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GUILD OF CLEANERS AND LAUNDERERS

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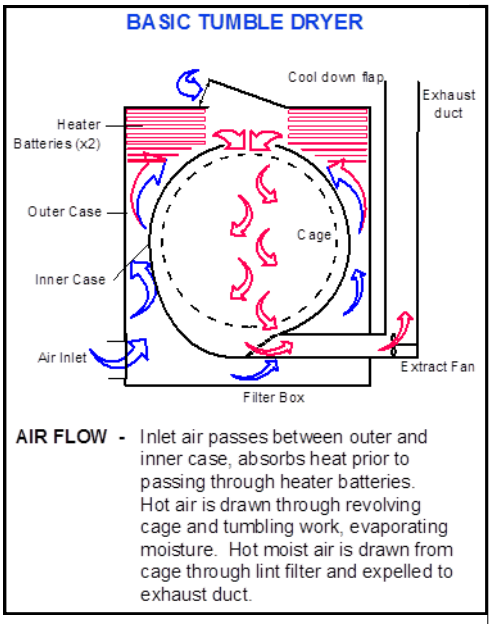
Tumble Dryers Performance and Safety



A conventional tumble dryer is designed to evaporate moisture from wet work using a stream of hot air. This Is generated either by drawing air over a steam-heated battery or by direct combustion of natural gas. There are two main types of control. The first is the temperature of the hot air stream which must be limited to prevent damage to the goods been dried. This is particularly important with direct gas fired units where much higher temperatures are possible than with steam heated designs. Secondly, the termination point of the drying cycle is determined for most types of dryer simply by programming a preset running time for the drying cycle. More modern dryers can be fitted with **Moisture Content Controllers** which are designed to prevent over drying and can have benefits in improved quality as well as money saving benefits.

In a **steam heated dr**yer (illustrated on the right), high pressure steam flows into a battery consisting of finned tubes where it condenses on the inside of the pipe walls. The condensate drains to the base of the battery and out into the condensate main via a steam trap.

The performance of a steam heated unit is governed by the steam pressure and the consistency of this; the higher the pressure the greater the steam temperature and hence the greater the heat transfer performance. The steam needs to be dry because any carryover of water droplets in the steam will form an insulating layer on the inside surfaces of the battery, reducing heat transfer and hence drying rate considerably.

The steam will also include a little air that would have originally been dissolved in the boiler water as well as some carbon dioxide, especially in areas where the water is alkaline. These non-condensables have to be vented continuously from the system and a well designed steam trap should do this.

In practice float traps and inverted bucket traps are preferred because they will vent air continuously and they will remove condensate at the same rate as it is formed, preventing any water logging of the base of the battery and reducing the risk of pin hole corrosion. This risk can be further reduced by positioning the steam trap about 45 cm below the battery rather than on a level with it.

Gas heated dryers -In direct gas fired dryers the products of a gas combustion are mixed with secondary air to create a uniform stream, the temperature of which can usually be precisely controlled, often at temperatures much higher than that achievable with a steam heated unit which is limited by the steam pressure available. The two big advantages of the gas-fired dryer are its much higher net thermal efficiency (because there is no flue loss or distribution loss associated with steam raised from a central. boiler). This means that the net gas consumption for drying will be approximately 25% less with a direct gas fired unit than in an operation in which the gas is first used to raise steam. A direct gas fired unit is also much quicker to warm up and can be used independently of the main boiler; this can be very convenient for example evening shift operation. The disadvantage of a direct gas firing is usually the slightly higher capital costs. Gas dryers, because they operate at higher temperature, are more prone to blockage with polythene from melted plastic bags. This can be a particular problem when processing healthcare work if these are not completely removed in sorting. In laundries where dry cleaning is also carried out, it is vital not to allow any trace of perchloroethylene vapour to enter the flame of a direct gas fired dryer because the combustion products will then include phosgene gas

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(which is poisonous) and hydrogen chloride (which dissolves in the moisture on the linen to produce hydrochloric acid and rapid rotting of the stock). This type of damage will also affect the galvanising on the drum of the dryer and all of the metal duct work with which the air stream comes into contact, particularly that downstream of the dryer itself. There are some electrically heated dryers but they are not as economic to run and have some of the problems associated with gas dryers.

Minimising harshness and yellowing -The quality of work from a tumble dryer varies appreciably because the dryer is often not operated with quality in mind. If the work has been correctly dewatered in the press or centrifuge/extractor then there will be the minimum amount of dissolved solids to cause harshness on the finished product. Similarly, the majority of the alkali from the rinse water will have been removed so the risk of alkali yellowing of the towels is also reduced to the minimum.

Dry Towel Quality - The secret for obtaining a soft towel is to use a medium drying temperature and not to over dry the towel. There is no point in over drying anyway because a cotton towel will recover 8% of its own weight with humidity from the atmosphere. In order to avoid over drying it is necessary to use one of the automatic dryness controllers available commercially.

Minimising greying - There is no risk to a terry towel in using a high air drying temperature early in the cycle but once the towel approaches dryness, problems will emerge if the terry loops become bone dry before the body of the towel itself has dried. Under these conditions the terry loop can char at very high temperatures but even at medium temperatures, a bone dry loop will tend to acquire a static charge. It then becomes attracted to every free particle in the drying air stream and the result is distinct greying. Processing coloured work mixed in with white work in the washer will make this problem even worse, much of the greying occurring in the tumble dryer itself rather than in the washing process.

SAFETY - Health and Safety at work requires the safe use of tumblers. Pay attention to:

a. Lagging of external steam pipe work. Insulation of all air trunking.

b. Door locks and devices that prevent opening of the door during operation.

c. Cool down methods.

d. Cleanliness. Particularly lint in the area surrounding the tumbler.
- Fire danger!

e. Spontaneous combustion - serious! Fire! Hot work left in dryer or trolleys. Compression. Particular care should be exercised with fabrics which have been soiled with oils, greases, or other combustible substances. (Flash point or ignition temperature of fabric will be reduced.)

Most fires are preventable. Those responsible for workplaces and other buildings can avoid them by taking responsibility for and adopting the right behaviours and procedures.

Fires need three things to start – a source of ignition (heat), a source of fuel (something that burns) and oxygen:

1. sources of ignition include heaters, lighting, naked flames, electrical equipment, smokers' materials (cigarettes, matches etc), and anything else that can get very hot or cause sparks
2. sources of fuel include lint fibres, wood, paper, plastic, rubber or foam, loose packaging materials, and waste rubbish.
3. sources of oxygen include the air around us
   Employers (and/or building owners or occupiers) must carry out a fire safety risk assessment and keep it up to date. This shares the same approach as health and safety risk assessments and can be carried out either as part of an overall risk assessment or as a separate exercise.

Based on the findings of the assessment, employers need to ensure that adequate and appropriate fire safety measures are in place to minimise the risk of injury or loss of life in the event of a fire.

To help prevent fire in the workplace, your risk assessment should identify what could cause a fire to start, ie sources of ignition (heat or sparks) and substances that burn, and the people who may be at risk.

Once you have identified the risks, you can take appropriate action to control them. Consider whether you can avoid them altogether or, if this is not possible, how you can reduce the risks and manage them. Also consider how you will protect people if there is a fire.

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Fire is probably the biggest risk to the launderer and can be caused by a variety of factors or situations. Prevention of fire in a laundry is therefore of major importance.

FIRE PREVENTION - The ignition of fluff which collects in premises where any laundry is carried out can result in the rapid spread of fire. Fluff should be prevented from accumulating, and, in addition to regular removal from the more accessible places, electric motors, heating coils and tumbler ducts, should be regularly cleaned.

The minute textile fibres comprising such fluff or lint will be particularly prone to spontaneous ignition when impregnated with oil, wax or other greasy residues. The areas under ironer beds and around the operating mechanisms of cabinet garment finishing machines are particular danger points. Deficient areas here would be ***Housekeeping*** and ***Maintenance***.

Spontaneous combustion, i.e. the condition where flaming occurs in the absence of an ignition source, is caused by the temperature of the textiles rising due to slow oxidisation of the textile fabric within the load.

The risk is increased with hot work taken straight from a tumbler dryer or ironer and tightly packed in or onto trolleys or trucks, and residues of oil, grease, wax, soap, rubber or similar materials on the fabric will further increase the danger. Also, from fabric softener, which is an oil, and evaporates in the tumble drying process and can contaminate an accumulation of lint in the tumble dryer vent ducting.

Particular care must be taken with loads containing kitchen cloths and oven cloths from which all the residues resulting from incomplete saponification/emulsification and removal of the greasy soiling may not be complete. This also occurs with workwear processing where oily/greasy residues can be liberated in tunnel finishers causing an oily/greasy film to condense onto adjacent surfaces providing, with lint and dust, a very good and widespread fuel source. Areas for attention include **training procedures and education of staff**

Cotton underpants with elasticated waist bands, particularly when degraded due to wear, are especially prone to spontaneous combustion if overheated.

Tumbler dried work has been a major cause of fires due to spontaneous combustion and special attention should be paid to operating procedures around the use of dryers.

a) Work should not be over-dried in the tumbler. The drying cycle time should be adequate either to condition the particular classification of work to the required residual moisture content, or, in the case of fully dried work, to dry the load and no more, i.e. to avoid overheating the work – apart from which excessive drying will not only increase costs but will reduce fabric life considerably. Deficient areas here would be mainly *Training* with *Housekeeping* (lack of adequate procedure or system).
Particular care should be taken to reduce the drying cycle time commensurate with the size of the load if part loads are dried. Many fires have occurred in tumblers, (and storage following tumbler drying), when timers have been set for normal sized loads whilst drying a few articles only. Look at your *Housekeeping systems*, + *Training*.

b) Textiles should not be left in tumblers after the drying process is finished, but should always be unloaded immediately. Again look at your *Training* and *Supervision procedures*.

c) Tumbler dried work should be separated and folded as soon as possible after removal from the tumbler. If this cannot be done, the work should be removed from the tumbler and spread out in such a way that the heat is lost quickly. Another point for *Training*.

d) Ideally, tumblers should be equipped with manual, or preferably automatic, means for cooling the load at the end of the drying cycle. Here Management, *Training* and *Maintenance* have a role to play.

f) Supervision and staff must be clearly informed of the correct operational procedures when processing and handling tumbler dried work, and reminded from time to time regarding the necessary precautions. Suitably worded notices attached to walls or stanchions in the tumbler drying and work storage areas are helpful. Again, *Housekeeping* and *Training*.

g) It is good practice not to tumble dry loads too close to the end of a working day because the dangers are increased by having dried work that will be left overnight unattended. If a tumble dryer is unloaded towards the end of the day then it should be spread around and not compacted and also make sure that it is cool before leaving the premises.

Continual vigilance is necessary to prevent fires occurring. Managers and Supervisors should constantly monitor the situation to ensure that staff adhere ***at all times*** to the laid down procedures. The continuation of the business is very much dependant on not having a fire and if there is no business there will not be any jobs either.

Pay special attention to *Maintenance*, *Training and Education*.