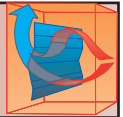


- PENETRANT TESTING INSTALLATIONS -



- ***Single process units as dipping tanks and powder chambers***
- ***Combi-room for accomodation of whole process plant***
- ***Semi-automatic plants with step by step operation***
- ***Fully automatic plants with step by step operation***



## - PENETRANT INSTALLATIONS -

### **Design of work places/ complete plants**

When designing and dimensioning a work place or a complete penetrant testing plant the following factors have to be considered:

- Frequency of testing
- Quantity to be tested
- Size of goods
- Design of goods
- Type of penetrant method
- Premises where testing will take place.

### **Combi-box**

When testing big but movable parts a combi-booth is preferable. All the operations included in the penetrant testing, i.e. dipping in a tank or spraying penetrant, rinsing, drying, coating with developing powder will take place in the Combi-booth. Normally a separate final inspection room is buildt. In order to to incresase the capacity of the system a dryer unit can also be installed separately from the combi-booth. The combi-booth is designed and buildt to meet requirements from customer and to fit premises available for building up a proper work place. In a combi-booth a vertical ventilation system is recommended. Clean air is supplied via a false ceiling destributing the air over the whole ceiling area without causing any turbulence. To achieve an extremely good ventilation in the booth, the exhaust air filtration unit should be installed under the workshop floor level. During the drying process electric or water-borne fan heating units will increase the temperature up to approx. 60° C . The ventilation will be operative in the following stages of the penetrant testing process:

- Pentrant and powder spraying
- Rinsing
- Drying

The walls of the combi-booth are inside insulated and covered with stainless steel plate and outside covered with varnished sheet metal.

### **Manual line**

A manuell line is an alternative for testing smaller parts measuring max 500 x 500 x 400 mm. (L x W x H)

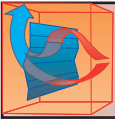
The parts are placed in plastic crates and pulled by hand on a conveyor between the work stations, which, in the principle can be the same as described under "Automatic lines" Most units are made of stainless steel. In this case the process at each station is manually started and stoped. The time is controlled with an alarm clock.

### **Automatic/semi-automatic lines**

If the parts are small, or not too large, and the testing capacity required is relatively large, then an automatic line is recommended. The line normally includes one station for each step of the testing process, i.e.

- Dipping in a tank or electrostatic spraying with penetrant.
- Rinsing is done on a nozzle ramp where the parts or the nozzles are rotating. Sometimes additional manual rinsing is also carried out. Spraying with penetrant and rinsing can also be robotist.
- Dipping in emulsifier, if applicable.
- If emulsifying is included in the process, a second rinsing must be added.
- Drying of wet parts takes place in a water dryer at 60°C with a large amount of air.
- A developer can be applied either in a storm cabinet or by electrostatic spraying.
- Blowing off excess developing powder can be done in a special room or in part of the final inspection room.
- Final inspection is carried out in a dark room with UV-light. The parts are taken from the conveyor and put on a ventilated work bench adjustable in height.

The parts to be tested are transported between the stations in baskets on belt or roller conveyors. Stations are separated from each other by electrically controlled hatches. A controll system enables the setting of different step intervals. The step intervall is the time between the feedings of the conveyor, i.e. the time the penetrant is applied before rinsing. The control system directs all step of the process but there is always a possibility to intervene and shift a step to manual operation. All the stations are properly ventilated. The wet units, all made of stainless steel, have collecting tanks taking care of the water and excess penetrant, which will then be pumped further to the purification plant. Both spraying with penetrant and rinsing can be robotized.



## - PENETRANT INSTALLATIONS -



*VOLVO AERO in Trollhättan, A-workshop, (pictures above).  
Flaw detection of aeroplane engine parts in an automatic installation. The goods are loaded in baskets transported through the installation by a "Power and free" conveyor. Step interval can be chosen between 15, 30 or 60 minutes. The following stations are included:*

- Loading.

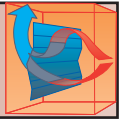
- Dipping in penetrant (dipping tank on lifting table).
- Rinsing station with spray nozzle ramp (with optional of manual extra wash)
- Dryer.
- Developing, automatic.
- Blower, manual.
- Final inspection, manual.

*SAAB Instruments in Jönköping, (pictures below).  
Flaw detection of hydraulic parts for steering systems in a manual installation with one station for each step. This is a solution for smaller goods put in to plastic crates and pulled by hand between the different stations which can be:*

- Loading.
- Dipping in penetrant (dipping tank with lowering device).

- Rough rinse station, like dishwasher.
- Fine rinse station, like dishwasher.
- Dryer.
- Developing, automatic.
- Blower, manual.
- Final inspection, manual.





## - PENETRANT INSTALLATIONS -



*Volvo Aero, factory in Norway.*

*Penetrant flaw detection of dynamo parts for the off-shore industry.*

*The plant consists of:*

- Penetrant and wash room with vertical ventilation. (All above floor level.)
- Dryer.
- Blower and final inspection room.

*VOLVO AERO in Trollhättan, A-workshop.*

*Penetrant flaw detection of aeroplane parts in a manually operated installation.*

*This is a solution for less numbers of larger components. All the steps here are performed manually and everything apart from the final inspection takes place in one room.*

*Ventilation is horisontical and the booth is a cascade curtain.*



## Reference List

Alfa Laval AB, manual installation.

Canthal Casting AB, line.

Volvo Aero AB, combi-booth factory in Norway

Volvo Aero AB, combi-booth in C-workshop.

Volvo Aero AB, line in A-workshop.

Volvo Aero AB, line in plate workshop.

Volvo Aero AB, line in nozzle workshop.

FFV Aerotech, manual line and combi-booth.

Volvo Aero AB, manual installation in X-workshop.

Volvo Aero AB, combi-booth in C-workshop.

Saab Instruments AB, manual line.

ABB Stal AB, manual installation.

Volvo Aero AB, combi-booth, line and manual installation in A-workshop.

Saab Aircraft AB, combi-booth and automatic developingbooth.

Volvo Aero AB, Penetrantbooth

Volvo Aero AB, combi-booth and automatik line in C-workshop.

Sandvik Steel AB, Robotinstallation for developingpowder.