

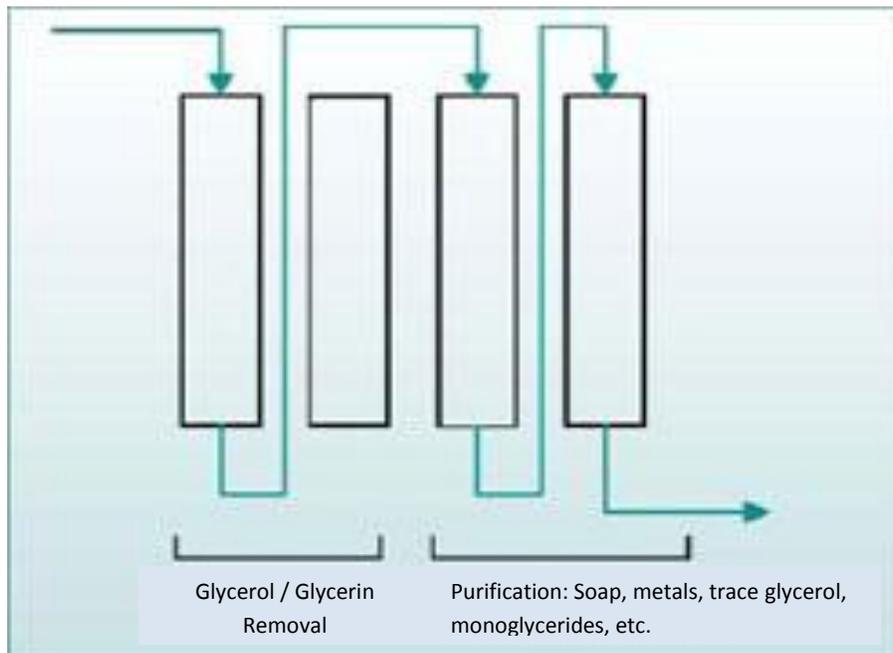


Biodiesel Industrial Usage Notes

T45 BD™ and T45 BD Macro™

INDUSTRIAL USAGE:

For a continuous process, it is recommended to install multiple (2,3 or 4) columns to eliminate down-time when replacing spent resin. It should be noted that introducing a second column will not impact your consumption of Tulsion™ T45 BD™ or T45 BD Macro™. The two columns are switched by valves to alternate between "lead" and "lag" treatment positions.



Extra glycerol removing capacity:

Even higher capacity for glycerol can be achieved by adding one or two extra columns of T45 BD™ or T45 BD Macro™ media dedicated exclusively to glycerol removal, as shown in the above figure. These additional glycerol removal columns are inserted just after the phase separation step. Note that the T45 BD™ T45 BD Macro™ media for these columns will not impact overall resin consumption. Why? Because when the glycerol removal columns are initially installed they will remove not only glycerol but also catalyst, soap, metals, mono and di-glycerides plus sterol glucosides. Therefore consumption of resin in the downstream purification columns will be saved.

When the media in a glycerol removal column is saturated with glycerol, the column can be regenerated by rinsing with methanol. For more information, visit www.thermaxindia.com website for more information on Biodiesel applications specifically the brochure on "Methanol Regeneration Procedure". Alternatively, clip and paste the following address to your search engine and scroll down the page for the Biodiesel icon (<http://thermaxindia.com/v2/ProductPage.asp?levelno=2&objectid=95&pageno=1&divid=3>).

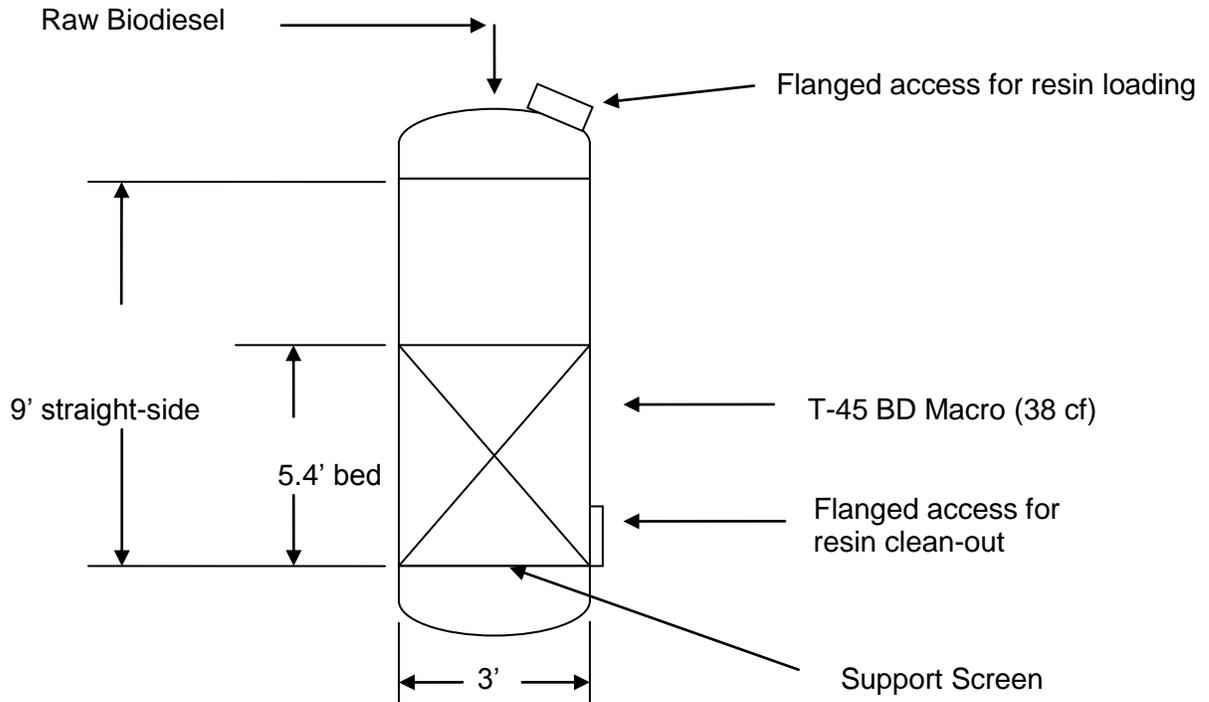
The methanol solution coming off the column can then be sent back to the trans-esterification unit where the methanol is recycled. The interest in having two columns dedicated to glycerol removal is that the plant can continue to operate while the first column is being regenerated. These columns can thus be regenerated several times to re-establish their glycerol removing capacity. However their capacity to remove soap and catalyst is finite and in steady state operation will only remove glycerol. Under industrial conditions, the T45 BD™ or T45 BD Macro™ media in the glycerol columns may be replaced by the spent resin in the downstream purification columns.

A Thermax Technical representative will work with you to select a column design best suited to your process. A column design sketch based on 10 MM gallons (37.8 MM liters) per year throughput is enclosed.

The column size will depend on the production rate you want to achieve in your plant. It should be noted that column size will not impact overall resin consumption or operating cost. Customers typically find it convenient to change the resin every 8 to 12 weeks. Thermax can assist in determining the appropriate column size to achieve this change-out interval. An example below for a 10-gallon per minute system (10 gpm or 37.8 liters per minute equates to 5 million gallons per year or 18.9 million liters per year).

System Summary

Design Criteria:	5 M gallons / year or 10 gpm flow 2.0 BV/hr service flow rate Bed L/D: 1.5 min.
Resin Loading:	1,145 lbs / vessel T45 BD Macro (38 cf or 1,080 litres) to fill 60% of vessel 1,600 lbs / vessel T45 BD (32 cf or 905 liters) to fill 50% of vessel
Column Dimensions:	3' diameter x 9' straight side 1 ½' high dome on top and bottom of vessel Carbon steel
Change out Frequency:	350 – 400 gallons / lb of media* 400,000 – 460,000 gallons B 100



* Operating capacity dependent on SOP and influent feed quality (FFA, glycerin level, soaps, metals, etc.)

CAUTION! Thermax T45 BD™ and T45 BD Macro™ resins are designed to be used in a water-free process. The gellular polymer beads (T45 BD) may swell 100% to 110% of their original volume as they absorb water. The beads will also swell over their life cycle as they remove impurities, including methanol and glycerol. It is therefore strongly recommended to leave sufficient void space in the columns.



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CHEMICAL DIVISION

An ISO-14000 Company

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