



Back to Basics: A Framework for Leather Manufacture

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Pre-finishing and Finishing

Part 3: Spray Techniques

Overview

There are three principal alternative spray gun translation modes in use providing regular and controlled application of finishing products:

The reciprocating gun system where between two and four guns are made to travel to and fro in a straight line at right angles across the leather being carried on the feed conveyor.

The rotary system where four, eight, twelve or sixteen guns fixed on a rotating frame are made to sweep twice in opposite directions in a curved path across the leather on the conveyor.

The oval path system is essentially a variation of the rotary system, where up to sixteen guns, carried on a chain, travel twice in opposite directions in a straight line across the leather on the conveyor.

Four types of electrically actuated automatic spray guns are in general use and any may be employed in conjunction with any of the gun translation systems.

Objectives

The techniques of gun translation together with gun speed control aim to produce the deposition of product in patterns guaranteeing optimum uniformity in cover. The systems also take into account the various conditions imposed by the spray guns and their settings as well as conveyor speed. The refinement of spray gun capabilities accurately controls the application of finishing products to the leather surface. The active elements of control and variability are volume of deposition, shape and size of spray fan, pressure of fluid product and pressure of atomising air.

Conveyor speed, i.e. the speed of movement of the leather past the guns unless synchronised with gun speeds will produce incorrect translation patterns and nullify the effects of system control.

Automatic leather spraying machinery

The three main categories of automatic leather spraying machines are:

The reciprocating path spraying machine. The constructional elements of this machine consist of a bridge fitted at right angles to the leather conveyor at a determined height above the conveyor. The bridge supports a single track which carries and guides a gun carriage in to and fro translation... The carriage is connected to an electric motor driven chain and chain wheel arrangement which provides its reciprocating motion. The spray guns, usually two or four, are attached to the carriage. Current reciprocators use mechanical or electrical means of varying gun translation speed. Some modern developments use pneumatic piston drives in place of the chain arrangement to provide variable speed reciprocation. The ability to correctly synchronise gun travel and leather carrying conveyor speeds is crucial in achieving an even spray pattern on the leather. Air and product supply lines together with electrical gun control wiring are directly connected to the guns and are trailed along by the carriage in a tray arrangement.

The rotary path spraying machine. A large frame bridges the leather transport conveyor. An axle assembly is mounted centrally on the frame incorporating liquid product and compressed air supply glands as well as a split ring unit to transmit electrical current to the solenoid switched gun control. A variable speed electric motor drive rotates the rotary gun carrier connected to the axle assembly. Four, eight, twelve or sixteen guns may be fitted to the carrier.

The oval path spraying machine. Not often seen in service it combines the simplicity of the straight line double path translation of the reciprocator system with

the higher capacity of the rotary machine. The bridge frame here also mounts the central axle assembly. The guns travel carried by an electric motor driven transport chain or equivalent band. Although the term oval is often used this is a misnomer. The actual travel of the guns across the leather is in parallel straight lines producing a trace pattern similar to that of the reciprocator. Sixteen guns are normally carried with this system.

All three types of machine described above are normally housed in a closed cabin fitted with large glass doors. Product fumes are thus contained and are suction extracted by systems incorporated in the cabin. (*More about this below.*)

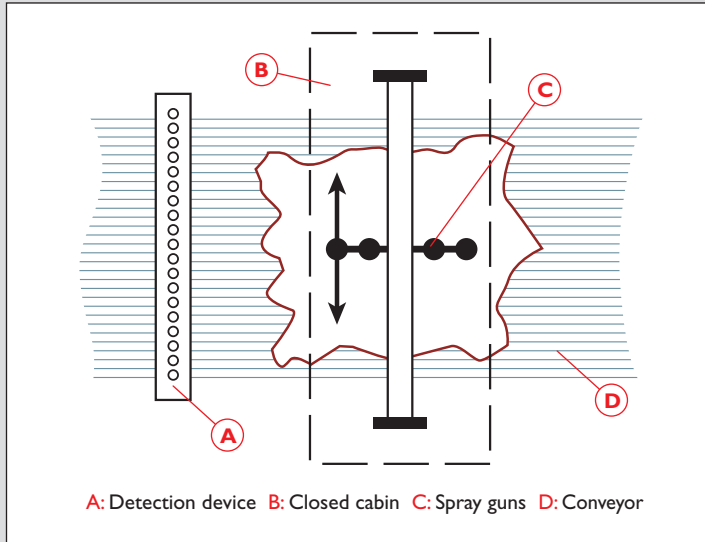
Electronic detectors sense the shape of the leather being introduced on the transport conveyor and signal this to the spray operating device. This device then activates the guns to spray when the leather is in position to receive the atomised product. (*More about this device below.*)

The four types of automatic spray guns employed are:

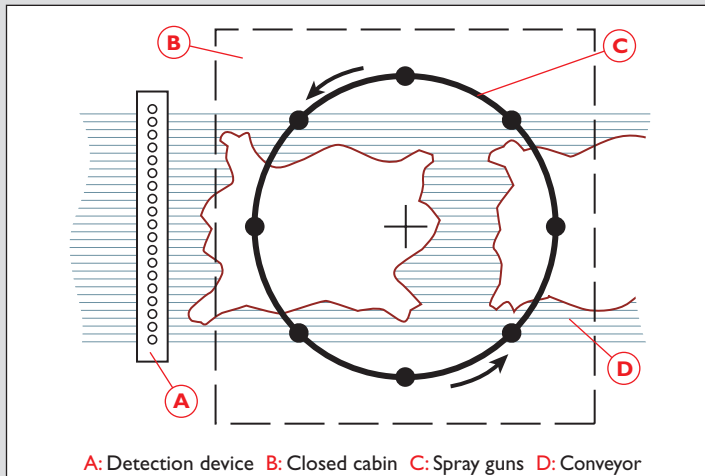
- The atomising gun where compressed air atomises the fluid product creating a spray fan which impinges upon the leather surface at high velocity. Suitable for delicate deposition of product but with the comparatively low transfer efficiency of 35% to 45% (transfer efficiency expresses the approximate amount of fluid product actually deposited compared with the quantity delivered by the gun).
- The airless gun where fluid alone is forced through the spray nozzle at high pressure forming the spray fan. Transfer efficiency is high.
- The air-mix gun, where a combination of low air pressure and high fluid pressure creates the spray fan. Transfer efficiency is between that



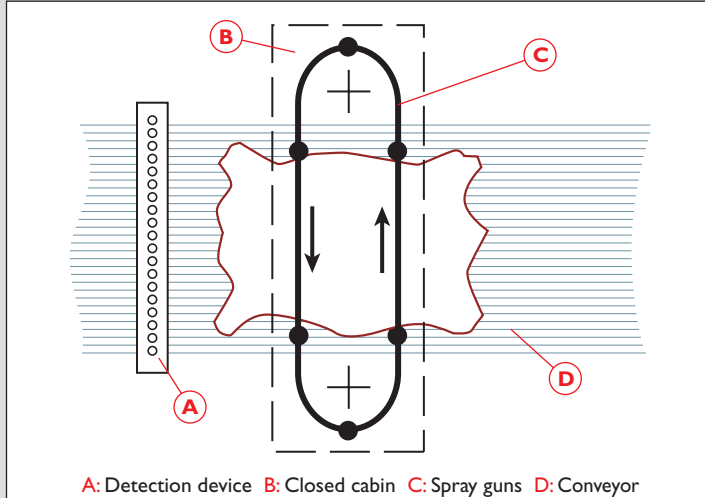
Panel E25 Part 3/1 Reciprocating path spraying machine



Panel E25 Part 3/2 Rotary path spraying machine



Panel E25 Part 3/3 Oval path spraying machine



of atomising and airless systems.

- The high volume/low pressure gun (HVLP). A relatively large volume of product is supplied to the gun. Low air and fluid pressure is used. The system has been developed to reduce product bounce back and spray fog. Emissions for this reason are lower. This type of gun is reported to produce product transfer efficiencies of the order of 50% to 70%.

The electronic spray operating device:

Electronic dedicated computer type controls, generally known as spray limiters or pigment economisers, have the primary function of receiving the outline of the leather feeding through on the machine conveyor. Based on this received data the device signals the spray guns to open when leather is present, and only when present, below the guns. This ensures that product is not wasted also limiting spray fog.

Other main programming and control functions of the device may include:

- Fine tuning of gun action (also taking into account spread of the spray fan).
- Programming of effect spraying and spotting.
- Selection of which guns are to spray.
- Activate gun washing mode and carrying out testing sequence.
- Setting and displaying gun translation and conveyor speed.
- Measurement of leather area sprayed.
- Count of number of pieces sprayed.
- Sophisticated devices are often able to save operational or programmed data and recall them at the touch of a key.
- Some of the latest devices are in fact industrial computers with internet access possible.

The fume extraction and scrubbing equipment:

The creation of overspray is effectively inevitable when atomising air guns are operated. The air generally within the spraying machine cabin then becomes laden with the overspray. This contains spray product much of which may accumulate on the inside walls and glass of the cabin as well as on the equipment in operation. To avoid this air is continually extracted from the cabin which would lead to noxious emissions into the environment if not treated. Plant mostly referred to as fume scrubbers, in most cases an integral part of a spraying machine installation, is employed to separate out product particles. Many types of spray cabin have a "wet floor" where water in circulation initially absorbs much of the particles. The extracted air is further scrubbed in so called water-wash towers. The result is emission of air with an acceptable degree of contamination. The water, now containing most of the polluting agents, is discharged to an existing effluent treatment plant. In place of the wet process some spray plants incorporate a dry filter which is replaced and dumped when loaded with product particles.