GUIDED TOUR
EXPERTISE & TECHNOLOGY CENTER

AN EXAMPLE TO FOLLOW
GREEN FACTORY

EDITION MCE EXIBITION — HALL 7 BOOTH V40 — 12-15 MARCH 2024
SINTRA SRL SOCIETÀ BENEFIT — VIA NOVARA, 35
AREA INDUSTRIALE SS229 - 28019 - SUNO (NO)

SiNTRA
SISTEMI INNOVATIVI DI TRATTAMENTO ARIA

SUMMARY

SINTRA
SISTEMI INNOVATIVI DI TRATTAMENTO ARIA

MIXIND TECHNOLOGY

1. Introduction

EXPERTISE & TECHNOLOGY CENTER OF SUNO (NO) **4.500 m² – height 14 m**

SINTRA s.r.l. Società Benefit was established in 1995 after 15 years of research, with the mission to develop the MIXIND® technologies of "ambient air pulsion" on the international market.

Today SINTRA is the original manufacturer of perforated steel ducts for supply air distribution and for ambient air pulsion.

In the Plant-Laboratory in Fontaneto d'Agogna the perforated ducts are produced, while in the ETC (Expertise & Technology Center) in Suno the NEW GENERATION PLANTS are conceived, developed and tested.

PLANT-LABORATORY OF FONTANETO D'AGOGNA (NO) **3.200 m² – height 5 m**

2. Objectives

The Expertise & Technology Centre (ETC) in Suno was inaugurated in 2022 and it is a state-of-the-art GREEN FACTORY, conceived by SINTRA after over forty years of continuous research.

With this realisation, SINTRA aims to definitely demonstrate that by implementing the new technologies installed in the ETC it is now possible to design large-volume buildings sustainably without necessarily increasing the initial investment. The key lies in the integrated design of the building, the systems and the production processes, following an innovative GREEN CONCEPT that correctly applies these technologies. The ETC aims to be a leading example, where quality is no longer a luxury, demonstrating that today it is possible to improve empolyees' quality of life affordably.

The focus on the intelligent use of available resources now allows us to optimise productivity by improving the work environment through the knowledge and application of these new technologies.

The ETC is a Research Centre designed to experiment and demonstrate the operation of these new technologies.

SINTRA makes its equipment, building, facilities and training room available to industry associations, research centres and universities interested in developing innovative technologies applicable, in particular, to large-volume buildings.

In the following chapters, the main characteristics and special features of SINTRA's ETC are briefly described.

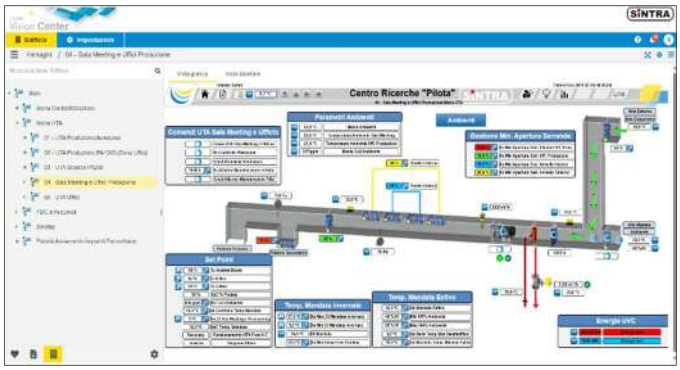
3. Energy independence

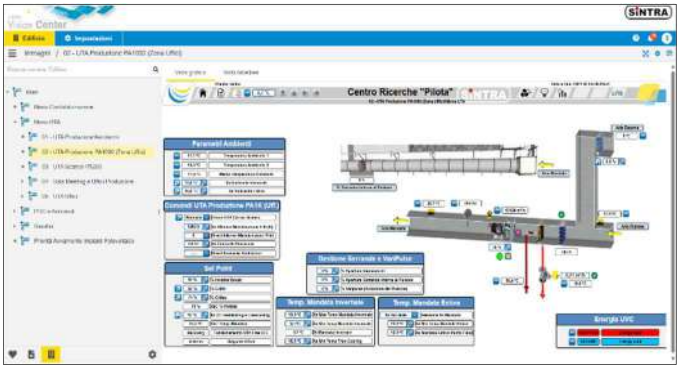
THE PHOTOVOLTAIC SYSTEM

The building is equipped with a high-efficiency 120 kWp photovoltaic system positioned on the high terraces, specifically designed for this purpose.

The BMS (Building Management System)

A BMS manages the energy produced by prioritizing the usage on each kWh: heating, lighting, process, water treatment, etc.



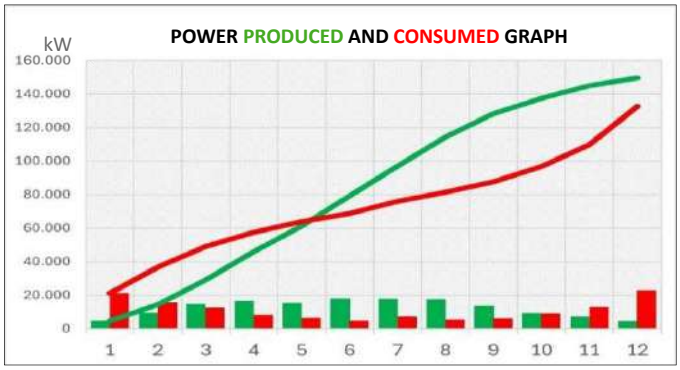


THE HEAT PUMP

A 90 kW heat pump produces the chilled water required for conditioning the offices and the hot water for heating the entire building.

ENERGY INDEPENDENCE

The electricity produced annually by the photovoltaic system is significantly higher than that consumed by the entire complex.



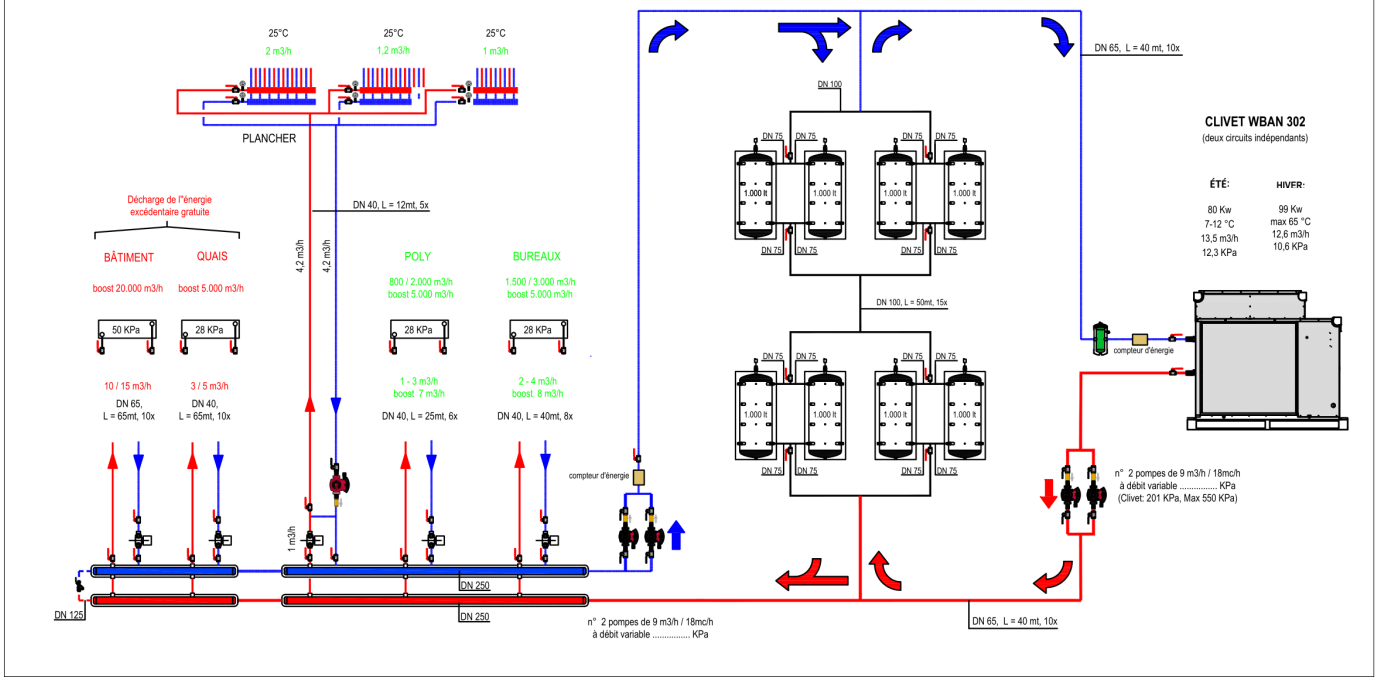
ENERGY METERING

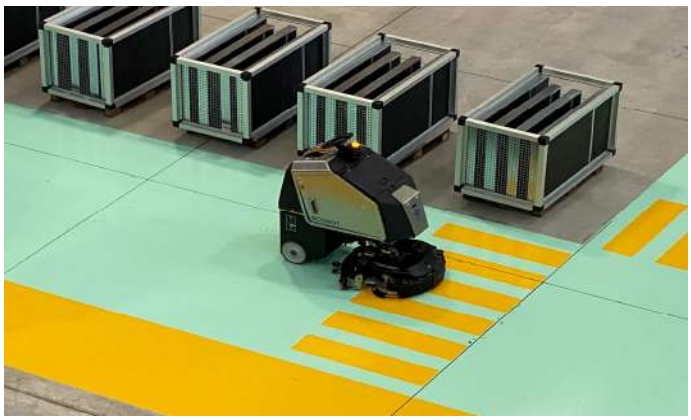
All energy utilities are monitored through dedicated energy meters.

THERMAL ENERGY STORAGE

Instantaneous thermal energy is stored in dedicated tanks before being drawn by various utilities using variable-flow pumps.

HYDRAULIC SYSTEMS





THE ROBOT

Among the secondary uses of the generated electricity is powering the batteries of a state-of-the-art robot that autonomously washes the 4.500 m2 building every night with minimum water consumption.

4. Water independence

PHYTODEPURATION

The building is not connected to the public sewer system. Wastewater is treated by the phytodepuration systems using specific plants suitable for this purpose.

RAINWATER

The phytodepurated wastewater and rainwater are further treated by a mechanical filtration system before being introduced into the biolake.

WATER FILTRATION

Only when there is surplus free energy the water from the biolake is further filtered for sanitary purposes, process water and irrigation of indoor and outdoor plants.

DIMENSIONS

The biolake has an area of approximately 1000 m2 and a maximum depth of 2 m.

WATER LILIES AND LOTUS FLOWERS

To complete the phytodepuration process, the biolake hosts varieties of water lilies and lotus flowers as well as various fish species: trout, sturgeons, carp, etc.










TROUTS

In particular, the presence of several trout species confirms the consistent quality of the water.

STURGEONS

The presence of sturgeons over one metre in length is an attraction for visitors.

QUALITY OF LIFE

The biolake is also an effective relaxation feature that contributes to improving the quality of life for our employees.

5. The innovative structural design of the building

THE HEIGHT OF THE BUILDING

Paradoxical as it may seem, with this GREEN FACTORY it is now possible to demonstrate that increasing the height of the building is cost-effective and allows for savings on both energy consumption and the cost of aeraulic systems.

THE 'ALTERNATING TERRACES' ROOFING CONCEPT

The shape of the 'alternating terraces' roof allows for numerous advantages.

HIGH TERRACES

High terraces serve only to accomodate photovoltaic systems.

LOW TERRACES

Low terraces are a protected and safe production area that allows the installation of machinery with easy access for maintenance.

ACCESS TO GLAZED SURFACES

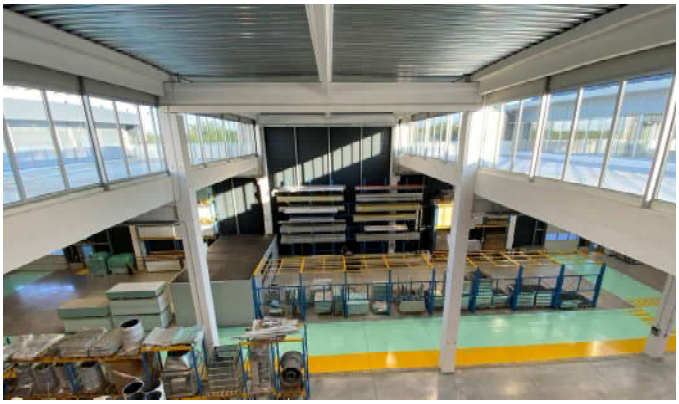
The low terraces also allow access to the high terraces and maintenance of the glass surfaces.

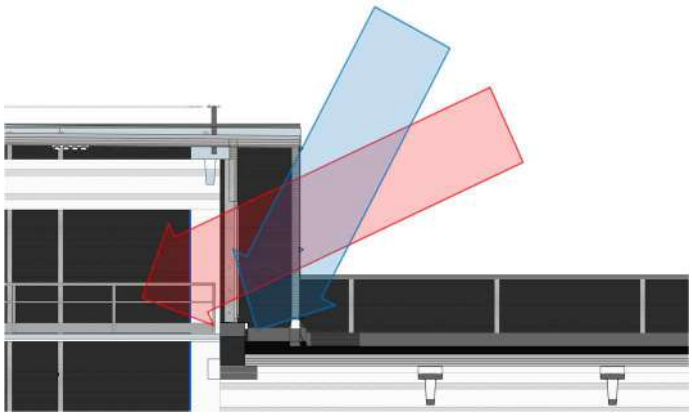
THE WALKWAYS

Convenient walkways connect the high terraces and allow the installation of technological systems.

THE WIDE WINDOWS

The large windows allow plenty of natural light and an important recovery of solar energy only in the winter season.





ZENITHAL SHADING

The extension of the high terrace is calculated based on the zenith of the sun so that solar heat only enters the room during the winter season.

ONLY 90 KW

Thanks to the high thermal insulation of both the walls and the roof, only 90 kW is needed to heat the building.

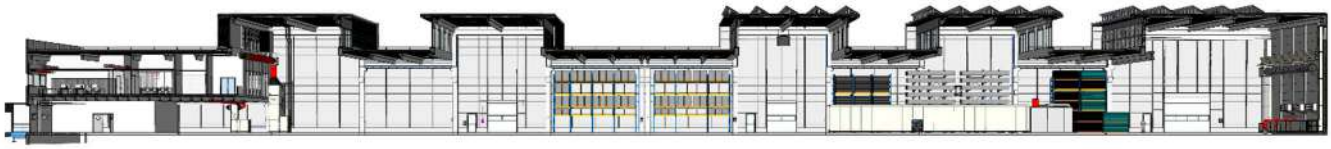
6. Innovative Production Department Systems

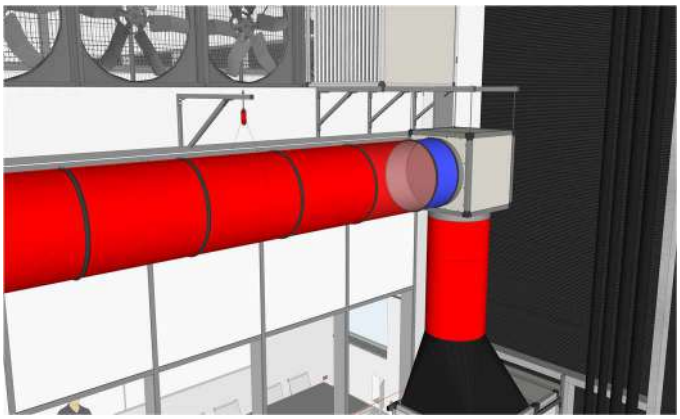
PRIMARY HEATING

The primary heating system of the building consists of a MEGA 1000 unit equipped with a 12-row heat exchange battery capable of delivering 100 kW, even with hot water at 35°C.

120-METER LAUNCH

The MIXIND® duct linked to MEGA 1000, has an air throw capability of 120 m and an induction capacity of up to 1.000.000 m^3/h of ambient air.





VARIPULSE®

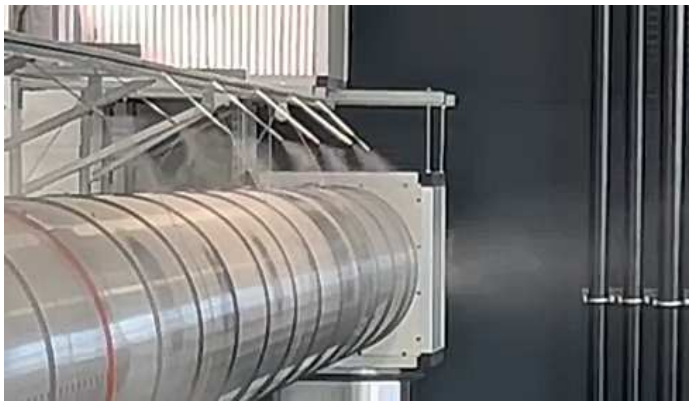
The MIXIND® duct is equipped with VARIPULSE® technology, allowing the air flow launch's angle to be adjusted as needed.

INTEGRATED DAMPER IN THE DUCT

The MIXIND® duct also features a hidden opposed-blade damper halfway down the duct, allowing for air flow to be regulated on the second half of the duct.

HYGROCOOLING® HUMIDIFICATION

At the top of the MIXIND® duct, the patented HYGROCOOLING® system is installed for high-efficiency adiabatic humidification and cooling.



480 L/h NEBULIZATION

The HYGROCOOLING® system allows for the evaporation of up to 480 L/h of tap water or demineralized water, atomizing it at high pressure into the large volume of induced air (1,000,000 m3/h).

6.1. Loading Dock Treatment

MEGA 250 WITH MTA

A vertical MEGA 250 unit with an Air Treatment Module (MTA) specifically treats the loading docks.

PULSER® DUCT

The PULSER® duct is arranged to create an "ambient air barrier," capable of instantly mixing constant micro-infiltrations of air caused by the use of loading docks.

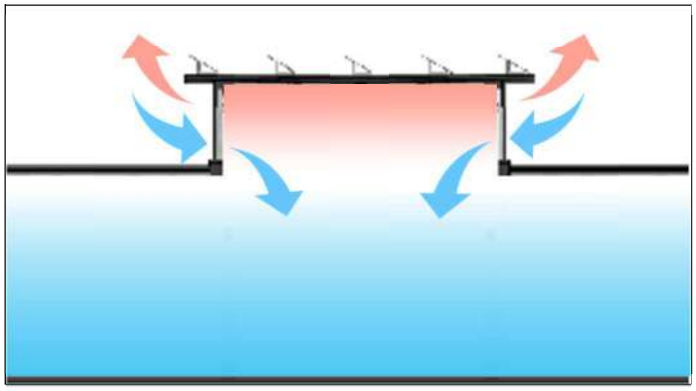
6.2. Free Cooling for Natural Ventilation

SUMMER OPENING OF WINDOWS

The large glazed surface arranged on alternating terraces allows for the opening of a predefined number of windows evenly distributed across the entire roof.

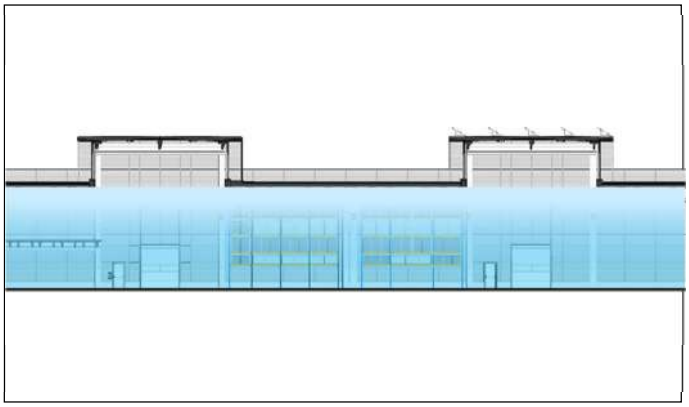
EXAMPLE OF MANUAL OPENING

Their manual or automatic opening, programmed at the beginning of the summer season, allows for abundant natural overventilation with cooler night-time air.



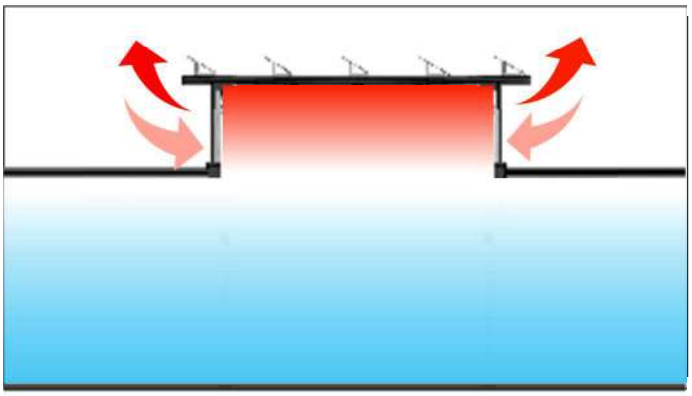
HOW IT WORKS

The cooler outdoor air naturally enters through the windows, allowing the evacuation of the warm air accumulated during daytime hours.



"COLD LAKE"

The significant insulation of the walls, without windows, and the height of the building allow the creation of a cold lake that naturally stratifies downward.

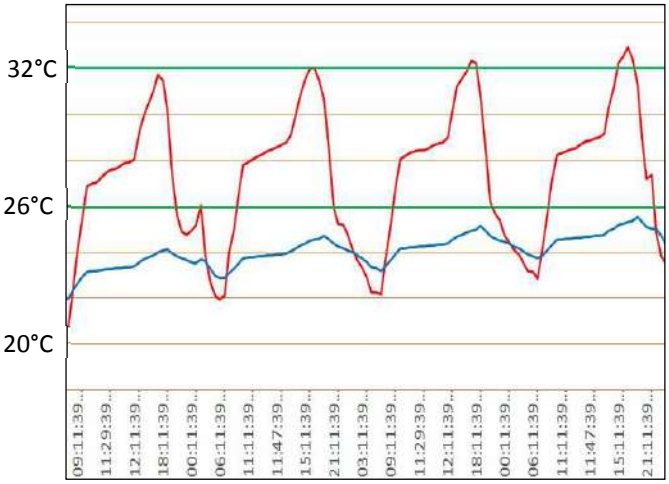


PROMOTING HEAT STRATIFICATION

During daytime hours, solar heat naturally stratifies beneath the roof and self-ventilates above the cold lake.

FREE COOLING

The cooling power stored at night by the ground slab, structures, and machinery maintains an ambient temperature between 21°C and 26°C throughout the summer season.



6.3. Cold Air Curtains VARIWIND™

AN ALTERNATIVE TO HOT AIR BARRIERS

As an alternative to traditional hot air barriers, which are high energy consuming, SINTRA proposes stainless steel cold air barriers to be installed outside the building.

VARIWIND™ COLD AIR BARRIERS

Each main door of the ETC is equipped with external VARIWIND™ cold air barriers of different power.

PREASSEMBLED MODULES

VARIWIND™ cold air barriers are prefabricated in modules that are easily assembled on-site.

SILENT SILENCER

VARIWIND™ columns can be equipped with a SILENT silencer panel to further attenuate fan noise, even at the intake mouth.

EC MOTORS

The VARIWIND™ cold air barriers are made up of variable airflow fans with low-energy consumption EC motors.

7. Innovative Office and Training Room Systems

7.1. Training Room Systems

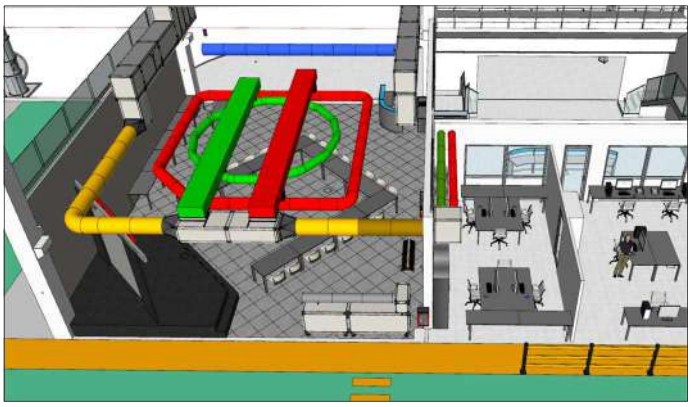
DOUBLE RING* COMPENSATED *COLLECTOR

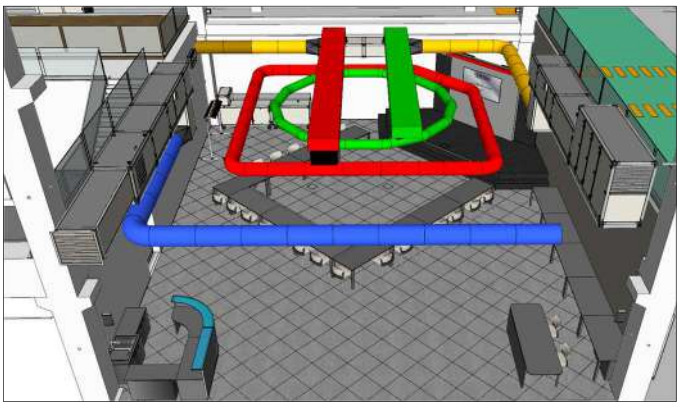
The air conditioning system of the Training Room is of the *frozen air* type with a *double ring compensated collector* with variable flow and hot/cold cycle reversal.

MEGA 250 + MTA ISO 8

The air handling unit consists of a horizontal MEGA 250 module, complete with Air Treatment Modules (MTA).

The MTA allow air filtration, with H13 filters and a 12-row coil capable of producing air at 9°C, with chilled water at 7/12°C.





MEGA 250 FOR OUTSIDE AIR

The outdoor fresh air is introduced through a horizontal MEGA 250 unit, also equipped with H13 filters. A high re-entry duct introduces outdoor air (untreated thermally) directly into the false ceiling, which serves as a return plenum.

7.2. ‘Dependent’ Production Office System

DEPENDENT SYSTEM WITH INDEPENDENT CONTROL

Although connected to the air handling unit of the training room, with significantly different thermal loads, the production office is completely independent in terms of temperature control and residual ground speeds.

PULSION BEAM

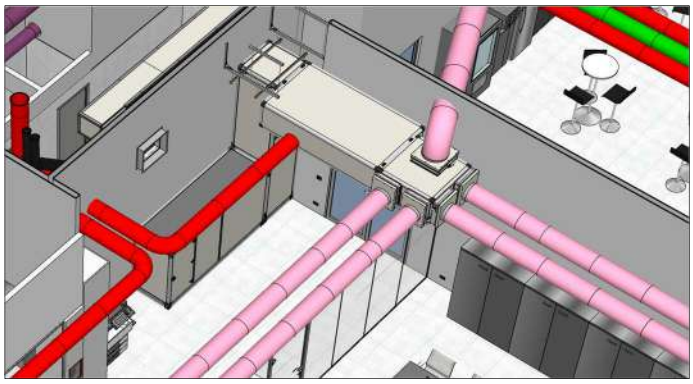
The production office is treated with variable airflow using a TWIN-2 pulsion beam (TWIN-VARIBOOST™ technology).

7.3. Multi-Zone System for Offices

AIR HANDLING UNIT

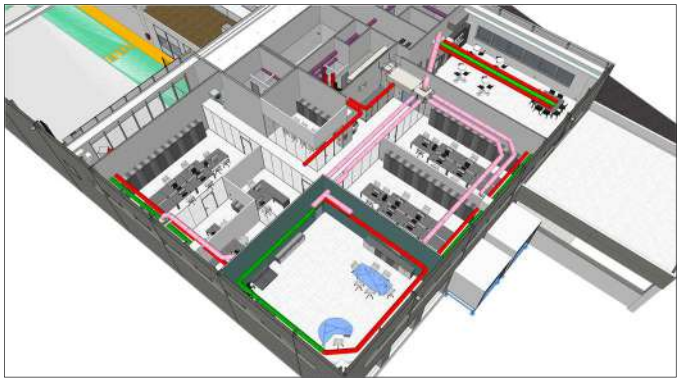
The office air conditioning system is a multi-zone chilled air system consisting of a vertical MEGA 250 unit equipped with with MTA modules.

The MTA modules allow for air filtration equivalent to ISO 8 standards, with H13 filters and a 12-row coil capable of producing air at 9°C, with chilled water at 7/12°C.



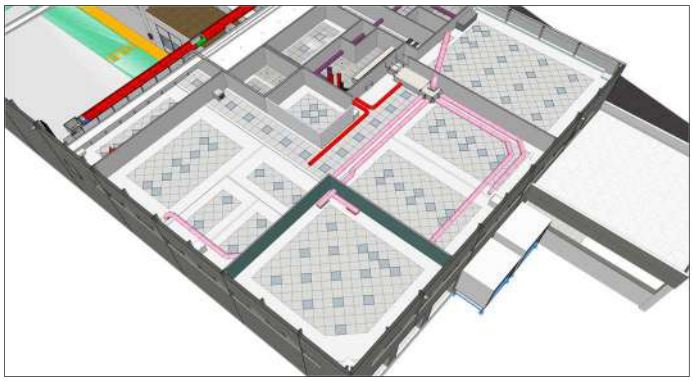
MULTI-ZONE PLENUM

A plenum installed in the false ceiling distributes the supply air, regulating both temperature and relative humidity independently for each office.



AUTONOMOUS CONTROL

The temperature, relative humidity, outdoor air and residual ground air velocity are regulated entirely independently for each individual office.



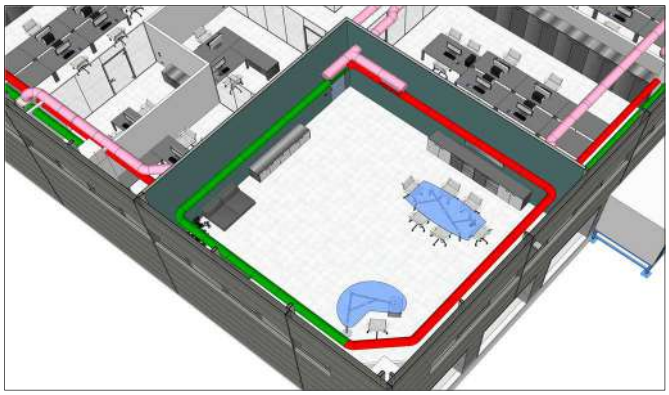
AIR INTAKE

The false ceiling serves as the air intake plenum for all offices.

For this system as well, outdoor air is treated separately from the air handling unit (AHU). The outside air is preheated by heat recovery from the extract air and introduced into the false ceiling with a dedicated high-induction MIXIND® duct.

TWIN-2 WITH SIMPLIFIED PLENUM

The offices are served by a TWIN-2 pulsion beam with a simplified plenum, where the control damper of the secondary PULSORE® is integrated into the first meter of the duct.



COMPENSATED COLLECTOR RING

The Executive office is treated with a compensated collector ring using TWIN-VARIBOOST™ technology, where one half of the ring serves as a primary fixed-flow PULSORE®, while the second half serves as a secondary variable-flow PULSORE®.

LOUNGE AREA

The lounge area is equipped with a TWIN-3 pulsion beam powered by a damper-equipped plenum.

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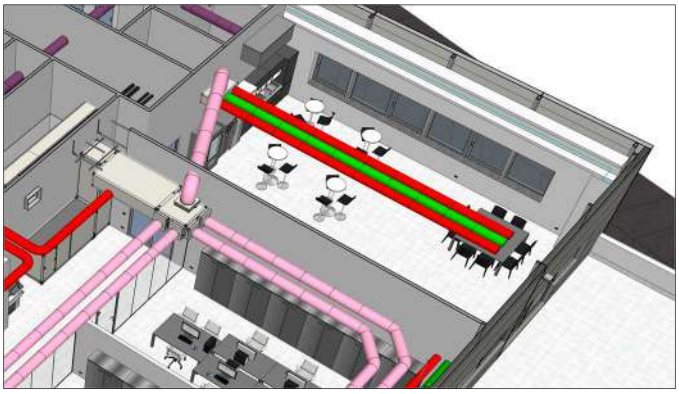
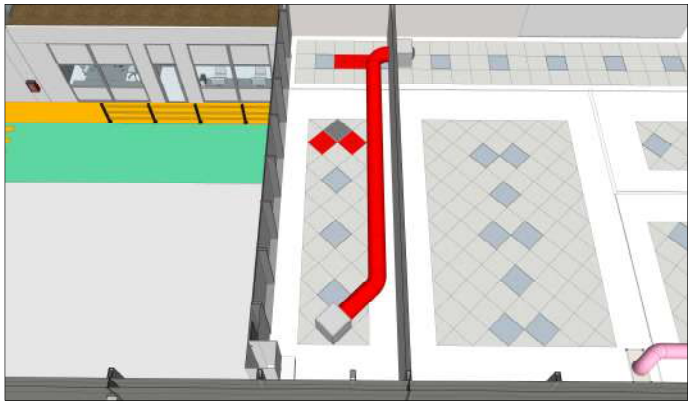


7.4. Meeting Room Overventilation System

PANORAMIC MEETING ROOM

The innovative technical solution used for treating the meeting room definitively resolves the usual issues of controlling temperature, relative humidity, and CO2 levels in a simple and cost-effective manner.



OVERVENTILATION

The room is simply treated with a overventilation system exceeding 10 changes per hour with isothermal ambient air to ensure the same thermo-hygrometric conditions as the surrounding main environment.

7.5. Bathrooms and Locker Rooms Overventilation Systems

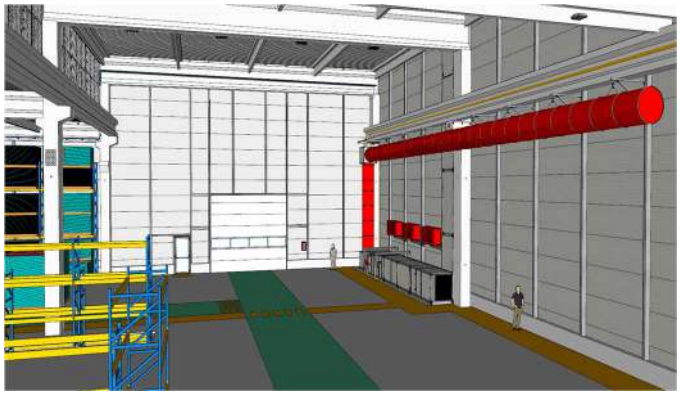
OVERVENTILATION OF BATHROOMS AND CHANGING ROOMS

Perforated ducts can also be effectively used for air extraction from service rooms.

By passing the extraction air from the offices through the service rooms by simple depression, perfect thermo-hygrometric conditions can be ensured in a healthier, simpler, and more economical manner.

8. Experimental Systems

8.1. Secondary Heating of the Facility



CONDENSING GAS HEATERS OF 300 kW

On the south wall of the building, an experimental system has been installed where three condensing gas air heaters can deliver up to 300 kW of hot air at 45°C, capable of simulating an overheated environment.

EXPERIMENTAL MEGA 1000

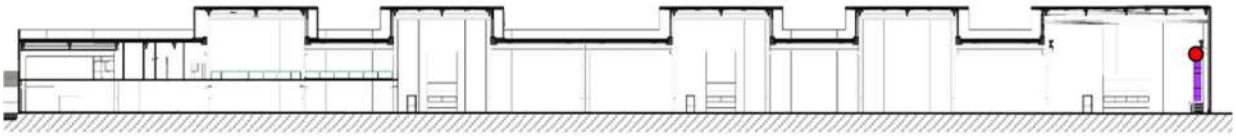
A MEGA 1000 pulsion unit has been equipped with intake modules suitable for receiving specific air treatment equipment (filtration, sanitization, etc.).

GAS MODULES ON AIR SUPPLY

Three condensing gas modules, each with a capacity of 100 kW, allow for experimenting with the induction and aerodynamic behaviour of air volumes up to a supply temperature of 70°C.

ALL-TIME LAUNCH CAPACITY RECORD: 150 METERS

Under isothermal conditions, the MEGA 1000 unit's PULSORE® can heat the entire building with a maximum tolerance of ±1°C over 150 m in length and 14 m in height. The residual ground speed is adjustable. The experimental system can also be used as secondary heating in case of primary system failures.



8.2. Summer Overventilation System with 2,000,000 m^3/h capacity

EXPERIMENTAL SUMMER OVERVENTILATION

On the roof of the southern end of the building, 50 MODULAIR™ fans, each with a capacity of 40,000 m3/h, are installed.

AIR EXTRACTION UP TO 50 AIR CHANGES PER HOUR

Each fan represents 1 air change per hour of extracted air. The system allows for simulating the aerodynamic behaviour of a space subjected to adjustable overventilation ranging from 1 to 50 air changes per hour.

VERY LOW ENERGY CONSUMPTION

Each MODULAIR™ fan can extract 40,000 m3/h with only 1.1 kW of absorbed thermal power.

BIMODULAIR

The BIMODULAIR is a low-energy vertical tower with a nominal airflow of 80,000 m3/h, with stainless steel blade for air extraction or outdoor air intake.

8.3. Winter Compensation System with 1.000.000 m^3/h capacity

COMPENSATING MODULAIR™

The BIMODULAIR towers can also be used for compensating large quantities of untreated outdoor air (foundries, painting facilities, furnaces, etc.).

MEGA 1000 EXTENDS THE LAUNCH BY 50 METERS

To prevent the fall of cold air under the supply fans, the high induction of the PULSORE® (50 air changes per hour) powered by a MEGA 1000 unit can capture the descending cold air stream, mix it with the ambient air and transport it up to about 50 m away.

EXPERIMENTATION WITH VERY COLD AIR

To test the performance limits of this very cold air compensation system, the plant also includes plenums with wing-profile deflectors on the two outermost BIMODULAIR units.

ADJUSTABLE LAUNCH ANGLE VARIPULSE®

The PULSORE® is equipped with the patented VARIPULSE® system, which allows for the adjustable air flow launch angle according to the requirements.

8.4. Economical and Self-Cleaning Filtering Walls through Weather Exposure

SELF-CLEANING FILTERING WALL

The large outdoor air masses required for summer or winter overventilation can be filtered with a simplified self-cleaning filtering wall exposed to the weather.

G4 FILTERING CURTAIN

A filtering curtain has been installed on a dedicated metal structure divided into two halves, with a G4 grade filter media, supported by a simple track system with pulleys.

8.5. Waste Recovery

WASTE RECOVERY

All waste from paper and plastic packaging is compacted and resold, thus producing resources.

9. Enhancement of Green Areas

THE OUTDOOR PARK

The outdoor park mainly consists of native plant species such as azaleas, rhododendrons and other acidophiles.










THE INDOOR ROOF GARDEN

Particular importance was given to the indoor greenery.

FREE HEATING 24/7

The presence of tropical plants is a certification of the constant temperature in the room.

WINTER HUMIDIFICATION

Plants and moist soil contribute to stabilizing relative humidity in the environment during the winter season.

OXYGENATION OF AMBIENT AIR

Plants also contribute to improving air quality by producing oxygen during daylight hours.

IMPROVED QUALITY OF LIFE

The pleasant aesthetics of plants in the workplace enhance the quality of life of our employees.

MORE RELAXING ENVIRONMENT

Plants contribute to a more relaxing environment, promoting productivity and effective communication.

THE INDOOR PANORAMIC TERRACE

The indoor terrace welcomes visitors and provides a panoramic view of the entire workshop without interfering with production.

THE OASIS

The oasis is an area where plants receive care in preparation for rotation within the offices.

THE OFFICES

Greenery also enhances the offices.

THE LABORATORY

The laboratory is also enhanced by plants.

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