

## PERFORATED DUCTS PRESENTATION









**TECHNOLOGY EVOLUTION** 





# **PRODUCTION TECHNOLOGY SPIROPACK**



SPIROJET<sup>™</sup> perforated ducts are made using the patented SPIROPACK<sup>™</sup> (Patent EP2449316) technology and produced in open modules, each one meter in length, stackable to reduce transportation volume, costs and environmental pollution. The double edge folding, which is sealed on-site with high-strength stainless steel rivets, provides the duct with high mechanical strength. This allows for convenient pre-assembly on the ground up to 10 meters in length and can be supported with a spacing of up to 5 meters, depending on the diameter, using cables such as Gripple or similar, which must always encircle its circumference.

Compared to closed ducts, despite the need to seal the modules on-site, installation times can be reduced by following the specific instructions available on our website. The patented **TWIN-LOCK™** (Patent EP2977663) collars, made with a double fixing system and without welding, are generally produced in magnesium-zinc-coated sheet metal, ensuring maximum corrosion resistance.

To facilitate on-site riveting operations with the highest quality execution, SINTRA offers two types of assembly kits at particularly affordable prices: one with compressed air, including the compressor, and the other with a professional battery-powered riveter. To ensure the highest quality of on-site installations, SINTRA offers a free half-day mini-course at its headquarters to train the operational personnel, issuing a specific qualification certificate.



Packing of **SPIROPACK™** open circumference circular ducts

SINTRA (Innovative Systems for Air Treatment) is the leading European manufacturer of perforated metal ducts for "supply air diffusion" and "ambient air pulsion".

**SPIROJET**<sup>™</sup> perforated ducts are customized for each order. The **SPIROPACK™** production line is fully automated and has a production capacity of up to 120 m/h of ducts, with an operational accuracy of  $\pm$  0.5 mm. This requires the exclusive use of high-quality sheets in galvanized steel, pre-painted steel, satin or mirror-finished stainless steel 430/304/316, magnesium sheet, aluminum or copper.

The ducts can be painted with epoxy paint in the desired color.





Battery-powered riveting kit



Compressor air riveting kit



# OFFERS TWO TYPES OF PERFORATED DUCTS

## **PERFORATED DUCTS**



# PRODUCT

**SPIROJET<sup>™</sup>** is a modern and user-friendly product. Made in one-meter modules using **GREEN SPIROPACK<sup>™</sup>** technology, it ensures the best environmental comfort and temperature uniformity in the space. Its proper sizing and high induction prevent heat stratification.

The modules are assembled together using the new patented **TWIN-LOCK™** collars, which are weld-free. The competitive unit cost, high induction rate and high-quality components make **SPIROJET™** perforated ducts one of the best products for air diffusion available on the market today.



## SPIROJET™ DUCTS WITH PATENTED TECHNOLOGIES



#### PROPRIETARY TECHNICAL SOLUTIONS

The patented **MIXIND®** technologies can be applied to **SPIROJET**<sup>™</sup> perforated ducts, which, although significantly increasing the cost per linear meter, often allow for **a reduction of the overall system cost** with particularly high energy performance and comfort.

The design of this type of system necessarily requires the technical support of **SINTRA**, as it is based on very specific design parameters acquired by **SINTRA** through over forty years of continuous research.

For the correct application of **MIXIND®** technologies, **SINTRA** offers a free service of **ASSISTED DESIGN**, subject only to the principle of **EXCLUSIVITY**.

The sole condition required for the use of the technical solutions proposed by **SINTRA** in this exercise is that the materials proposed for their implementation be supplied by **SINTRA**. Without this essential condition, **SINTRA** would risk exclusion from fair commercial competition, given the higher price per linear meter.

**SINTRA**, therefore, proposes to compete based on technical solutions rather than the products that constitute them. Furthermore, the solutions developed by **SINTRA** in this context systematically utilize proprietary technical solutions, protected by international law.

#### The Free ASSISTED DESIGN SERVICE includes

- \* Environmental Diagnosis
- \* Technical Guidance
- Definition of the Risk Coefficient for each individual duct
- Definition of the QPE<sup>®</sup> (Quality Performance Efficiency) coefficient for each proposed technical solution

## PERFORATED DUCTS PRODUCT IN FREE COMPETITION

# SPIROJET



The **SPIROJET<sup>™</sup>** perforated ducts in **SPIROPACK<sup>™</sup>** configuration consist of a set of one-meter-long modules, each comparable to a traditional high-induction diffuser.

The diffusion element is represented by the perforation, which is applied to each module, regardless of the duct diameter.

The air exiting the holes induces a quantity of ambient air generally 30 times greater than the air exiting the holes.

The number of holes, their diameter and their arrangement on the wall of each **SPIROJET™** duct module define its performance.

The calculation of the perforations is carried out using a Computational Fluid Dynamics (CFD) mathematical model based on the system's characteristics.



The maximum performance in terms of temperature homogeneity, both horizontally and vertically, within  $\pm 1$  °C, and control of residual air velocities at floor level, are achieved under the following operating conditions:

<ul> <li>Maximum installation height:</li> </ul>		
o for heating:	8	m
o for cooling:	20	m
Maximum throw:	15	m
<ul> <li>Velocity inside the duct:</li> </ul>	5 m/	/sec
• Maximum $\Delta T$ during heating phase:	10	°C
<ul> <li>Minimum supply temperature:</li> </ul>	12	°C

Beyond these values, the system deviates proportionally from the maximum performance indicated above.

#### DESIGN

The design of a system using **SPIROJET<sup>M</sup>** diffusion ducts is carried out in a conventional manner, evenly distributing the ducts in the space, as is generally done for any type of diffuser.

To compensate for temperature losses along the duct axis, it is necessary to size the duct diameter for an incoming air velocity of 5 m/s.

The proper sizing of each **SPIROJET™** duct essentially depends on its correct unit airflow rate, based on the installation height.

The performance con still be considered equivalent to that of traditional ducts even with values outside the above-mentioned range.

The optimal unit air flow rate is indicated in the graph below, which, with a tolerance of  $\pm$  30%, ensures the proper functioning of the system.

#### ADVANTAGES

- Highly competitive cost,
- Pleasant aesthetic appearence
- No need for thermal insulation
- High quality air diffusion
- Adjustable throw angle
- Capability to use the patented VARITRAP® (Patent EP2224183) system to regulate air velocity at floor level
- Option to request a free protective film on the outer surface of the duct

And thanks to the patented **SPIROPACK<sup>™</sup>** technology:

- Reduced assembly time and costs
- Smaller transport volume, resulting in:
  - o Lower transportation cost
    - o Reduced environmental pollution
- Reduced on-site space requirements
- Improved cleanliness of the Ducts on-site
- Fewer support brackets required
- High pressure resistance (3,000 Pa)
- High mechanical strength
- High-quality materials

## SPIROJETTM DUCTS WITH PULSION TECHNOLOGY





The **MIXIND®** technology is characterized by its ability to "push" the entire volume of ambient air instead of "throwing" the supply air into the treated zone, as is typical of traditional air diffusion systems.

The **MIXIND®** technology is therefore defined as "air pulsion" since it utilizes the specific microturbulent flow induction of the perforated duct to create a "pressure field" capable of imparting continuous motion to the entire mass of ambient air at the desired velocity.

The duct that apply the MIXIND® technology is called PULSORE®.

The application of this technology substantially modifies the commonly used design solutions.

The proper placement of **PULSERS™**, which generally favors long throws, is crucial in defining the system's performance.

As mentioned earlier, the correct design of a system using **MIXIND®** technology necessarily requires the technical support of **SINTRA** through the free **ASSISTED DESIGN** service.

#### ASSISTED DESIGN

The **ASSISTED DESIGN** is a free-of-charge service offered by **SINTRA** that conditions the use of the innovative technical solutions proposed by **SINTRA** to an exclusivity right.

By filling out the request form in the most comprehensive way possible, **SINTRA** is able to perform a comparative analysis with over 30,000 registered systems in our Database (1983-present).

A **TECHNICAL GUIDANCE** session, organized via video conference, will allow our clients to properly design the desired system with our support, meeting their technical and economic needs.

It will also enable a proper assessment of any compromise imposed by economic or architectural requirements.



#### **KEY BENEFITS**

- Energy savings and total destratification
- Maximum temperature homogeneity both horizontally and vertically
- Full recovery of endogenous heat
  - Manual adjustment of residual air velocity at floor level with patented VARITRAP<sup>®</sup> technology
    - Variable airflow capability of 70-100% with **VARIAMIX**® technology
  - Elimination of return ducts:
    - ✓ Lower ducts cost
      - ✓ Reduced space requirements
      - $\checkmark$  Reduced weight on structures
      - ✓ Lower pressure losses
      - $\checkmark$  Lower fan power consumption

#### • Thanks to ASSISTED DESIGN:

- $\checkmark$  Lower total system cost
- ✓ Optimization of airflow rates
   o Lower fan power consumption
  - o Lower filter consumption
- Fewer air ducts to be supplied:
   o Reduced space requirements
  - o Reduced weight on structures Shorter construction duration
- Guaranteed results

## **NEW GENERATION PLANTS** WITH PROPRIETARY TECHNOLOGIES





Over the past decades, in its continuous research journey, **SINTRA** has been able to perfect new technologies applicable to the original **MIXIND®** technology, some of which are patented, others in patent-pending status, and others simply the result of specific know-how.

These proprietary technologies are referred to as **QPE®** (Quality-Performance-Efficiency) technologies, and their application characterizes the **NEXT GENERATION SYSTEMS**.

#### QPE<sup>™</sup> CONTROL PRINCIPLE





**TWIN-3 PLENUM EXAMPLE** 



#### **DESCRIPTION OF MAIN TECHNOLOGIES**

- Patented **TWIN-VARIBOOST** (Patent EP2557368/EP3293462) technology that allows the combination of primary **PULSERS<sup>™</sup>** for comfort management with secondary **PULSERS<sup>™</sup>** for power management:
  - ✓ VARIABLE COMFORT:
    - Ability to easily adjust residual air velocity at floor level at any time
       Energy saving for rapid start-up time and elimination of nighttime attenuation.
  - VARIABLE AIRFLOW up to 10 ÷ 100 %:
    - o Energy savings of >50% on fan power consumption
    - o Savings of >50% on filter consumption
    - o Improved gravimetric efficiency of filters
    - o Lower average system noise
- Patented **VARIPLENUM** (Patent 1397501) technology that enables the integration of multiple air handling units (AHUs) or rooftop units (RTUs):
  - Ability to effectively treat the entire space even with a portion of the AHUs/RTUs operating
  - Increased system reliability in the event of a failure of one of the AHUs/ RTUs
  - ✓ Extended system lifespan due to reduced operating hours of AHUs/ RTUs
- ICED AIR technology that allows.
  - $\checkmark$  Further reduction of the total system airflow
  - ✓ Accurate control of relative humidity in dehumidification mode without the need for post-heating coils
- **MEGA** technology that ensures temperature homogeneity throughout the space regardless of power input
- **FCIE** (Extreme Winter Free-Cooling) technology that allows the direct introduction of cold outside air, even at sub-zero temperatures, without condensation or comfort loss.
- Patented HYGROCOOLING<sup>®</sup> (Patent 1401522) technology for high humidification and powerful adiabatic cooling using "dry duct" induced air
- **MODULAIR<sup>™</sup>** superventilation technology with high-capacity technical fans and low energy consumption.
- During the Technical Orientation (OT), other products and technologies may be proposed, such as: VARITRAP<sup>®</sup>, VARIWIND, RADYAL, MODUFILTER, VARITOP, TWINFLOW, VARIFILTER, VARISMOKE, VARIPULSE<sup>®</sup>, VARITOTEM<sup>®</sup>, etc.

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STABILIMENTO-LABORATORIO - Ducts Production Center - Fontaneto d'Agogna (NO)



EXPERTISE & TECHNOLOGY CENTER - Research Center - Production Center - Suno (NO)

## SINTRA Soc. BENEFIT

#### **STABILIMENTO-LABORATORIO**

Corso Europa, 24 28010 Fontaneto d'Agogna (NO) Tel.: (+39) 0322 86 36 01

#### **EXPERTISE & TECHNOLOGY CENTER**

Via Novara, 31/35 28019 Area Industriale Suno (NO) Tel.: (+39) 0322 86 36 01

### SINTRA FRANCE

31-33 Rue des Clotais 94360 Bry-sur-Marne Tel. : +33 (0)1 55 12 18 96

#### **BUREAU DE LYON**

15 Rue de Chavril 69110 Sainte-Foy-Lès-Lyon Tel. : +33 (0)4 72 20 04 92

#### **BUREAU DE NANTES**

Les Bureaux du Sillon – Étage 22 8 Av. des Thébaudières 44800 Saint-Herblain Tel. : +33 (0)2 85 52 47 80



www.sintra-mixind.com



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