over of the Keys” against the background of Massa Martana. The painting, dating back to the early 17th century, still has its original, precious, marbled frame. The artist was certainly one of the most important Umbrian painters of his time, known for his elegant, mysterious style somewhere between Mannerism and Baroque, gained in Rome from his contact with Roman and Lombard



San Pietro sopra Le Acque: entrance with frescoes of the life of St. Francis.

painters who revolved around the great cardinals Angelo Cesi and Marcello Lante, both bishops of Todi.

The chapel on the left-hand side of the church contains a small fifteenth century fresco, detached from a farmhouse in Todi. It is framed by two small paintings on wood by Andrea Polinori, depicting St. Francis and St. Anthony.

The convent winds around a cloister now enclosed by the old, sealed arches. The building on the ground floor reveals massive structures and elegant halls with incomplete, cross-vaulted ceilings. The entrance corridor is frescoed with scenes from the life of St. Francis, taken from St. Bonaventure's *Legenda Maior*, which may be a 17th century work by Giovanni Antonio Polinori, Andrea's brother, and his workshop. The fresco in the lunette above the convent entrance door is a work by Andrea and depicts the scene of St. Francis receiving the stigmata.

Under the portico on the church façade are some unassuming, eighteenth century frescoes, covered in visitors' and pilgrims' graffiti and signatures, some of which would make interesting reading. In full view on the left-hand portico wall in a Baroque-style frame there is a fifteenth century fresco, detached with all its supporting wall, portraying the patron of the painting praying the Virgin Mary, accompanied to her by his patron St. Peter. This is perhaps the sole artistic testimony of the previously destroyed church.

The most recent studies on San Pietro sopra Le Acque have been carried on by Francesco Campagnani, a young scholar of local history.

M. Giuseppina Malfatti Angelantoni
Art Historian

THE STORY CONTINUES

After the death of Giuseppe Angelantoni, in 1995 the three companies, AG, ACS and AS merged into one, “Angelantoni Industrie Srl”, today the holding company of the homonymous industrial group. Various changes have taken place over the last twenty years with takeovers, company transformations, acquisitions and transfers, which have modified the Group structure, including the investment made by FAL Holding into Angelantoni Industrie.

In addition to Gianluigi, the current Executive President, other family members also working in the Group include Cesare (Honorary President) and Annalisa, joined by some members of the third generation: Antonella, Francesca, Beatrice, Paola, Federica and Marco. The Group’s industrial businesses employ approximately four hundred employees, spread over four manufacturing plants. Angelantoni Industrie also has offices of its subsidiary ATT “Angelantoni Test Technologies” in Germany, France, India and China, plus its representatives, distributors and technical service centres in approximately 50 countries in the world, where the Group exports over 70% of its production.

The gradual development of business has led ATT to be one of today’s leading companies worldwide in the sector of simulated environmental tests (with the design and construction of space simulators, with ACS trademark, as the jewel in the crown) and ALS, Angelantoni Life Science, to be top on the national market in the sector of scientific and technological refrigeration for the biomedical and pharmaceutical sectors. Together with the new partners, Shanghai Antolin Life Science, ALS is also planning to expand considerably in China with the highest value added equipment.

Kenosistec, under the control of ATT, is one of the major national companies in the thin film coating technology sector and holds several recent patents, which ensure a promising future.

The Angelantoni Group also has some significant corporate shareholdings:

- Archimede Solar Energy, manufacturer of receiver tubes for concentrated solar power (CSP) systems, which use oil, direct vapour or above all molten salts as the intermediary fluid.

- Turboalgor, a start-up that operates in the field of energy efficiency of compression refrigeration systems for traditional refrigerants and for transcritical CO₂.

We are proud to share some of our most significant successes in the last 25 years with our readers.

ÖTZI: THE ICE MAN

One of the major archaeological discoveries of the last century was undoubtedly “Ötzi” (the name comes from Ötztal or Val Venosta, near where it was found), the almost 5,500 year-old mummy from the Similaun glacier. It was found by accident in September 1991 by two German tourists at a height of 3,200 metres in Italy, just 92 metres from the Austrian border.



Ötzi, the Similaun mummy.

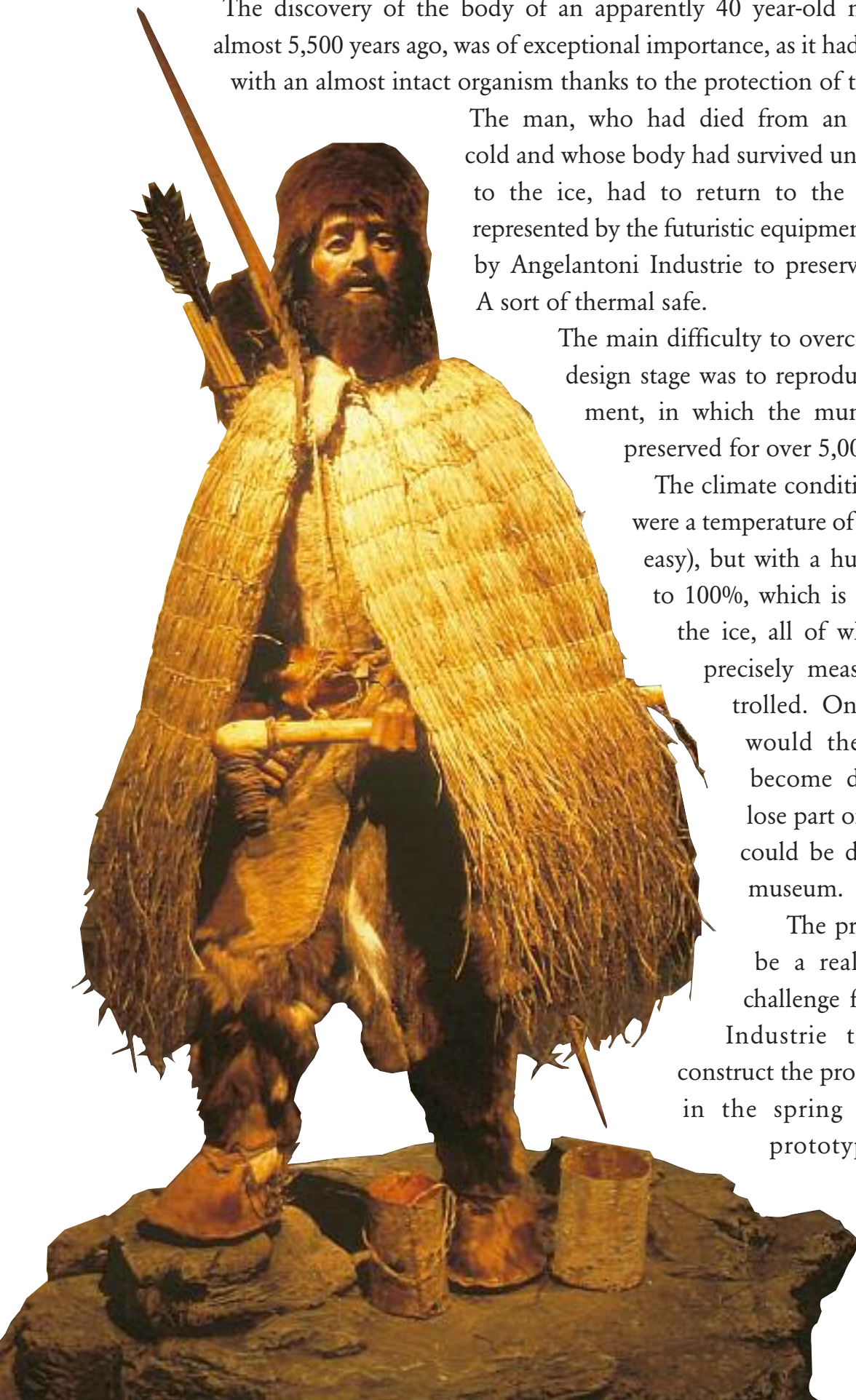
The discovery of the body of an apparently 40 year-old man, who lived almost 5,500 years ago, was of exceptional importance, as it had been preserved with an almost intact organism thanks to the protection of the ice.

The man, who had died from an arrow and the cold and whose body had survived until today thanks to the ice, had to return to the “ice kingdom” represented by the futuristic equipment manufactured by Angelantoni Industrie to preserve the mummy. A sort of thermal safe.

The main difficulty to overcome during the design stage was to reproduce the environment, in which the mummy had been preserved for over 5,000 years.

The climate conditions to simulate were a temperature of -6°C (relatively easy), but with a humidity of close to 100%, which is the level inside the ice, all of which had to be precisely measured and controlled. Only in this way would the mummy not become dehydrated and lose part of its weight so it could be displayed in the museum.

The project proved to be a real technological challenge for Angelantoni Industrie that began to construct the prototype in Milan in the spring of 1996. The prototype was tested for several months





Exterior of the climatic chamber containing “the Iceman”.

with a sample mummy inside and in the summer of 1997, the International Commission authorised Angelantoni Industrie to create the entire climatic system. An entire museum was set up for Ötzi in Bolzano (Archeological Museum of Alto Adige) in the former offices of Banca d’Italia. Angelantoni Industrie’s challenge to preserve a man from the past and make him available for all future generations was crowned with success.

ISRO, THE FIRST LARGE SPACE SIMULATOR

The inaugural ceremony was held on 11 February 2007 in Bangalore for the large space simulator for tests on satellites, built in two years by Angelantoni on behalf of ISRO, Indian Space Research Organisation. Taking part were the Italian Prime Minister, Romano Prodi, and the Minister of Foreign Affairs, Emma Bonino, some representatives of ASI, the Italian Space Agency, and Prof. Roberto Battiston, then Director of the Perugia branch of the I.N.F.N. and future President of the ASI.

The Director of the Department of ISRO, responsible for the activities of the space simulator, Dr. N.K. Misra, expressed his extreme satisfaction for the positive, precious technical and human collaboration established with his Indian staff during the two years work.

The space simulator delivered to ISRO was one of the largest installed in Asia and the most technologically advanced in the world.

The simulator consists of a cylindrical chamber, with a diameter of 7 m and a length of 11 m, in which the satellite to be tested is placed.

The system is equipped with 4 cryogenic pumps, which generate the high vacuum and which can each pump 60,000 l/sec. The cryogenic pumps use helium to reach temperatures of 10° Kelvin, corresponding to -263°C. The vacuum level reached is 10⁻⁷ mbar.

The thermal system consists of 15 independent circuits, capable of reproducing the conditions around the satellite in space. They gradually reproduce all the temperatures from the side radiated by the sun to the dark side, i.e. from +180°C to -180°C. Liquid nitrogen guarantees cooling and is stored in 4 large tanks (22 m high), which can store up to 500,000 litres of nitrogen.

The space simulator is managed and supervised by a control and management system by a group of over 20 electrical panels to distribute power and control the systems with PLC logic, a data acquisition rack (almost 800 temperatures), SW to



monitor the entire system, complete with synoptic charts and redundant systems, spread over a command console consisting of 5 PCs and on another 12 workstations over 2 floors connected in a network. The system can also exchange data via optic fibre cable with the satellite control system.

RENAULT, HUB FOR CORROSION TESTS

The Renault test centre at Aubevoye extends over 772 hectares and is 40 years old. Here, experts, engineers and technicians fine tune, test and grant type-approval for the vehicles, including electric vehicles. Everything is tested, including vehicle manageability and braking under various weather conditions and on different types of road, durability, thermal performance at high and low temperatures, the acoustics and electromagnetic compatibility.

ATT has supplied the centre with the following prefabricated chambers;

- 11 prefabricated climatic chambers (109 m³)
- 1 prefabricated climatic chamber with infrared ray system (190 m³)
- 2 prefabricated climatic chambers for corrosion tests (207 m³)
- 1 prefabricated thermostatic chamber (171 m³)

Thus, it can conduct tests with cycles of heat, humidity and freezing, infrared radiation and cyclic corrosion.

Test objectives: to subject the vehicle to climatic and saline stresses to accelerate the corrosion process.



Two of these chambers are for large vehicles, one of which is equipped with an infrared radiation system on the ceiling and on sides.

One of the two prefabricated salt spray chambers is also equipped with a wind simulation system which can adjust the air speed from 0 to 90 km/h.



LEONARDO “PRISMA MISSION”

On 23 March 2019, the PRISMA satellite of the Italian Space Agency (ASI) was launched successfully from the European base in Kourou (French Guiana). Its advanced electro-optic instrumentation enabled it to acquire images of the earth's surface containing information about the chemical and physical composition of the objects observed in the scene and to contribute unique information on various scientific applications.

Angelantoni Test Technologies is proud to have contributed to this important mission with its space simulator named “GALILEO Large Thermal Vacuum Chamber”, with which environmental tests were made on the satellite's advanced, hyperspectral, electro-optical instrumentation produced by Leonardo and installed in the Testing Laboratory at their headquarters in Campi Bisenzio (Florence).

The simulator - equipped with independently thermo-regulated shroud, thermal plate and decontamination plate - has a useful internal volume of approximately 17 m³, a temperature range of -193/+150°C and reaches the high vacuum value of 10⁻⁶ mbar in less than 3 hours.

«We are expecting a boost for research and development of Earth observation applications actually based on the capacity of the hyperspectral data to provide information on the chemical and physical characteristics of the areas observed», explained Piero Benvenuti, ASI's Special Commissioner, in an interview with the magazine *Le Scienze*, «Precision agriculture, the study and control of vegetation, atmospheric pollution, the monitoring of coastal waters, the analysis of soil properties and the control of urban areas are some of the sectors that may benefit from the information obtained by PRISMA».



EDF, ACCELERATED CORROSION TESTS

It was designed and created specifically for EDF Electricité de France. This is a 700 m³ large chamber for the accelerated test of external high voltage insulators (300 KV). The system includes simulating temperature, humidity, salt spray, rain and sunlight with ultraviolet rays.

This chamber gives EDF the opportunity to conduct cyclic and combined tests on high voltage insulators made of composite material. The tests have an acceleration factor of up to 10 times higher than a traditional test.

The accelerated corrosion tests are also conducted on parts or small components in the one-piece DCTC chamber (Dry Corrosion Test Chamber), which enable the results of 6 months worth of traditional salt spray tests to be obtained in just 3÷4 weeks, by alternating the climatic factors (dry and wet phase).



THE SIMULATION OF THE SATELLITE'S ENTRY INTO ORBIT: THE TAI CASE

One of the largest space simulators ever made by ATT ensures satellites function well by recreating the extreme environmental, operational conditions.

Starting with the launch of the Earth observation satellite GOKTURK 1 on 5 December 2016, the test centre of Turkish Aerospace Industries (TAI) used one of the largest space simulators ever produced by ATT (ACS brand).

Situated at TUSAS - Turkish Aviation and Space Industry Inc. - in Ankara, the USET centre (Space Systems and Integration and Testing) stretches over an area of 3,800 m² and is equipped with instrumentation to observe land communication services, pre-assembly and assembly services, system integration, functional and environmental test services.

Environmental testing activities aim specifically to demonstrate the resistance of the satellite and its components to the launch conditions and environmental conditions in orbit. These tests create the



environmental conditions as similar as possible to those that surround a satellite from its launch to its entry into orbit to ensure the satellite and its subsystems function correctly under such conditions.

The simulator (Thermal Vacuum Chamber), which ATT designed and produced according to TAI's requests, is 6 m in diameter and achieves the vacuum limit of 1×10^{-7} mbar with a temperature range from -190°C to $+100^{\circ}\text{C}$, using a liquid nitrogen cooling system. It is also equipped with a special system to maintain the test sample perfectly horizontal during the test, named Horizontality Control System (HCS).



THE NATRIP PROJECT FOR VEHICLE TESTS

ATT installed one of the largest walk-in chambers for emission tests using temperature, humidity, sunlight and wind simulation systems at a major Test and Certification Centre in India.

In order to conduct emission tests according to standardised guidelines, the ACS brand chamber was paired up with a dynamometer and an exhaust collection and analysis system.

The chamber enabled a wide range of combined tests to be conducted:

- Mass emission test (for vehicles up to 3.5 tons GVW) under extreme temperatures, with humidity and solar load control
- Emission test according to Euro-V (petrol - cold emissions), BS, ECE, EPA, Japanese and Indian standards
- Vehicle performance test: cold start-up, heater performance, cabin HVAC performance, etc.
- Customer-defined research and development test.





RAL SPACE, THE SUCCESS OF ACS IN UK

One of the largest space simulators produced in Europe by Angelantoni Test Technologies (ACS brand) was installed in June 2020, in mid pandemic, at the Rutherford Appleton Laboratory (RAL) in Great Britain.

Measuring seven metres in diameter by twelve metres in length and with a temperature range from -180°C to $+100^{\circ}\text{C}$, it is the largest thermal vacuum chamber to be installed in the UK and will be classed among the “giants” of Europe used to conduct tests on interplanetary probes for scientific missions and on commercial satellites orbiting round the earth.

RAL Space carries out global space research and technological development involving over two hundred space missions. The work to complete the structure began in November 2018.

Shipment to the United Kingdom from Italy was by sea. The chamber sections were then transported by a convoy of 6 lorries from Portsmouth Harbour to Harwell - to the National Satellite Test Facility (NSTF) in Oxfordshire - in what was one of the largest single road movements Great Britain has ever seen. The three-lane motorway was only just big enough to accommodate the very “special” transfer.

This project was a challenge not only from the technical and qualitative viewpoint, but also for the time schedule. Both requisites were achieved in full, thanks to Angelantoni’s professionalism and experience in producing very complex, high performing and very large pieces of equipment. The customer provided precious collaboration during installation: a bond formed immediately that united the team with the passion for building one of the largest and most advanced European space simulators.

The ACS thermal vacuum chamber is part of a series of international equipment for environmental tests on payloads and space satellites - including systems for vibration, electromagnetic compatibility (EMC) and antenna measuring tests - which

the National Test Facility is setting up to become the national reference test centre for English companies in the aerospace sector.



CLIMATIC TESTS FOR LITHIUM-ION BATTERIES

The main automotive development and test centres in Italy and abroad have been working for years on solutions for everyday electro-mobility and the use of renewable energy.

ACS has supplied its climatic test benches to test lithium-ion modules and high voltage batteries to these state-of-the-art laboratories, which subject the battery systems to a wide range of climatic and temperature conditions together with load-unload systems.

A flexible temperature and humidity range is extremely important for a test laboratory. In order to respond to the various specifications of battery tests, the climatic chamber performance must be very high, yet with the lowest possible energy consumption.

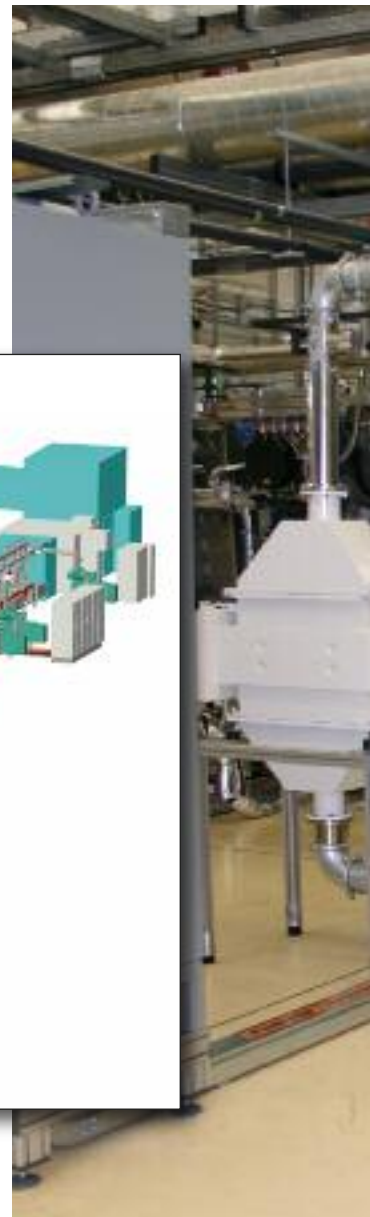
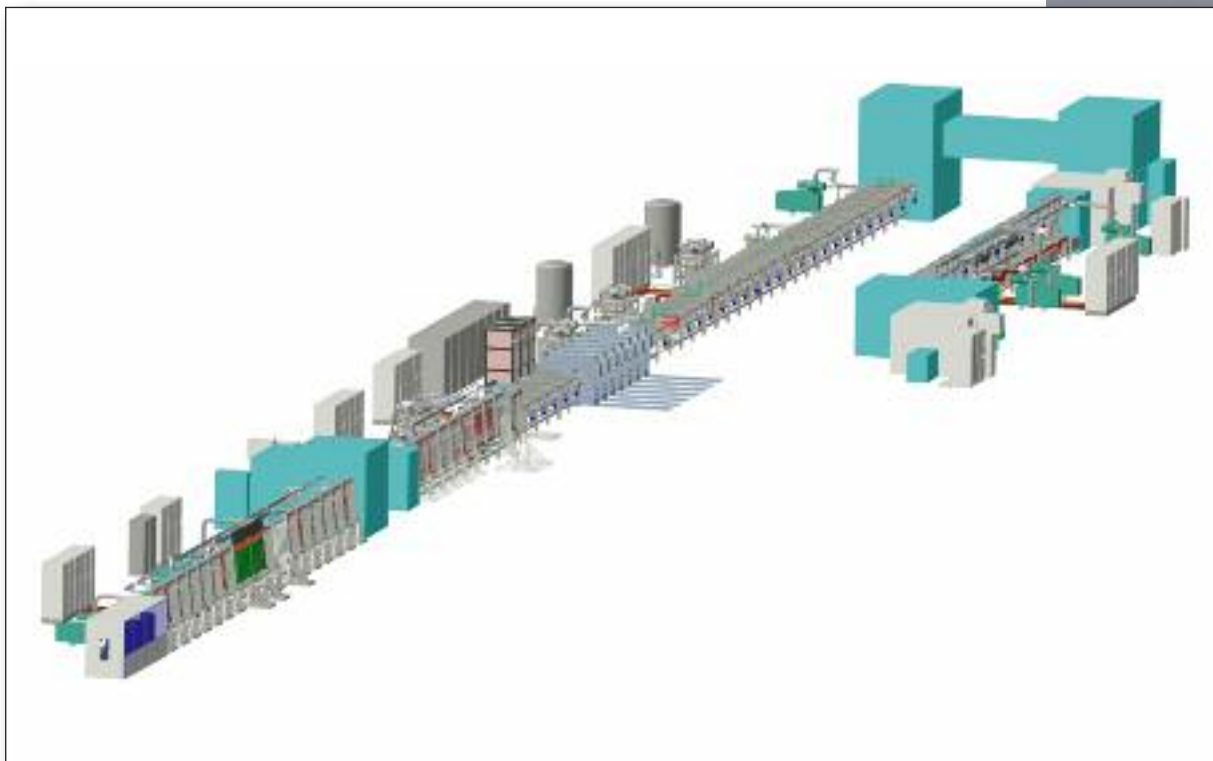
ACS has specifically developed a series of one-piece or walk-in T and RH test chambers, which fully meet the high demands for flexibility and performance with a temperature range from -40°C to $+140^{\circ}\text{C}$ and controlled relative humidity from 10% to 95%. Thus, battery packs can be tested according to the customer's widest specifications.

The chambers are also equipped with a large range of safety devices up to EUCAR 6 risk level to provide protection under any adverse circumstances.



ARENDI THIN FILM PHOTOVOLTAIC MODULES

The Arendi project began in 2005 and envisaged a scale-up from 2 cm² to 0.72 m² of a process developed at the laboratories of the University of Parma to produce 600x1200 mm photovoltaic panels with Cadmium Telluride (CdTe). The over 100 m long line envisaged



the production of a finished panel every 2 minutes, from the glass wash on entry to depositing the final layer of electrical contact.

The new element consisted of the use of an unconventional deposition technique, CSS (Close Space Sublimation) for the CdTe, a material which made the photovoltaic cell one of the top performers available on the market at a very competitive price.

The production line was designed, produced and installed by Kenosistec in 20 months and produced the first panel after 24 months



ASE - RECEIVER TUBES FOR CONCENTRATED SOLAR POWER

The close collaboration between Enea and Angelantoni fully materialised in 2009, when an Enea patent to produce high temperature solar receiver tubes was accepted. The patent, which was strongly seconded by the Nobel Prize winner, Prof. Carlo Rubbia, envisaged the use of stainless steel pipes covered in a multi-layer of metal and ceramic materials, which would enable the absorption of sunlight to be optimised and transmit it to a fluid consisting of molten salts to raise it up to 550°C.

This fluid powered a central heating plant to produce electricity and could be stored in order to last through the “dark” hours and keep the plant working 24/7. The Enea Research Centre in Portici (Naples) fine tuned the process with machines produced by Kenosistec to create small samples (planar) and true-size tubes (70 mm diameter) and from 600 mm to 4 m long.



Their knowledge of the process problems enabled Kenosistec to design, produce and start up an 80 m long production system that can deposit simultaneously on 13 steel tubes each 4 m long. The system was created, tested and put into production at the headquarters of Archimede Solar Energy (ASE) in Villa San Faustino, Massa Martana (Perugia).



SPUTTERING FOR OPTO-ELECTRONIC COMPONENTS

Kenosistec tackled and won a further challenge regarding the design, production and installation of a special cluster of sputtering to create a pilot production line of opto-electronic components for a major Japanese manufacturer, operating in the semiconductor industry.

The bespoke system was designed for a laboratory, which would have to overcome numerous logistic obstacles to house it. It was successfully installed in the Silicon Valley and envisaged the automatic loading of wafer boxes into 3 process chambers to clean the sample and to depose the various metallic, oxide and nitride materials.

The system proved extremely versatile not only for developing new processes, but also for checking a small production. After a few years of use, the system was purchased by an American university which uses it for basic research.





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SAFETY AND SAVINGS

IN BLOOD CONSERVATION

Hemosafe® 2.0 is part of the Angelantoni Life Science professional line of automatic refrigerators. It was designed to comply with the increasingly strict blood conservation and management standards. The Hemosafe® 2.0 software controls and manages the blood bank safely and reliably thanks to its interface and real-time connection with the external management system (BBMS) of any Transfusion Medicine Service. It is perfect for use in all those situations where concentrated red blood cells (erythrocytes) and plasma need to be preserved in compliance with Directive 93/42/EEC - Medical Devices, in structures belonging to the S.I.M.T. (Immunohematology and Transfusion Medicine Service), private clinics, outlying hospitals, operating theatres and A&E, where blood is distributed, preserved and then assigned remotely. It can be also be placed at the S.I.M.T. to enable the red blood cells collected to be rapidly loaded and profitably distributed to outlying centres.

The user interacts with Hemosafe® 2.0 via a colour LCD touch screen panel. The simple, functional interface shows users only the permitted commands and actually prevents them from taking any decisions already set remotely by the BBMS (Blood Bank Management System).

The software supplied with Hemosafe® 2.0 integrates the functions to control automated storage with those to manage and identify the bags preserved inside. It also enables bag identification data to be rapidly archived and consequently loading/unloading them using the FIFO (First In, First Out) system.



SMARTFREEZER®

THE “CHERRY PICKING”

BIO-BANK STORAGE

The EVO and EVO LAB Smartfreezer® series is an ALS robotic solution to automate the storage and retrieval of vials containing biological material, preserved in bio-banks at cryogenic temperature (-180°C). The loading and unloading of an individual vial (“cherry picking”) avoids exposure of the test tubes to unnecessary thermal stress inside the device. The operator does not have to come into contact with any cold surface or liquid nitrogen while using the machine. In fact, the user only has to use the software interface to request the sample. The robot uses a compressed air arm to manage the movement of the vials held by 10 rotating disks from ambient to cryogenic temperature inside the device. The test tubes are stored inside these disks. The same procedure is used for pick-up.

The traditional systems used to preserve at cryogenic temperature are manual and expose the samples and the operators to various risks. In fact, the operator has to wear safety equipment to prevent any possible suffocation and/or burns from liquid nitrogen. He is also responsible for correctly selecting the samples, a process which involves moving heavy racks inside awkward tanks. Retrieval of an individual sample exposes all the samples stored in the boxes/racks to ambient temperature. The Smartfreezer® automatic action avoids all these circumstances.

The samples are preserved in nitrogen vapour, which offers safer conditions and prevents the risks of sample cross-contamination. The guaranteed temperature range is from -180°C to -150°C . The device is also equipped with an internal bar code reader to identify the samples and with a PC touch screen, which makes it easy and intuitive for the user. System access is restricted by a username/password and all operations carried out are recorded in a LOG file, which will enable the exact sequence of events to be established at all times. The level and number of user levels

are free and can be configured by the administrator, who can grant or refuse authorisations to carry out each individual procedure to the various users of the device. The use of the Smartfreezer® guarantees safety and a correct bio-bank activity.



FREEZERS TO PRESERVE ANTI-COVID VACCINES

ALS actively took part in the anti-Covid fight by developing a series of one-piece or modular freezers to preserve the vaccines at temperatures of $-20^{\circ}\text{C}/-75^{\circ}\text{C}$.

We produced not only standard or customised solutions, with an individual capacity of up to 10 m^3 , but also Reach-in freezers available from -20°C to -85°C to be installed in laboratories, hospitals, wholesalers and pharmaceutical sites. The freezers are designed to preserve the vaccines with optional redundant refrigeration systems to enable maximum conservation safety.

The prefabricated models are available with volumes of 4,000 litres (3-door) and 6,000 litres (4-door), whereas the 500 and 800 litre models can be supplied with one door.

Special emphasis has been given to the safety and traceability systems to control access with the “Bioguard” system: under this system only authorised users can access inside the machine.



Furthermore, all accesses are traced under the user name, duration of door open and door open event. It usually envisages connection to the Cloud / Local monitoring software.



ATT

ANGELANTONI
TESTTECHNOLOGIES

THE BEST SUPPLIER AND PARTNER



中国航空综合技术研究所
CHINA AERO-POLYTECHNOLOGY ESTABLISHMENT

SUSTAINABILITY AND THE FUTURE: THE NEW CHALLENGES FOR THE ANGELANTONI GROUP

The Green challenge is unavoidable to safeguard our planet and for future generations. Environmental sustainability must not, however, prejudice social sustainability. The ecological transition must, therefore, be an opportunity, not a risk.

To achieve the objective of “zero emissions” will require a change in mentality and behaviour (i.e. life style) not only for citizens and businesses but also for institutions, including governments. For small or large family run or managerial companies it will mean tackling new uncertainties and risks very soon. It will require not only decisive strategies and the use of talent and common sense, but also the expansion of future planning and investments to restrict the use of and finally replace fossil fuel energy. When an investment is evaluated, ESG (Environmental, Social, and Governance) criteria are more and more taken into consideration. These criteria are applied to

analyse an investment not merely from an economic and financial viewpoint, but also for its environmental, social and governance impacts.

The Angelantoni Group has complied with sustainability since 20 years, as proven by the “Flower” project, and it is very careful to comply with the ESG principles, now followed by an ever increasing number of investors and companies. We have, therefore, invested over the years in a process of environmental sustainability, based on radical processes and products innovation. Here are our most significant future challenges.



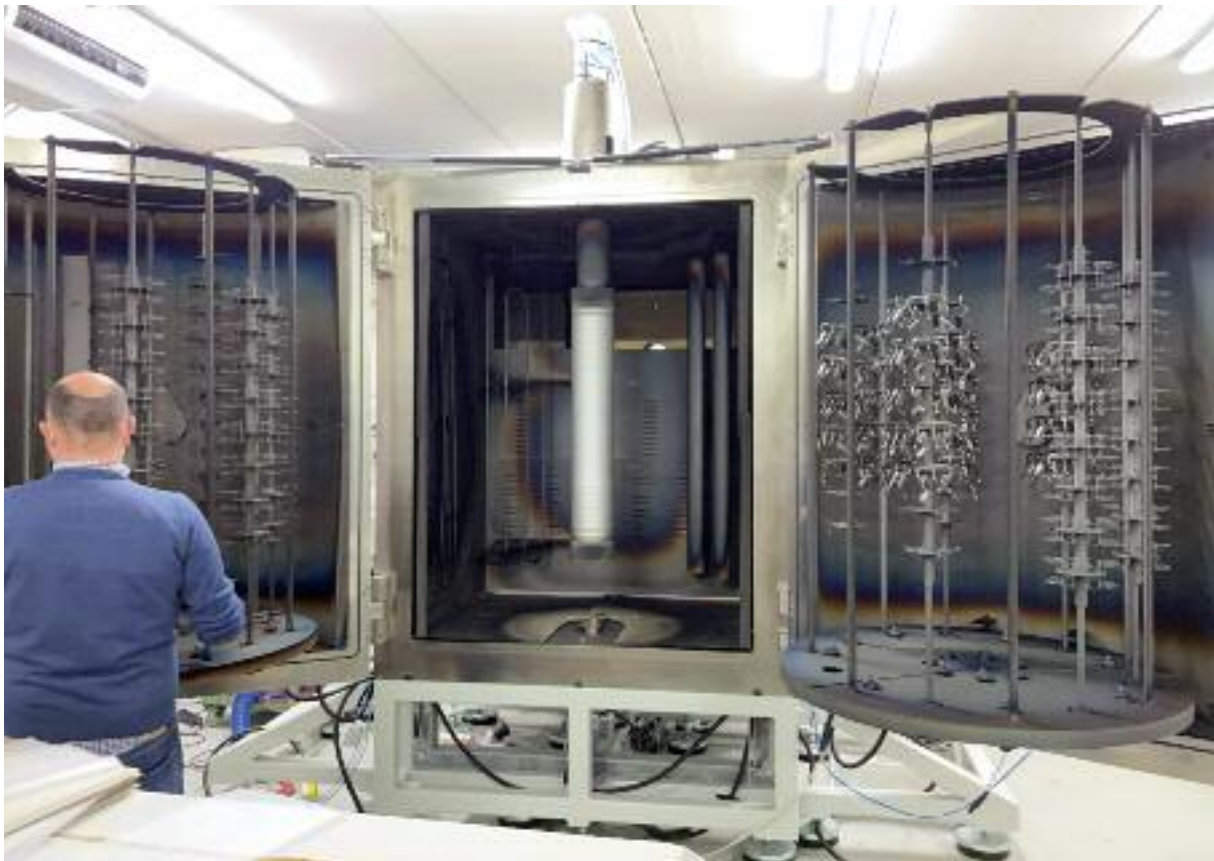
CHROME+® THE GREEN CHROMIUM COATING

Chrome+® appeared after several years of collaboration between two Italian businesses in Lombardy: Kenosistec Srl in Milan and Barnem Tecnologie Plastiche Srl in Brescia.

This is a two-layer coating (UV paint and PVD coating), which starts from plastic sublayers and enables chromium to be deposited that will pass some of the strictest Automotive tests (DBL7402 certified by IMAT UVE), to which coatings are subjected to verify their resistance to thermal, corrosive and abrasion stresses.

The usual chromium coating with a galvanic finish generates highly cancerogenous waste materials (hexavalent and trivalent chromium), which require expensive disposal. The European community has been seeking alternative technologies for at least two decades to reduce the impact of the galvanic process.

Chrome+®, the green chromium coating, is the right solution and uses two basic processes:





- The first has been filed with exclusive right of paint use (Barnem T. P.);
- The second has already been patented worldwide for Kenosistec's Hi.P.Po. deposition technology.

After an opportune wash, the plastic surfaces are painted using Barnem paints with UV technology and subsequently subjected to PVD chromium coating using the Hi.P.Po. cathode.

Barnem Tecnologie Plastiche has already created the first Coating Centre for third parties to promote the Chrome+[®] technology. Today, this deposition technology is applied on ABS and PC ABS plastics; in future it may also be experimented on other types of plastics.

Hi.P.Po. is a highly productive Kenosistec deposition technology (up to 10 times higher than traditional coating systems), which also offers a more homogenous and reduced consumption of the cathode. The “black Hippo” version gives incomparable results in black in the “decorative” sector, e.g. taps and fittings, domestic appliances, fashion accessories, etc.

BIOK[®], THE LATEST GENERATION OF TRANSPARENT ANTIBACTERIAL AND ANTIVIRAL FILM

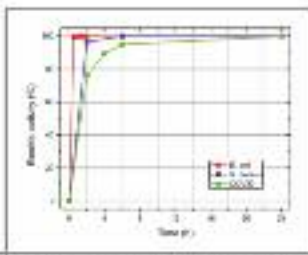
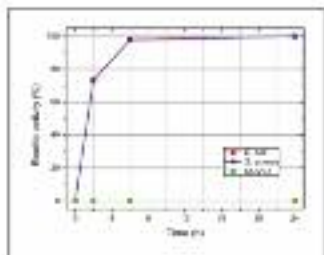
Kenosistec, together with IIT (Italian Institute of Technology), has developed and patented a new mix of nanomaterials with antibacterial and antiviral properties that provides a barrier for objects of everyday use.

The new coating can be applied on glass, steel and plastic and has a translucent finish. With its antibacterial properties (capable of destroying up to 99.9% of common bacteria), it allows us to enjoy our daily life freely and safely. BIOK[®] is the only protective coating today, which combines 5 main features: antiviral/antibacterial properties, it is translucent, it is biocompatible (non toxic), and it has an extremely low cost and can be applied to any type of material and surface.

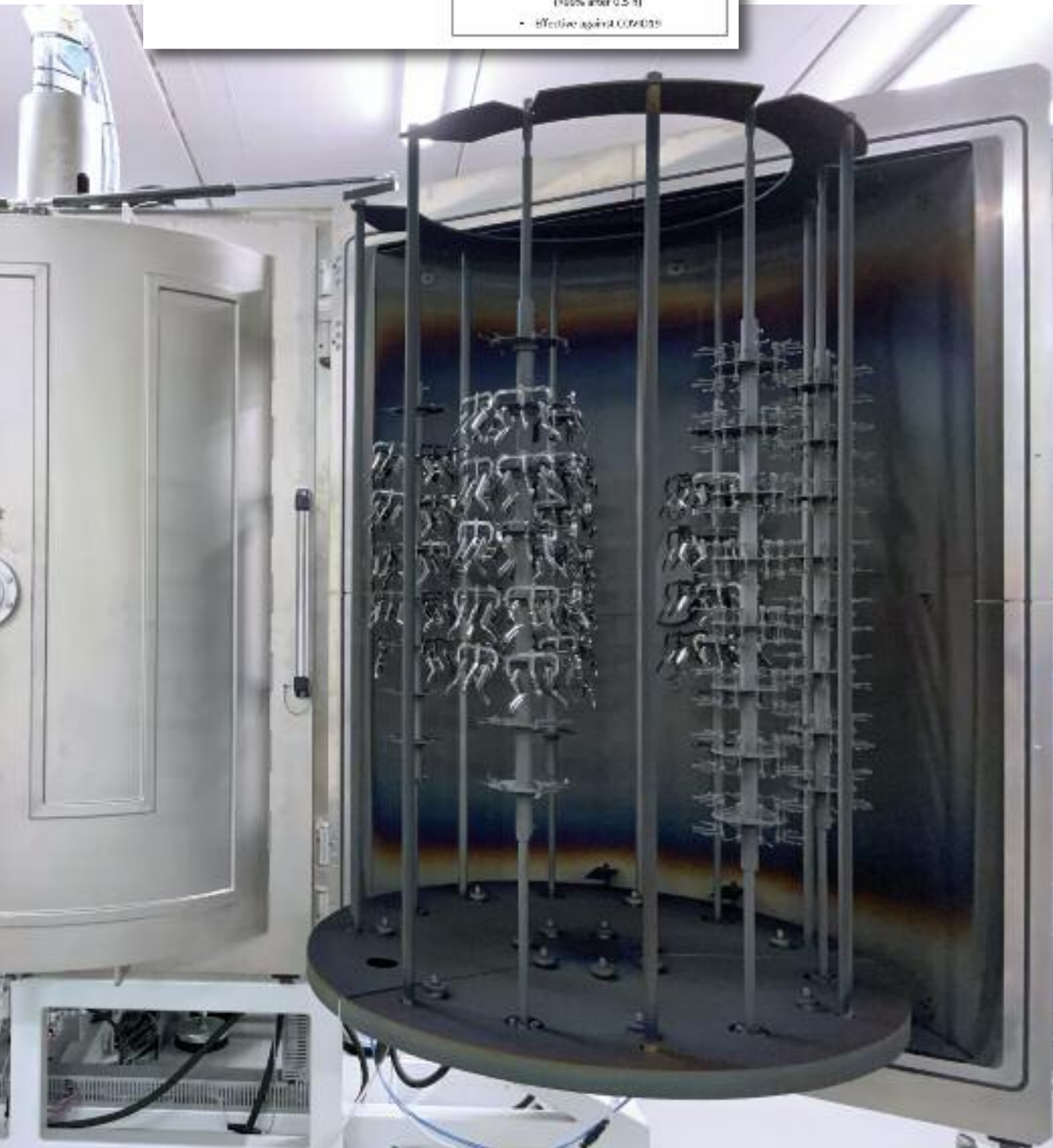
Rigorous and scientific validation tests were conducted to assess the antibacterial and antiviral activity of BIOK[®] coating at the Department of Pharmacological and Biomolecular Sciences of the Milan University. The efficacy of BIOK[®] coating was also tested against some of the most prevalent bacterial species, Escherichia Coli (Gram-negative) and Staphylococcus Aureus (Gram-positive), responsible for many direct contact infections, including the most recent COVID-19.

Silver is an element already known for its antibacterial properties and the silver particles in the new BIOK[®] coating are dispersed in a nano structured matrix, which enables high antibacterial and antiviral activity to be obtained. The Ag⁺ ions released use a patented mechanism of action and interact with the bacteria membrane by altering its ability to function and damaging the cells. In the case of viruses, on the other hand, the Ag⁺ ions bond with the proteins and inhibit their ability to join and reproduce.





- The presence of Ag increases the biocidal activity (100% after 0.5 h)
- Effective against COVID-19



PEROVSKITE, THE FUTURE OF THE NEW PHOTOVOLTAIC MODULES

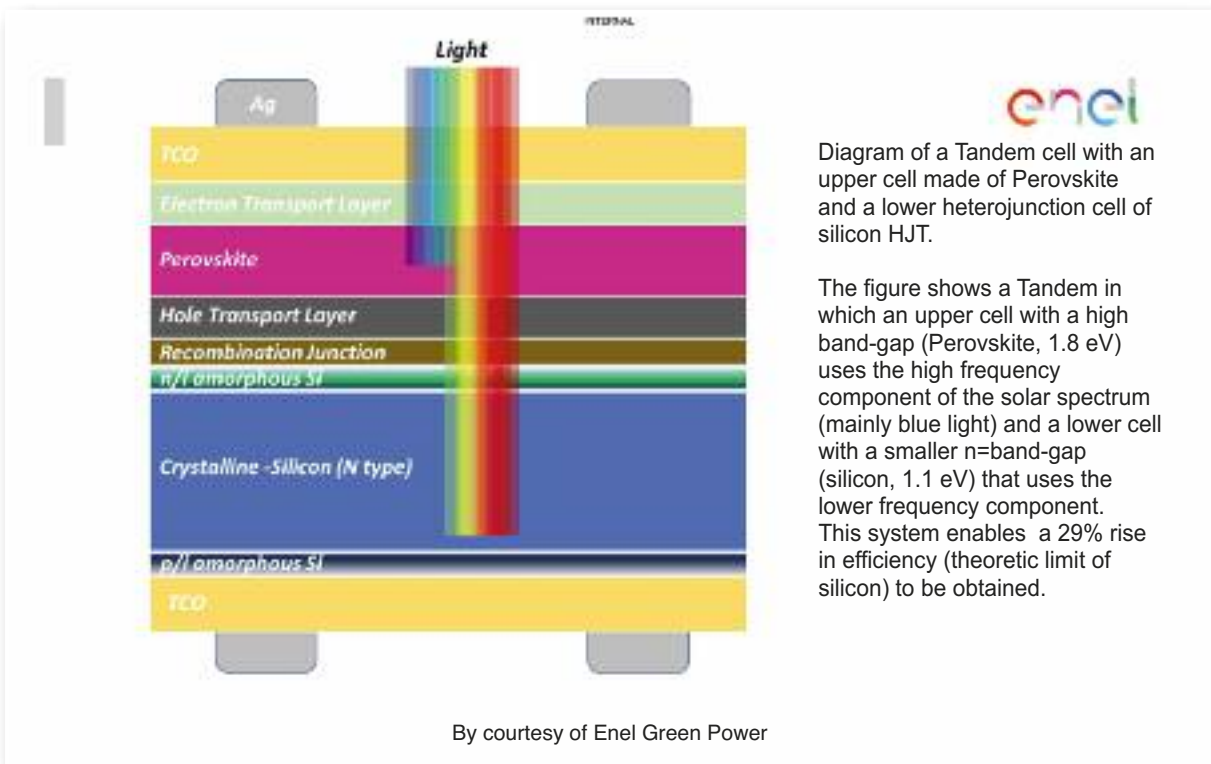
Kenosistec, together with CNR-IMM in Catania, led by Prof. Alessandra Alberti (in the photo), has patented a revolutionary evaporator, which reduces the production cost of a photovoltaic cell with Perovskite and improves the properties of the final deposition and its duration.

The current silicon solar cells (SSC), despite their low cost, are unable to fulfil the urgent demand to considerably increase the amount of energy from renewable sources without occupying enormous surface areas.

The opportunity to produce photovoltaic cells with Perovskite (capable of absorbing solar radiation in complementary portions of the spectrum to those absorbed by silicon) enables the construction of “tandem” cells, in which the Perovskite is superimposed on the silicon and enables traditional cell efficiency to be increased by over 28%.

Perovskite is a flexible material which can also be applied to 3D materials, e.g. fabrics, mobile phones, glasses and many more to give them photo-sensitive properties. Kenosistec and CNR-IMM in Catania have developed and patented the “PEROVSKY” process with the ambitious objective of making the manufacturing process of new generation Perovskite photovoltaic cells cheaper, more sustainable and far more efficient.

The project is one of the first investments by Eureka! Fund S.r.l. and aims to develop the Proof of Concept (POC) for the Perovsky project.



ARCHIMEDE: ELECTRICITY AND WATER FROM THE SUN

Solar energy is a reliable, proven renewable source to generate electricity, but how can we use it to guarantee a stable supply for the end users? In fact, solar energy is a fluctuating, fairly unpredictable source, that is incapable of fully meeting the end users' needs. Its availability depends on night and daytime cycles, weather conditions and peaks in the demand for energy. Only adequate energy storage systems (thermal in this case) can stabilise and level out the fluctuations in solar energy by freeing the production of electric power from the offer and making the system more flexible and capable of guaranteeing a stable supply "ON DEMAND".

MATS "Multipurpose Applications by Thermodynamic Solar", is an ENEA project which was co-funded by the European Union as part of the 7th Framework Programme, completed and operational in 2018.

This is a CSP (Concentrated Solar Power) system which thanks to the development of innovative technology, aims to resolve the aforementioned problems. It is, therefore, the basis of a new thermodynamic solar technology.



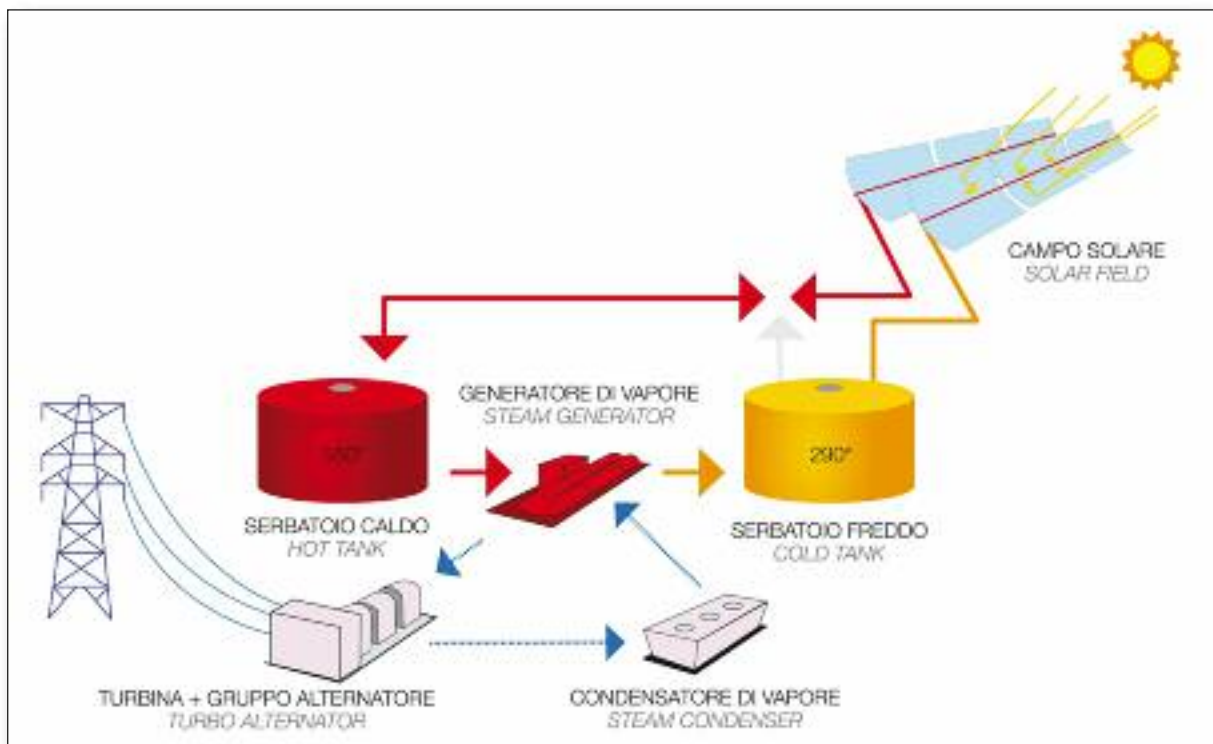
The MATS technology is based on linear, parabolic mirrors that concentrate solar radiation to generate heat at high temperatures. The solar receiver tubes absorb the concentrated solar radiation and the heat is transferred to a heat transfer fluid.

The core of the technology is the receiver tube produced by Archimede Solar Energy (ASE) under ENEA patent. This element had to be capable of transferring the solar radiation heat to the fluid without any thermal dispersion in order to optimise the process of generating steam.

The receiver tubes used in MATS work with molten salts (sodium and potassium nitrates) as the heat transfer fluid. This fluid has various positive, environmental safety and technical characteristics and thanks to the ASE tube it is able to reach very high temperatures of up to 550°C.

The heated molten salts are then stored in an innovative heat storage system.

This technology also integrates a steam generator to guarantee system flexibility, especially for the energy grids. This combined system actually enables the controlled production of heated steam to move the turbines.





The MATS system also has a co-generative supply cycle designed with a Multi-Effect water desalination unit (MED) applied as a steam condenser unit to recover the residual heat from the superheated exhaust steam.

The desalinated fresh water is a high value by-product, especially in CDP systems built in desert areas or areas with little water. The heating and cooling of the buildings is another co-generation option.

Thus, it will be possible to generate electricity and co-generate fresh water in a desert region to support social and economic growth in the area.

The MATS Consortium consists of partners from Italy, Egypt, France, Germany and the United Kingdom. The National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA) leads the project. The main Egyptian research partner is the Academy of Scientific Research and Technology (ASRT) in Egypt and the concentrated solar power plant was built inside the City for Science and Technology (SRTA-City) in Borg El-Arab.

This is the first plant of its kind in the world with its unique features of fluids that respect the environment, easy management and flexible operations.

R472A

THE REFRIGERANT GAS WITH THE LOWEST EVER GWP

The refrigerant gas developed by ATT (Angelantoni Test Technologies) is the result of constant research and was designed mainly for ULT (Ultra Low Temperature) and ESS (Environmental Stress Screening) applications. The focus was on minimising the GWP (Global Warming Potential), as required by the European Regulation on fluorinated gases (F-Gas), in force from 1st January 2015. The objective of F-Gas is to protect the environment, prevent unwanted effects on the climate and restrict global warming.

Over five years of work, the global commitment of all the necessary resources put to use by ATT, important partnerships with universities, research centers and accreditation centres, and tens of thousands of hours of testing enable us to now introduce a new blend of HFC refrigerants: R472A, the refrigerant gas with the lowest ever GWP, a value of 353 as opposed to the 14,800 of the standard R23!



R472
ACS "GREEN" REFRIGERANT GAS

**"We at ACS
sustain the
environment
with a new
ecological gas
having the
lowest GWP ever
and giving you
lots of
advantages!"**

ACS | TESTING FOR
A BETTER PLANET

R472A has already obtained class 1 safety certification by ASHRAE (American Society of Heating, Refrigerating and Air Conditioning Engineers), the world's leading authority on regulations and certifications in the refrigeration industry.

ADVANTAGES OF THE NEW ATT REFRIGERANT GAS

APPLICATIONS: R472A can be used for ULT (Ultra Low Temperature) applications, which need to reach a temperature below or equal to -70° . With the new R472B blend it is possible to reach -80°C .

GWP: The new ATT gas has a 98% GWP lower than other gases used for ULT applications, such as R23 and R508b.

SAFETY: The ATT gas is non-flammable and non-toxic and it is safe even if there is a leak.

BETTER PERFORMANCE: The R472A thermodynamic properties ensure better performance in the cooling phase, thanks to its high enthalpy jump in the evaporation phase.



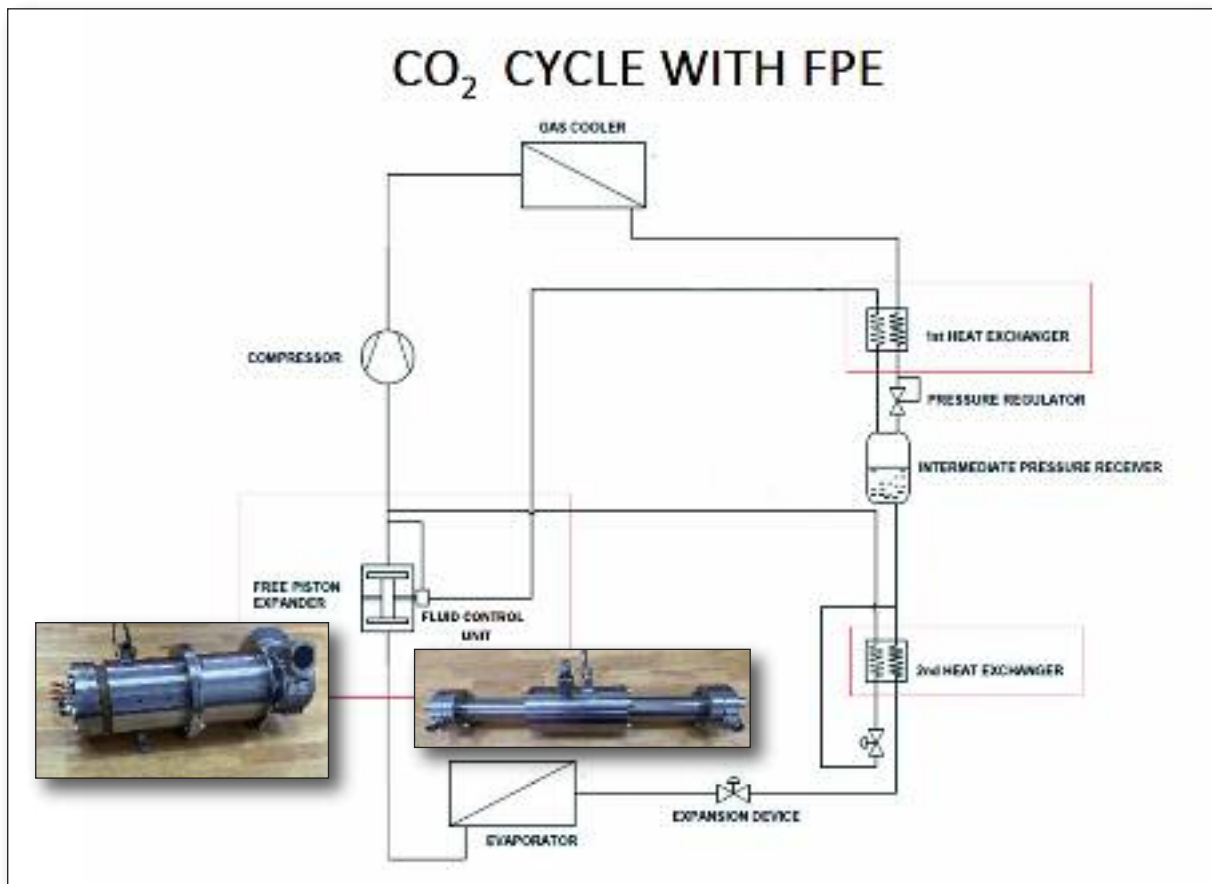
RETROFITTING: Systems that currently use R23 are 99% compatible with R472A. The machines that are not perfectly compatible can be adapted simply without any structural modifications.

AVAILABILITY: The mixture components are easy to procure, so availability on the market and a long working life is guaranteed for our R472A.

ENERGY EFFICIENCY IN CO₂ REFRIGERATION SYSTEMS

The systems developed by Turboalgor aim to significantly improve the refrigeration efficiency and capacity. All this with reduced investment costs and return times.

Of far greater importance is the environmental result, considering that artificial cold (refrigeration and air conditioning) generated with compression systems is directly responsible for the consumption of approximately 15% of the world's



electricity and for the production of approximately 4.5% of the total greenhouse gas emissions.

The new F-Gas legislation establishes that refrigerant gases with a GWP (Global Warming Potential) that exceeds 2500 are prohibited.

This is why the use of transcritical CO₂ is on the rise, especially in refrigeration systems for mass retail distribution.

All refrigeration systems, even those using CO₂, have an unused quota of energy that becomes waste energy.

Turboalgor's innovation is to recover this energy and reduce consumption of electricity by approximately 20%.

Energy is recovered via two devices, both protected by international patent, which are totally innovative in the world of refrigeration and contribute to reducing energy consumption and to safeguarding the planet.

ICE CORES TO COMBAT CLIMATE CHANGE

ALS Angelantoni Life Science has designed two shelters to preserve ice cores taken from Antarctica and transported refrigerated to Italy for studies and research on the climate thousands of years ago. The research project is run by the Cà Foscari University of Venice together with ENEA.

The main objective of the project is to obtain information on climate change in Antarctica over thousands of years with large amounts of high resolution data.



The researchers want to understand the greenhouse gas effect during the transition of the Mid-Pleistocene period from 900,000 years ago to 1.2 million years ago, when a dominant, 40,000-year cycle gave way to the current 100,000-year period.







The ice cores, taken from different depths, contain a large amount of data on the climate of the past period and contribute to a better understanding of the causes of climate change up to modern times.

The two shelters can store up to 40 crates of ice cores at a temperature of -70°C and are equipped with double, totally independent refrigeration systems to guarantee maximum operational safety even during handling operations and transport by ship.

CONCLUSIONS

We have attempted to follow Giuseppe Angelantoni's example and create an entrepreneurship capable of blending the economic development of our companies with that of the surrounding territory.

We have followed a business culture based on merit and solidarity, focused on giving value and responsibility to our human capital in order to achieve concepts of innovation and sustainable progress.

Entrepreneurship that respects the environment, as shown not only by our products, but also by our infrastructures, such as the 2 MW thermal biomass power plant; over 600 KW of photovoltaic panels on the factory roofs; the solar concentrators for domestic hot water; geothermal systems and heat pump systems.





Italy can succeed. We have a great history that is not merely art, culture and music, but also technology. We only have to think to the incredible construction engineering of the Etruscans and Romans; to the Renaissance, with Michelangelo, Galileo Galilei, Leonardo da Vinci and Brunelleschi, followed by Alessandro Volta, Guglielmo Marconi, Enrico Fermi and Emilio Segre. And lastly recent Science Nobel Prize





winner, Camillo Golgi, Giulio Natta, Salvatore Luria, Rita Levi Montalcini, Renato Dulbecco, Riccardo Giacconi, Mario Capecchi, Carlo Rubbia and Giorgio Parisi.

All we have to do is look to the past. Thanks to the stories of men like Giuseppe Angelantoni we will be in a better position to understand the present and to anticipate the future.



● *Australia*

● *Brasil*

● *France*

● *Great Britain*

● *Greece*

● *India*

● *Iran*

● *Israel*

● *Mexico*

● *Poland*

● *Spain*

● *Singapore*

The Netherlands ●

Taiwan ●

Switzerland ●

Scandinavia ●

Russia ●

Turkey ●

USA ●

China ●

Egypt ●

Saudi Arabia ●

Germany ●

United Arab Emirates ●







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rom a tiny village in Umbria to the world. This is the story of Giuseppe Angelantoni, a man who came from an underprivileged background and who, with strict ethics, enormous self-discipline and a series of brilliant intuitions began to construct an archipelago of enterprises. Head of a large family that has continued to follow in the wake of the initial project and expand it to international dimensions, Giuseppe Angelantoni has not only achieved a masterpiece of "social engineering" by industrialising the area in which he was born, he has also revealed his inner, poetic soul by purchasing the convent that housed the school he attended briefly, and transforming it into his home.

