



# Wiped Film Evaporator



The cutting edge of experience



Universally acknowledged as a lead player in the Textile Dyeing Plants industry, Dalal Engineering Dyeing Plants are comparable to the best in the world. Apart from these plants, Dalal offers a wide range of allied machinery.

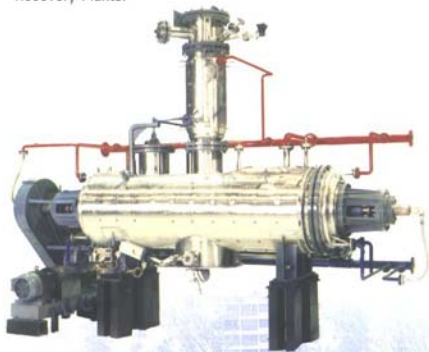
Dalal Engineering traces its roots back to more than several decades, when it forayed into manufacturing of stainless steel equipment.

Today, the scope of activities of Dalal Engineering has expanded to include operations that cover a diverse range of industrial applications. This has been made possible by its constant endeavour to upgrade technology. This endeavour is supported by a highly efficient Research and Development laboratory, with its team of trained technicians.

The oldest division of Dalal is the Chemicals Division. The products in the Chemical Division range from Rotary Vacuum Dryers to Wiped Film Evaporators and then to Solvent Recovery Plants.



Dalal is also recognised as a leader in the arena of Finishing and Polishing machines. These high-end machines range from Standard Machines with and without separation, Spirotech Machines with and without separation, Centrifugal Finishing Machines and Vibro Energy Dryers. Dalal also offers integrated solutions in finishing systems to a number of leading companies.



## Wiped Film Evaporator

Wiped Film Evaporator (WFE) is used for evaporation/concentration of heat sensitive liquids and slurries under vacuum conditions. It employs thin film technology which yields high heat transfer coefficients making the process highly effective. Due to a short residence time, higher jacket temperatures are possible without thermal degradation.

The Evaporator is used for concentration, distilling, stripping, dehydration and deodorisation of products which are heat sensitive or viscous. The equipment can handle a very wide range of feed compositions ranging from 1% to over 95% concentration.

WFE has several advantages as stated in the table below. The operation is continuous with a single pass, the self cleaning continuous contact wipers produce and renew the thin film. Such an operation improves product yield, avoids residue and colour formation. It has an internal condenser (optional) that minimises the pressure drop and maintains vacuum.

### Advantages

- Evaporation at low operating temperature
- Short residence time (few seconds)
- High heat transfer coefficients
- Low pressure drop on vapour side
- No degradation or loss of active ingredients
- Self cleaning/wiping of the heat transfer surface
- Suitable for viscous liquids
- Continuous operation
- Low maintenance



## Advantages over conventional evaporators

Parameter	Batch type Agitated Reactor	Shell & tube type evaporator (falling/rising film)	Wiped Film Evaporator
Residence time	Many hours	Few hours	Few seconds
Temperature	High temperature required	High temperature required	Much lower temperature can be used
Product quality	Product degrades due to long exposure to time and/or higher temperature	Degrades somewhat less than batch reactor	Degradation is avoided due to minimal exposure to time, lower temperature and single pass operation
Process pressure	100 mm Hg or higher	40 mm Hg or higher	0.001 Hg or higher
Efficiency	Low	Medium	High

## How it works

The operation process in the WFE is simple but effective.

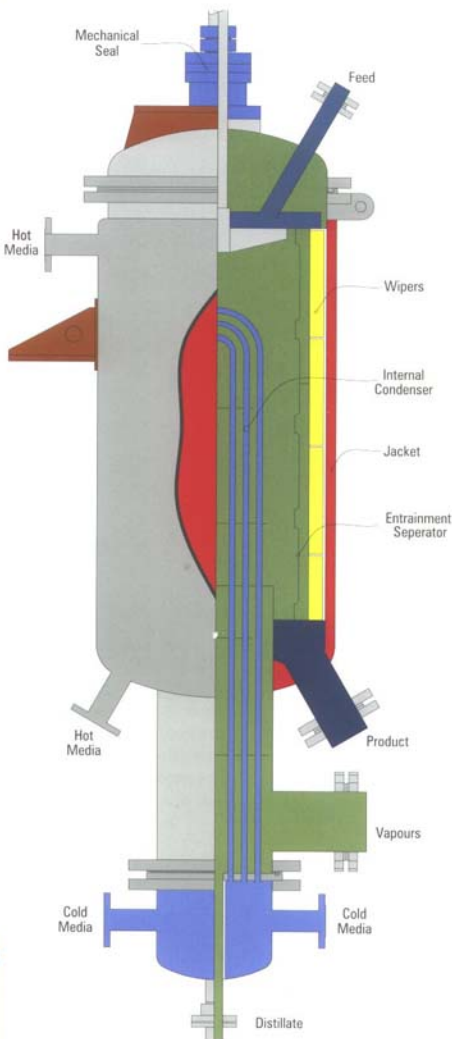
Feed is introduced at the top of the unit and spread on the shell inner surface by the rotating distribution plate. Specially designed wipers wipe the feed thus creating and renewing the film. This thin film enables an efficient heat transfer even for highly viscous fluids.

The low boiling component evaporates and passes through an entrainment separator. This minimises the carry over of liquid droplets along with the vapours. The vapours are removed through the vapour line to an external condenser (optional) and condensed. For specific applications which demand low pressure drop, the central section of the evaporator is provided with a condenser, thus making the unit a short path/molecular distillation unit. In this case, the vapours are allowed to condense on the outside of the tube bundle and flow out of the evaporator via the condensate outlet provided at the centre.

The high boiling component flows along the shell wall and is discharged from the product outlet.

Wiper action is important in promoting downward flow. The product/concentrate should be in fluid form at the operating temperature.

Different designs of rotors are available depending upon the product, its viscosity and the process pressure.

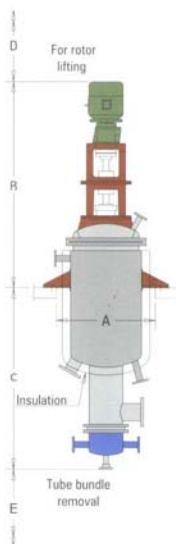


WFE is available in sizes ranging from 0.45 m<sup>2</sup> to 20 m<sup>2</sup> in stainless steel, carbon steel and in other materials such as hastelloy.

Approximate dimensions are given below.

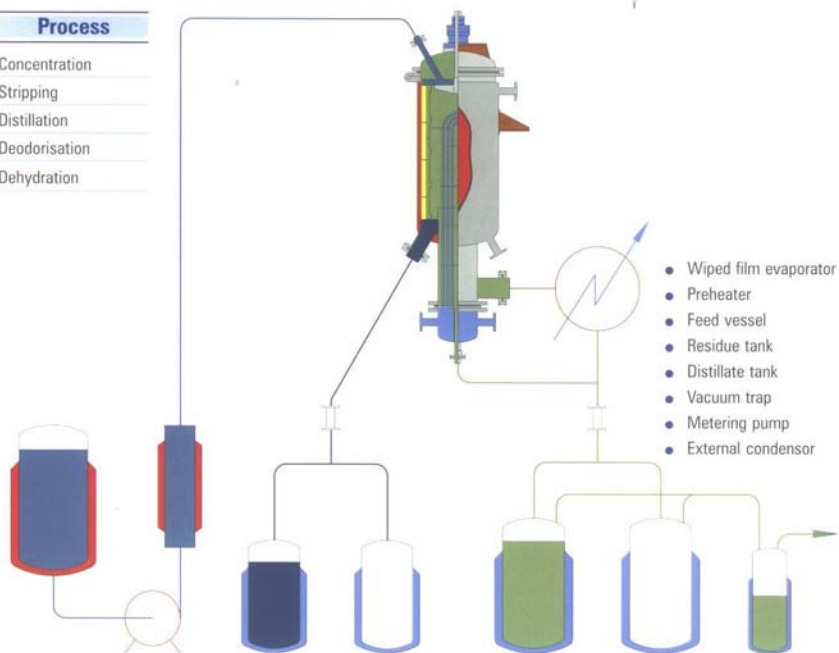
Evaporator area m <sup>2</sup>	0.45	1.0	2.0	3.0	5.0	7.5	12.0	20.0
A (Square Cutout)	660	1010	1010	1320	1320	1320	1650	1895
B	1190	1710	1760	1800	1865	2249	2604	3360
C	616	1295	1770	1460	2205	2877	3590	5155
D	480	900	1200	1130	1190	2600	3000	2050
E	600	1000	1900	1690	2100	3000	3625	4000

Other sizes available as per requirement. Internal condenser is optional.



### Process

Concentration  
Stripping  
Distillation  
Deodorisation  
Dehydration



## Falling Film Evaporator

A Falling Film Evaporator is used for concentration and evaporation of relatively low viscosity liquids. Steam, hot water or hot oil is used as the heating media and the process is carried out under atmospheric or vacuum condition.

The Evaporator is used for volume reduction where dilute products are concentrated to a medium concentration. The process is continuous. The liquid to be concentrated is fed from the top and a distributor ensures proper feed distribution in each of the tubes. The distributor also ensures that all tubes are wetted and that the liquid flows in a film. The liquid and vapour both travel vertically downward. Due to a relatively thin film, the heat transfer coefficient is better than that obtained in reactors and simple shell and tube evaporators.

If further concentration is required, the concentrated product can then be fed to the WFE.

### Advantages

High heat transfer coefficient

Minimal fouling

Versatile equipment (easy to control as response to change of parameter is quick)

Ideal for low  $\Delta T$  applications (low difference between hot medium and boiling temperature)



## Total Solutions

Dalal Engineering supplies complete systems consisting of one or more wiped film evaporators, falling film evaporators, auxiliary condensers, sub-coolers, receivers for residue and concentrate, vent condenser, vacuum system, interconnecting piping with instrumentation, valves, etc.

A prototype Wiped Film Evaporator system is available at its Thane factory where trials can be conducted to determine feasibility, and equipment with guaranteed performance can be offered.



## Industries and Applications

<b>Adhesives</b>	Solvent stripping of adhesive intermediates
<b>Bulk Drugs</b>	Concentration of fermentation extract Solvent stripping and concentration of bulk drug intermediates
<b>Fatty Acids</b>	Distillation Concentration of glycerine
<b>Fragrances &amp; Perfumery</b>	Solvent stripping
<b>Herbal &amp; Natural Extracts, etc.</b>	Concentration of refined extracts of products such as neem, texas bakata, aloe vera, tomato licopin Concentration of lime juice, protein hydrolysate
<b>Oleo Resins</b>	Concentration of pepper/chilli/marigold extract
<b>Organic Industry</b>	Recovery of acetic acid & other applications
<b>Para Formaldehyde</b>	Concentration
<b>Pesticides</b>	Solvent stripping of maletheon, abate, ethion, phorate, D. V. acid chloride, cypermethrin, monocrotofos, anilofos, dimethoate, devrinol, permethrin, etc.
<b>Polymers</b>	Solvent stripping in dilute condition
<b>Used Lube Oils</b>	Distillation to recover used lube oil

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