



Drying efficiently in the finishing department

As far as its external appearance goes, the drying tunnel of today is much the same as the drying tunnel of twenty or thirty years ago. And, although these are simple machines, they are by no means unsophisticated nowadays. The rising cost of energy as a proportion of total manufacturing costs has turned the spotlight onto an area which is one of the biggest energy consumers in the tannery, and machinery manufacturers are addressing inefficiencies which have probably been tolerated for far too long.

Drying is required after the wet spraying or rollercoating of pigments, oils, waxes and lacquers. In decades gone by, when solvent-based materials were the norm, drying was nearly always done with steam-heated units for the sake of safety. Solvent-based coatings dry easily at relatively low temperatures, but today's water-based materials require more heat input, and

cross-linked finishes often require a high temperature to cure effectively. The tendency now is toward bigger driers with greater energy consumption, and the existing inefficiencies have consequently been magnified. Water-based coatings, however, have allowed greater use of drying technologies which would have been too hazardous for use with solvents, and which offer more opportunity for efficient control.

So what is wrong with a steam-heated drying tunnel? The answer is... not a lot, as long as you have a ready supply of cheap steam or cheap energy to use it. In the past, the central boiler house would have been one of the first items on the plan of a new tannery, but nowadays most engineers seek to supply heat energy as directly as possible to the processes requiring it. Steam raising and distribution is notoriously inefficient—typically less than 25% overall thermal efficiency in a factory environment—with

most of the energy wasted being lost up the chimney, radiated from pipework and vessels, and dribbled away by steam and condensation leaks. Steam driers have the advantage of being simple and cheap, and still constitute a large proportion of the market, but they probably only maintain this position because so many new machines are replacements for older units in existing tanneries where the steam supply is already established. Steam-heated driers tend to be more sluggish to control than direct-fired units, and steam control valves are expensive. However, advances in efficiency have been made: modern units should be far better insulated than old designs, and heat recovery units are available to preheat the incoming ambient air from the moisture laden exhaust air.

An increasingly popular type of drier is the direct-fired unit. Instead of heating the circulating air in the drier with a pressurised steam battery, it is heated by a gas or oil-fired burner through a dry heat-exchanger, usually made of special stainless steel. The heat exchanger separates the combustion air of the burner from the circulating air in the drier, so that the products of combustion are not brought into contact with the leather surface. Direct-fired driers are usually more responsive than steam-heated units, heating up and cooling down more rapidly. Gas or oil burners are complex items, but modern PLC controlled units are relatively cheap, very reliable, and come with a high level of service and spare parts availability from their manufacturers, if a well-known make is specified.

One point to remember with direct-fired ➤



A multiple roller coater line with Poletto gas-fired driers



A conventional steam-heated drying tunnel (Tecnolettro)



DRYING EFFICIENTLY IN THE FINISHING DEPARTMENT



Low profile electric radiant drying tunnel from Carlessi

driers is that the burner will draw large volumes of air into the finishing area, which can be a problem when you are trying to keep the area as clean as possible.

More attention is now being paid to the filtration of the hot air circulating in the drier, to prevent airborne dust from being blown onto the finished surface. These internal filters are easily forgotten, and can radically affect the performance of the drier if allowed to become partially blocked—a regular schedule of removal and cleaning or replacement is essential.

Drying through the circulation of hot air means that the humidity in the drier always tends to rise, and the more humid the circulated air the less it dries. It is therefore necessary to continuously bleed-off a proportion of the circulated air and

replace it with fresh ambient air. This is always a balancing act; too much bleed-off means that energy is needlessly wasted, while too little means that the unit will not dry well, despite achieving a high temperature. On modern driers the level of bleed-off is sometimes controlled automatically by a humidity sensor, but these need regular cleaning and checking, and this function is often forgotten. The heat energy which is potentially lost in the humid air exhaust can be recovered by passing it through a plate heat exchanger to pre-heat the replacement ambient air. These heat-exchanger systems are increasingly cost-effective as energy prices rise inexorably, and are often worth retro-fitting to existing driers—the whole of the installation is mounted on the tunnel roof and requires no 'internal surgery'.



Gas-fired tunnel with burners mounted inside the casing and heat exchange system above (Gemata)



Another design of a gas-fired tunnel with burner mounted to one side (Carlessi)



A large modern steam drying tunnel from Gemata

Another approach to drying is through radiant heat, which removes the necessity for air circulation in the tunnel. Units using gas-fired catalytic heating panels have been available for many years—they are more compact than circulated-air units, and are generally capable of reaching higher surface temperatures. Whilst they are generally thermally efficient it is, however, quite difficult to measure and control the temperature of the leather surface as it is heated by infra-red radiation from

the panels. Another approach, which has seen considerable development by Carlessi, is electric radiant drying, with ribbon-like electrical elements set into ceramic panels. These are capable of very accurate temperature control. Early problems were experienced with element failures caused by the humid air and chemicals given off by the drying leather, but these have been overcome by changing the metallurgy of the elements. Some leather technicians would maintain that their leathers do not respond well to radiant drying, and that circulated-air driers have a more 'gentle' drying action, but the dust-free drying available with radiant drying offers particular advantages when surface quality is at a premium.

The most efficient and appropriate drying tunnel for any particular finishing shop is still a major energy consumer and the greatest, and most common, sin is to leave it running when it should be turned off!

How many times do we come across drying lines with conveyors running and fired up to full temperature, but with no sign of any leather being dried? We are told that it is "warming up", or "waiting for the next batch"—when in actual fact it is simply wasting money. A simple device sometimes fitted by energy-conscious engineers is a proximity switch and timer that will turn off the drier heat input if no leather has passed down the tunnel for five minutes; with today's energy prices, should this not be a standard fitting from all manufacturers? 🌐

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