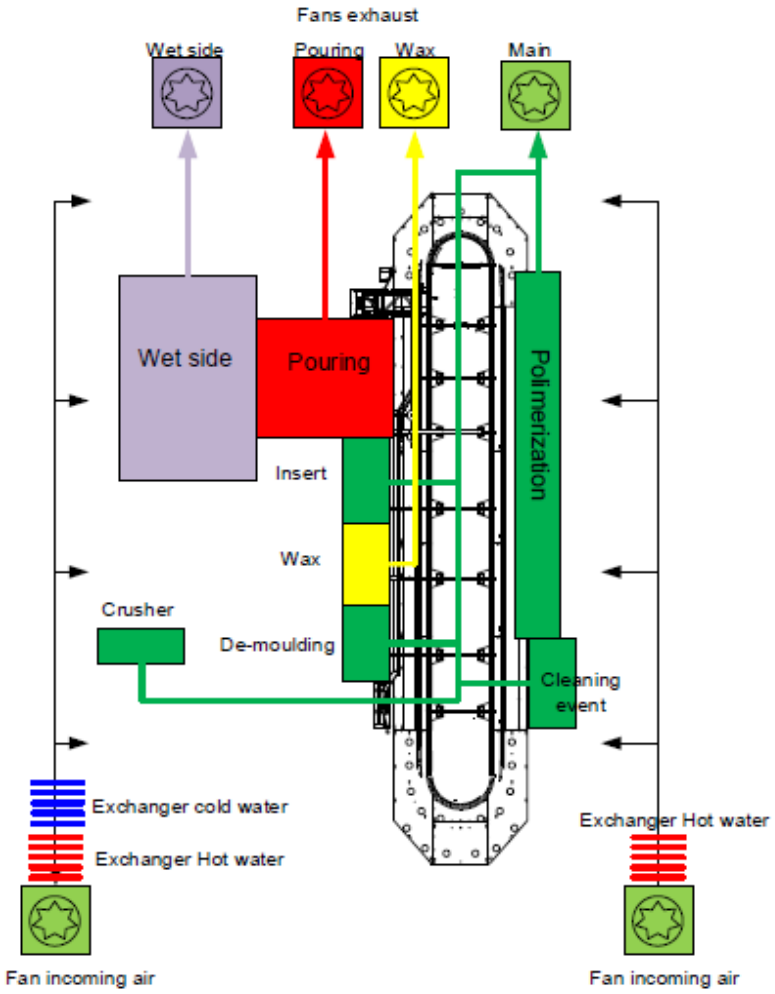
# Annex 7

# VENTILATION (MOULDED FOAM PLANT)

## 1 PROCESS

### 1.1 Installation Principle




#### 1.1.1 Definition

The racetrack is dedicated to polyurethane foam production, for car seats. It comprises a certain amount of carriers, and 2 moulds maximum per carrier. Moulds are heated over 60 °C. The heat flux in the racetrack is given by the heating system of each mold and the heat emitted by the process and machineries. Polyurethane production is realized by addition of diisocyanates + polyether polyols + catalysts (aliphatic amines mainly). This gives an exothermic reaction which creates vapour emissions (of diisocyanates and amines).

To facilitate the demolding, release agents are sprayed into the moulds. They contain wax + naphtha solvents (called hereafter VOC's).

The design of an exhaust is based on the velocity needed to capture the pollutants: this velocity is monitored at the EMISSION POINT of the pollutant NOT at the hood surface. It should be:

- 0,5 m/s minimum for pouring robot and release agent spray booths,
- 2 to 5 m/s for PU dust capture.

In any case, the exhaust must be placed as close as possible from the emission point, and NOT over the operators' heads.

### 1.1.2 Exhaust

We use 4 fans:

- 1.1.2.1 Wet side
- 1.1.2.2 Pouring
- 1.1.2.3 Main LEV, Local Exhaust Ventilation,
- 1.1.2.4 Wax fan (explosion-proofed)

### 1.1.3 Incoming air

The balance between incoming air with the outgoing air. A minimum balance can be about 1 m3/hr extracted for 0,9 m3/hr in. Optimum would be 1 / 1. A heat exchanger can be placed in the exhaust in order to recuperate a part of the heat extracted and pre-heat partially the incoming air.

If a push pull system is designed (incoming air blown inside a release agent spray booth), air must enter the booth at a velocity of 0,5 m/s maximum.

## 1.2 Wet side

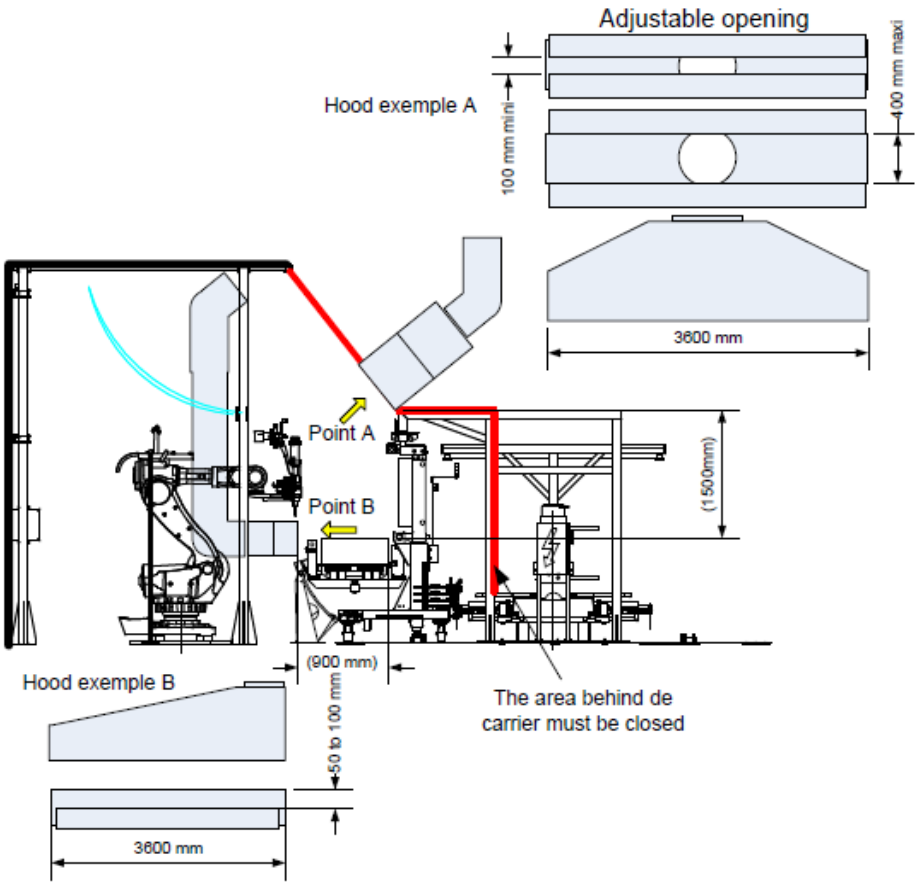
### 1.2.1 The complete system of ventilation is composed of:

- Air conditioning system for temperature between 20 and 24 degrees
- Incoming air 800 m3/hr (depending on the room size and nature)
- 3 x outgoing air ducts of 200 mm diameter above each couple of pumps
- For each outgoing air duct, the air velocity is equal to 3 m/s at the inlet,
- Total outgoing air flow must remove the volume of wetside room 5 times per hour (1000 m3/hours)

The air conditionning gas used must be compatible with the actual CE regulation.

## 1.3 Pouring area

It is an enclosed area where the robot pours the foam on the mould

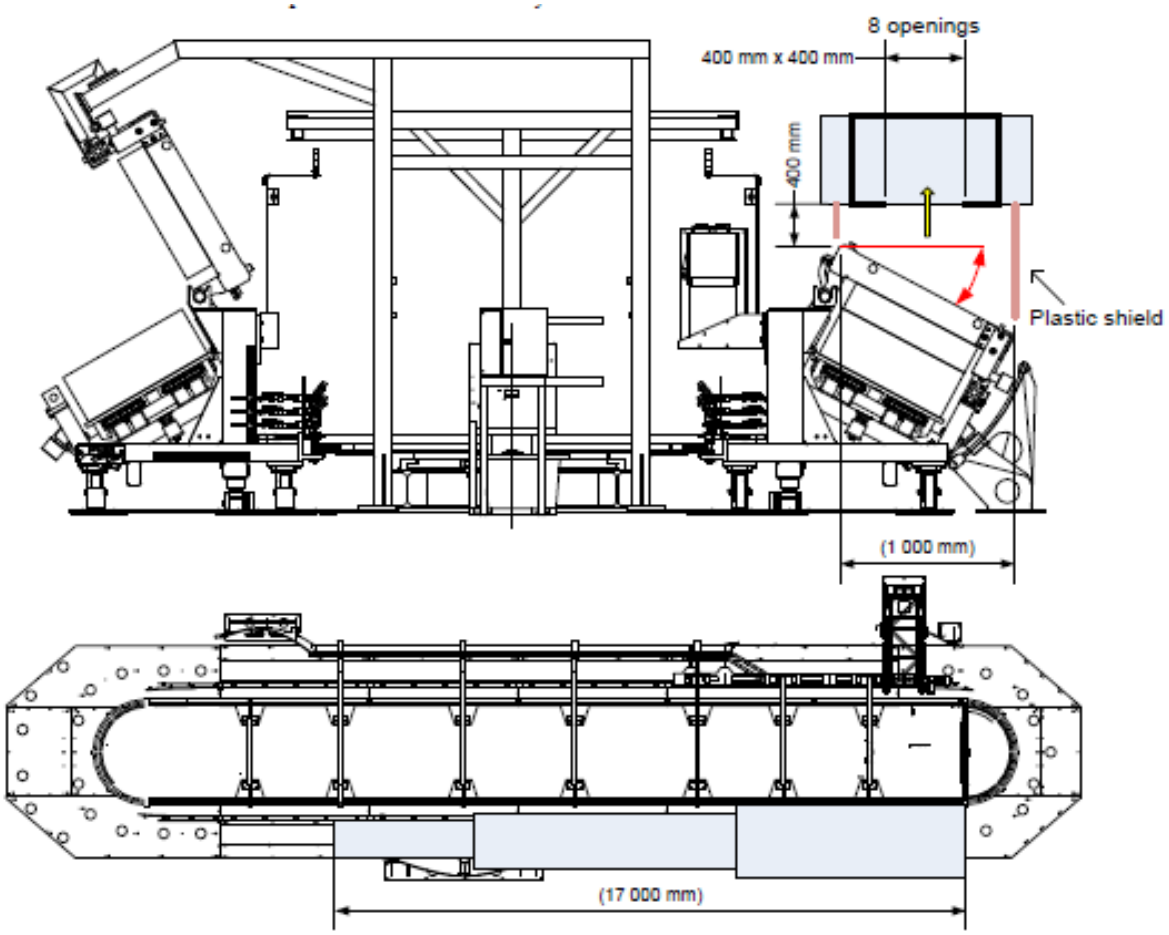


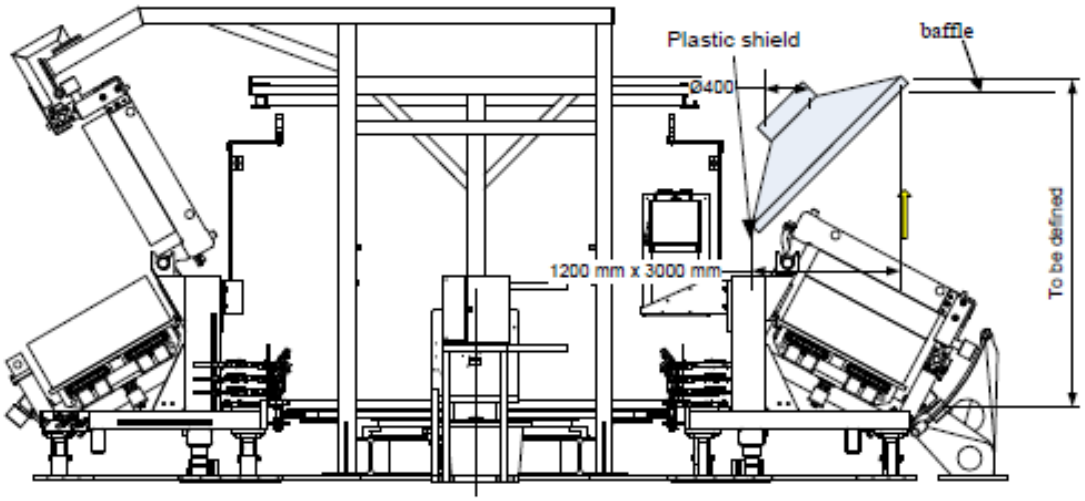

Dimensions between brackets are indications only.

## 1.4 Polymerization

In the polymerization area the mould is closed but vapours are released through the mold vents.

The mould has 2 position: bended at 45° and a horizontal position. This area is totally enclosed.


8 openings
400 mm x 400 mm
400 mm
Plastic shield
(1 000 mm)
(17 000 mm)

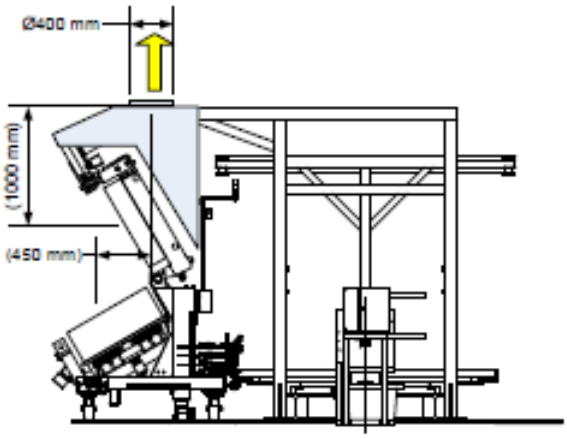

Plastic shield
baffle
Ø400
1200 mm x 3000 mm
To be defined

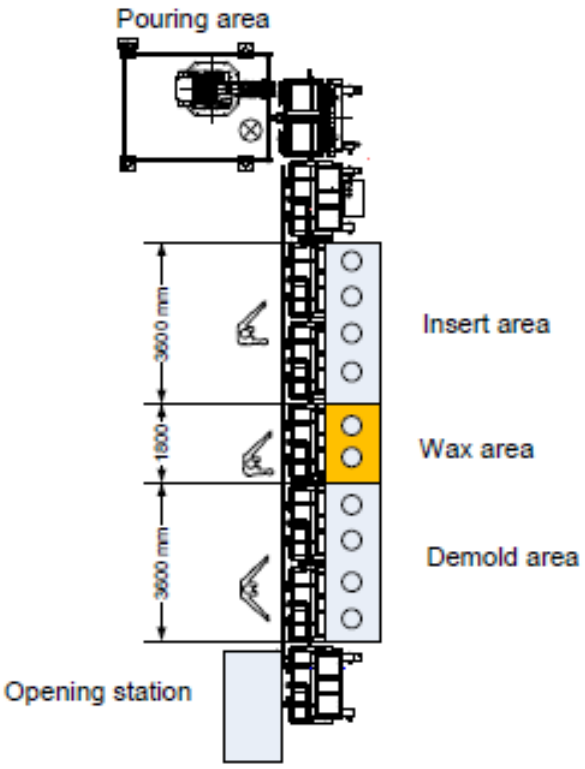
## 1.5 Demolding- Wax- Insert

- Demolding 4 openings Ø400 mm

- Wax 4 openings Ø400 mm

- Insert4 openings Ø400 mm



## 1.6 Crusher

The hood must be defined in order to capture the entire volume of hot gazes released during the crushing process, by assuming that all the catalysts will be released during crushing. This gives usually a volume of one liter of gazes per part.

## 1.7 Incoming air (SEE MAIN LAYOUT)

Incoming air volume should be equivalent to the exhaust volume. Two fans should be used.

## 1.8 Electrical Control

One electrical cabinet for all system

Per fan:

- Switch on¥off
- Green light running
- Red light stop

Speed control is needed to adjust the air flow whenever possible.

Emergency stop directly on the fan and one on main electrical cabinet. Interlocks between the racetrack and the fans.

## 1.9 Maintenance

## 1.10 Design and installation

The installation will be provided with a complete documentation, (including a PID and an electrical diagram) and all design calculations including the head pressure drop curve from the ducting / filtering and the fans clearly showing the working point of the installation.

The head pressure drop of the entire installation should be reduced to a minimum. 90° connections between ducts are not allowed.

The maximum velocity in ducts should be reduced to 20 m/s.

A pre-approval phase will take place before installation: the first draft design schematics and calculation will be sent to Central HSE for approval and / or modification and comments.

If dampers are used, the adjustments of the dampers will be clearly defined on the schematics.

Hangers should be located every 3 to 5 m. The location of the ducts must be defined with Central HSE, any duct creating an obstruction on the sprinkler protection.

The amount of singularities must be reduced to a minimum (elbows and curves, dampers). The ducts would be preferably from a circular shape and in metal. There is no need to use stainless steel ducting. Wax ducts must be fully grounded (physical connection between each length of duct).

The exhaust stacks must have a height of 1/3 of the building height. Incoming air louvers shall be placed at roof level but not exposed to the stack emissions.