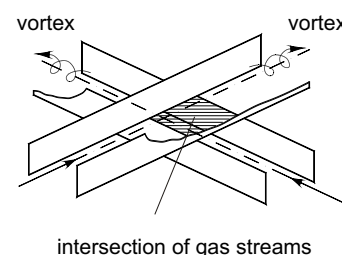
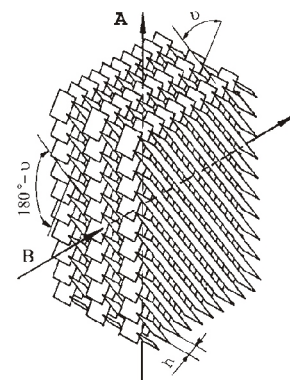


MULTIWIR PACKINGS

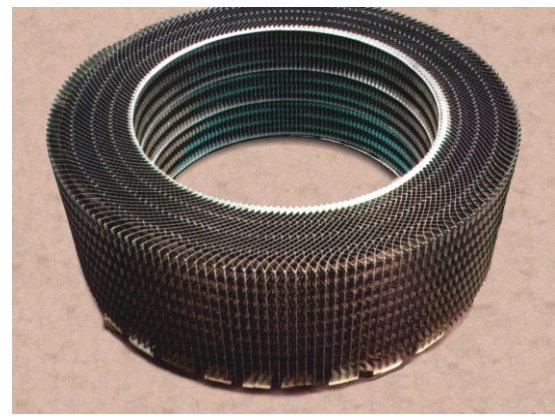
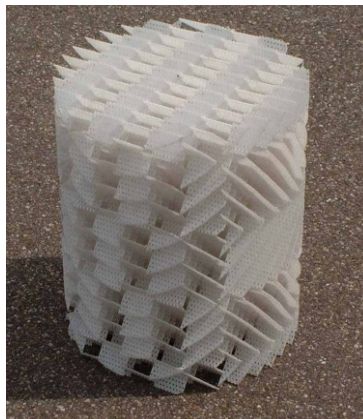
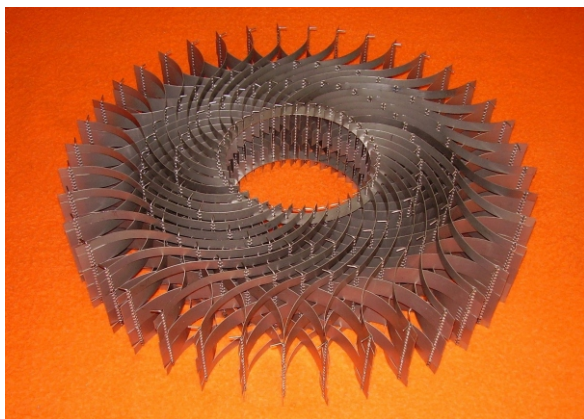
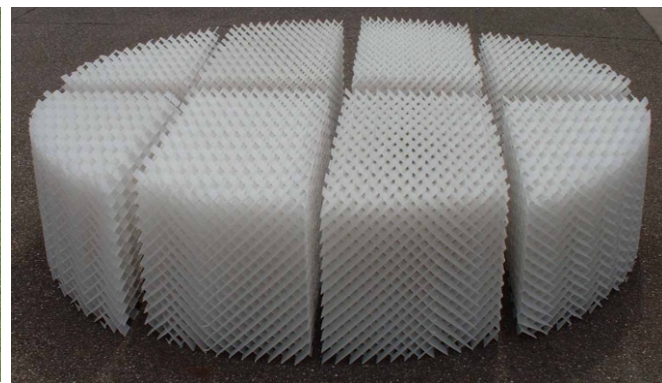
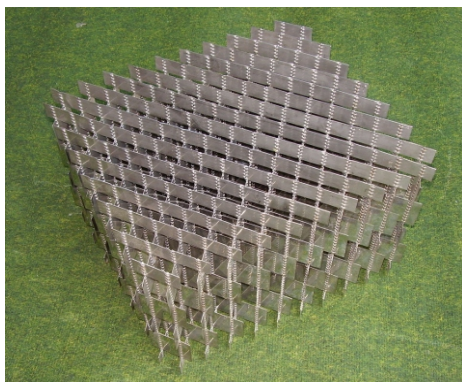
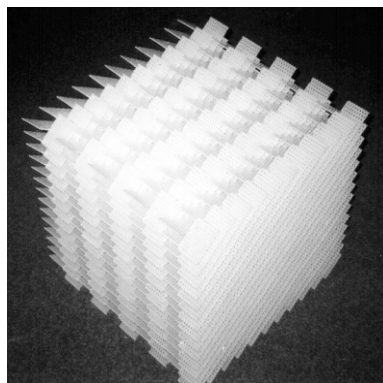
The name **MULTIWIR** ("wir" is a Polish word for "vortex") originates from a phenomenon of multiple vortices, stable and orderly in nature, induced into gas streams flowing through a structured packing of a special design. The packing consists of layers of parallel slats organised in such a way, that the slats belonging to the adjacent layers cross at a certain angle. This structural design causes the gas stream to divide into multiple jet streams which flow along the slats and mutually propel the rotational motion of each other. The diameter of the vortices equals $20 \div 30$ mm and the frequency of the rotation ranges from 30 s^{-1} to 60 s^{-1} in most industrial applications.

The centrifugal force resulting from the rotational motion of gas streams is the main factor responsible for the separation of dust and droplet particles from the flowing gas. The separation efficiency depends on parameters of the Multiwir packing and on the gas velocity; its highest value observed in experiments was 90% - 100% for each particle size greater than $2 \mu\text{m}$ in diameter.

Jan Kwaśniak, PhD Eng., the inventor of Multiwir packings conducted experimental research on the gas flow characteristics and the separation efficiency at Technical University (Politechnika Łódzka) in Lodz, Poland and at Technical University in Clausthal, Germany in 1970s and 1980s. His research was further continued by German scientists at universities in Karlsruhe, Stuttgart and Essen.



MULTIWIR packings are made from stainless-steel and polipropylene.



www.multiwir.com

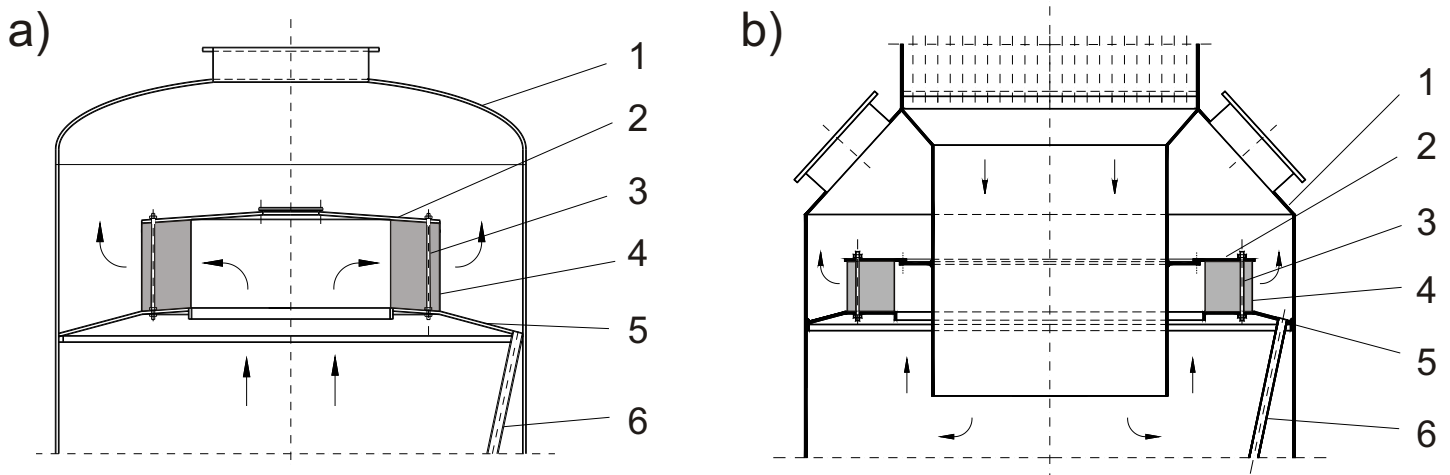
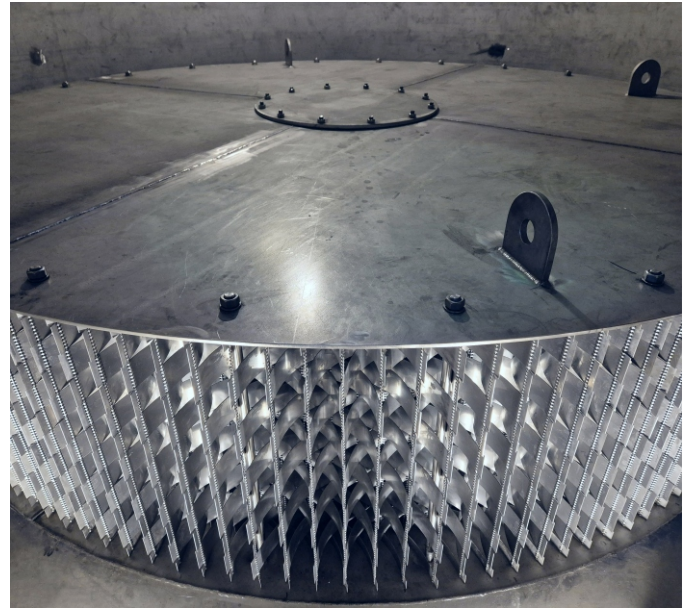
multiwir@multiwir.com

MULTIWIR ENTRAINMENT SEPARATOR

MULTIWIR ENTRAINMENT SEPARATOR has been designed for separating juice droplets from the vapour in the evaporator body.

The device is being installed in the upper part of the vapour chamber (Robert evaporator) or its annular space (falling-film evaporator). It consists of a ring-shaped Multiwir packing mounted on the conical bottom plate (5) and covered with a lid (2). The packing is made of stainless steel slats that can be easily assembled inside the existing evaporator.

The droplet separation process proceeds in the Multiwir packing (4) because of the centrifugal force created by the rotational motion of vapour streams flowing along the packing channels. Droplets are thrown onto the metal slats and flow towards the liquid return pipe (6).



a) Robert evaporator, b) falling-film evaporator, 1. vapour chamber, 2. lid, 3. lid-holding bolts, 4. MULTIWIR-PACKING, 5. bottom plate, 6. liquid return pipe

MULTIWIR DROPLET SEPARATOR is distinguished by:

- very high separation efficiency
($< 2\text{ppm}$ of sugar in the vapour condensate)
- low pressure drop ($< 600\text{ Pa}$)
- effortless installation in the existing evaporator
- long-term guarantee of efficient operation
and ease of maintenance

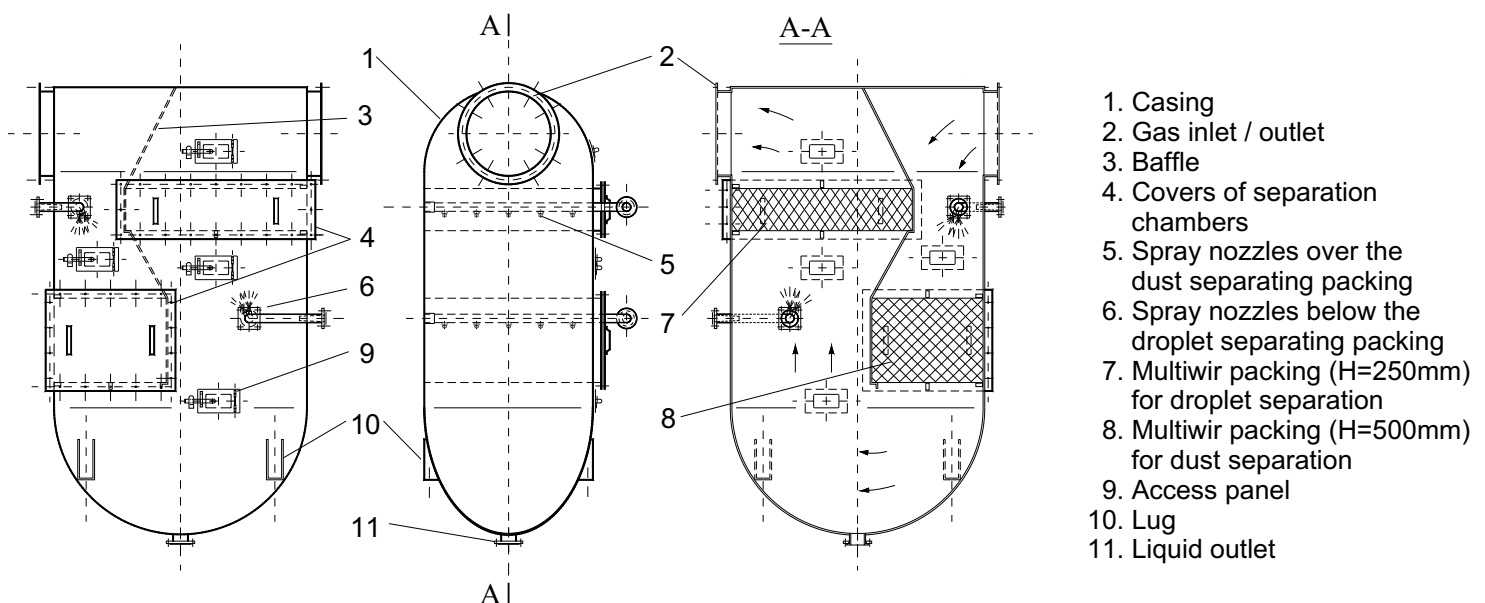
MULTIWIR SUGAR-DUST SEPARATOR



MULTIWIR SUGAR-DUST SEPARATOR has been designed for cleaning the outlet air stream of the sugar dryer or cooler.

The apparatus is intended for two-stage operation including dust- and droplet separation processes. It has been equipped with two sets of Multiwir packing made from polypropylene, as well as two sprayers connected to the impeller pump and the circulation tank.

The sugar-dust separates inside the Multiwir packing (8), which is continuously sprayed with the circulation juice. The sugar concentration in the juice is regulated automatically at 51÷53Bx. The entrained droplets separate on the Multiwir packing (7), which can be periodically sprayed from below with the hot condensate in order to dissolve sugar crystals forming gradually on its bottom surface. The separation process proceeds inside the packing channels due to the centrifugal force induced in the rotating air jet streams.



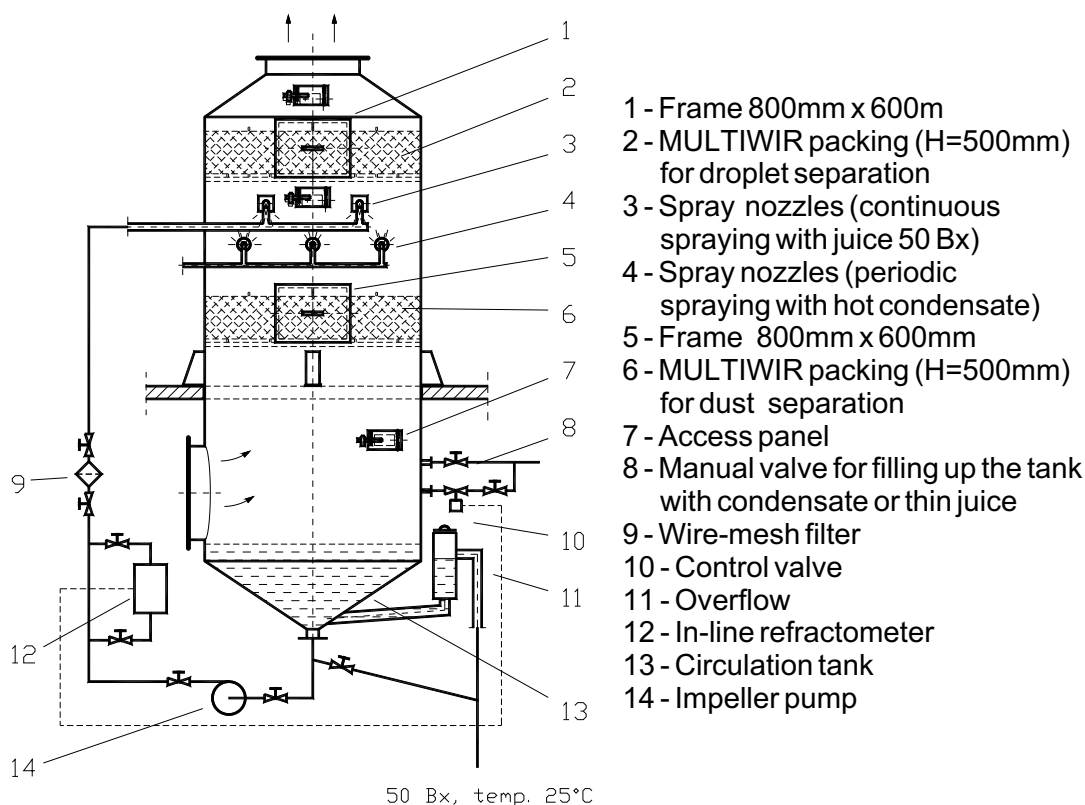
MULTIWIR SUGAR-DUST SEPARATOR is characterized by:

- very high separation efficiency (99,9%)
 - low pressure drop (< 1200 Pa)
- evaporation of water from the circulating juice at the expense of air-cooling
 - low investment and operating costs
 - small and compact size
 - ease of maintenance

MULTIWIR SCRUBBER

MULTIWIR SCRUBBER is a cylindrical apparatus designed for separation of sugar-dust particles from the outlet air stream of the sugar dryer or cooler. Due to its very simple construction, it is being more frequently installed in the sugar industry nowadays than the Multiwir sugar-dust separator presented on the previous page.

The scrubber is equipped with two sets of Multiwir packing made from polypropylene, which are placed on support grids in the middle and the upper part of the vessel. The lower part of the apparatus is the circulation tank (13). The two-stage operation system of the scrubber includes the dust and droplet separation processes. The dust separation proceeds inside the Multiwir packing (6), which is continuously nozzle-sprayed with the circulation juice. The sugar concentration in the juice is 50 Brix (or more) and it is controlled automatically. The droplet separation occurs inside the Multiwir packing (2) which can be periodically sprayed from below with the hot condensate. Dust and droplet particles separate from the air due to the centrifugal force induced into the rotating air jet streams inside the channels of the Multiwir packing.



MULTIWIR SCRUBBER is characterized by:

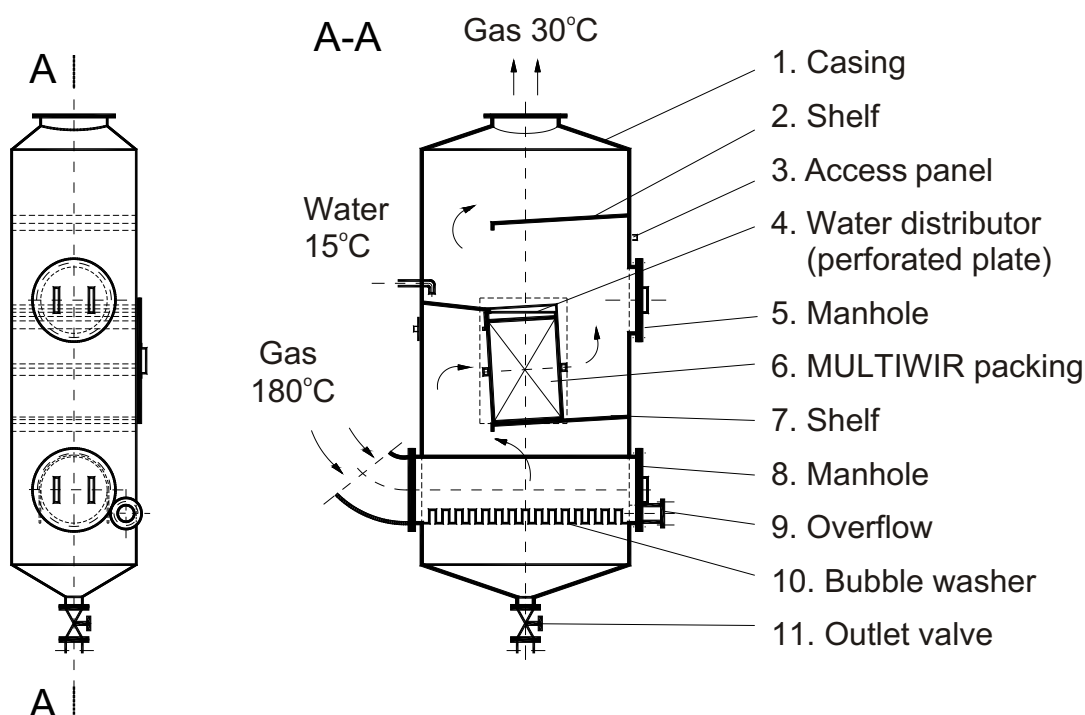
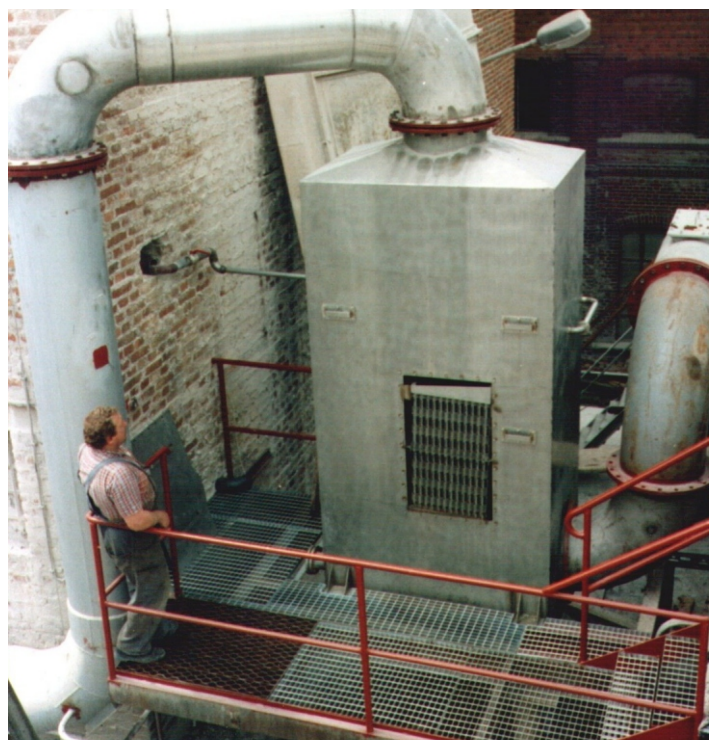
- high separation efficiency (99,5%)
 - low pressure drop (< 900 Pa)
- evaporation of water from the circulating juice at the expense of air-cooling
- low investment and operating costs
 - small diameter of the apparatus
- resilience to one-hour pump failure
 - ease of maintenance

MULTIWIR CARBONATION-GAS WASHER

MULTIWIR CARBONATION GAS WASHER is used for cooling and cleaning the hot carbonation gas, as well as for saturating it with water vapour.

The apparatus made entirely from stainless steel consists of two parts including a lower part equipped with a bubble-washer, and an upper part containing Multiwir packing. The packing has been covered with a perforated plate, which operates as a water distributor.

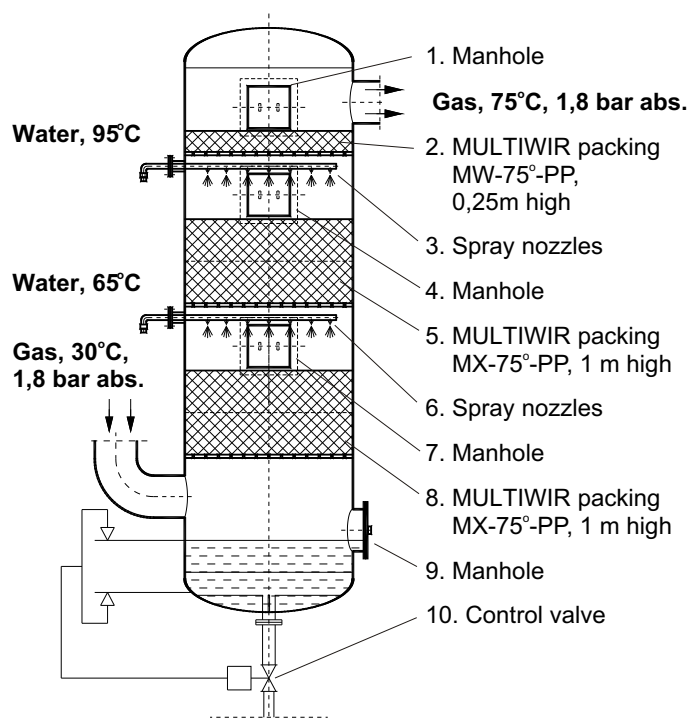
The operating principle of the apparatus is that of two-stage. First the bubble-washer cools the hot inlet gas stream and saturates it with water vapour and mist. Then the actual dust separation proceeds inside the Multiwir packing due to the centrifugal force induced in the rotating gas streams flowing inside the packing channels. Dust particles are being thrown onto the surface of the metal slats and rinsed continuously by fresh water.



MULTIWIR GAS WASHER is characterized by:

- high separation and cooling efficiency
 - small and compact size
- a small supply of water required
 - maintenance-free operation

MULTIWIR GAS HEATER & HUMIDIFIER



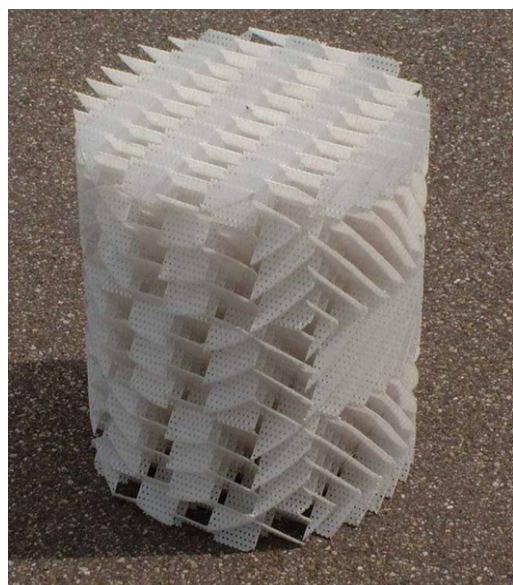
MULTIWIR carbonation gas heater & humidifier has been designed for heating the carbonation gas and saturating it with water vapour by contact with hot water. This process improves the subsequent carbonation of the juice and reduces energy consumption.

The apparatus is a packed cylindrical column, filled with Multiwir MX structural polypropylene packing placed on two levels (2 x 1m high). It is also equipped with sprayers mounted over both packing layers and a droplet separator at the top (0,25 m high).

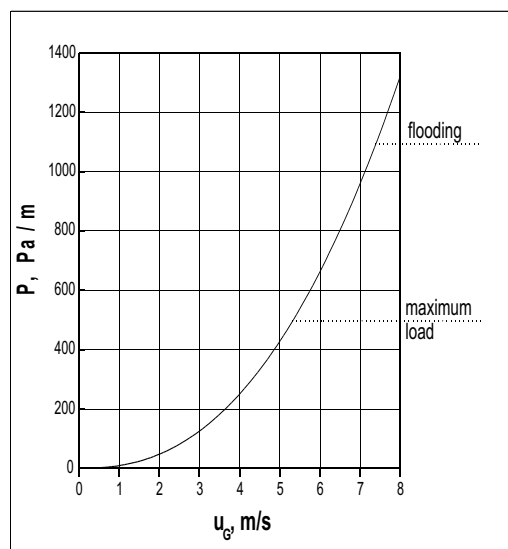
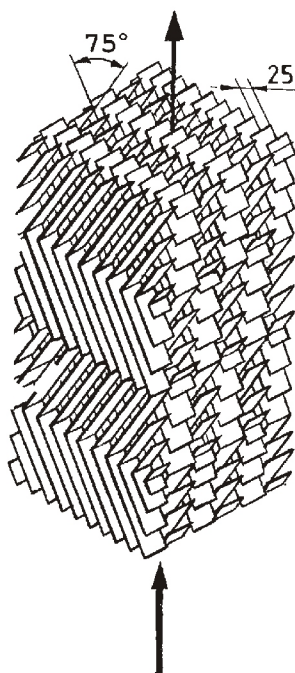
The Multiwir MX packing on the lower and the upper level are sprayed with hot water at temperatures 65°C and 95°C respectively. The carbonation gas flows upwards through the column, in counter-current to the flow of water. The water level is stabilized by a control valve, because of the overpressure in the apparatus (around 0,8 bar).

MULTIWIR CARBONATION GAS HUMIDIFIER IS DISTINGUISHED BY:

- high efficiency resulting from uniform water distribution on the Multiwir MX packing surface
- a wide range of possible gas and water flow
- low pressure drop (below 1000 Pa)



MULTIWIR MX-75°-PP packing



Pressure drop
in MULTIWIR MX-75°-PP Packing