

TULSION®



BIODIESEL PRODUCTION: OPERATING NOTES

T-45 BD & T-45 BD Macro

Tulsion T-45 BD and T-45 BD Macro are specially formulated ion exchange resins engineered to maximize the removal of soap, glycerin, trace metals and mono-glycerides from raw biodiesel fuel. Both Tulsion resins were designed to be operated either in stand-alone fixed bed ion exchange columns or preferably in a series flow lead-lag configuration, which allows for complete utilization of the resins capacity.

While literature on competitive products state consumption rates of 1 lb (or kg) of media will treat 900 – 1600 lbs (kg) of biodiesel, the operating data below provides an example of how Thermax's resins can be expected to perform. That is, production experience with Thermax's gel resin Tulsion T-45 BD has demonstrated that operating costs could be reduced by 20-25% versus efficiencies stated in competitive literature for gel resins. The operational advantages for the Thermax's T-45 BD Macro exceed that of the gel resin and these data too are summarized below.

Therefore, the frequency of "rebedding" or replacement of the spent resin will be lower with T-45 BD Macro but it will still be dependent on the level of impurities in the raw biodiesel, the volume of biodiesel to be treated and the size of the columns. The data below were generated on series flow, lead-lad systems operating at a flow rate of less than 10 bed volumes (BV's) per hour and at temperatures between 40°C and 60°C.

T-45 BD

T-45 BD:	4 months continuous operation
Feedstock:	RBD (Refined, bleached, degummed) soybean oil
Quantity T-45 BD installed:	2,200 lbs (1,000 kg or 1 MT)
Mode of Operation:	1 month primary or lead column 3 months secondary or lag column
Resin Life:	4 months
Biodiesel Processed (gallons):	100,000 gallons in lead 600,000 gallons in lag
Biodiesel Processed (Metric Tonnes):	2,450 MT total
Gallons / 1 lb. of T-45 BD:	~ 320 gallons / lb. T-45 BD
Lbs. (kg) of T45 BD / MT B100:	0.9 lbs (0.4 kg) / MT B100
<i>Competitive Literature:</i>	<i>3.1 lbs (1.4 kg) / MT</i>
Cost to operate T-45 BD @ \$7.30/lb:	2.3 cents / gallon
<i>Competitive Literature:</i>	<i>3.5 cents / gallon</i>

Note: 1 gallon B100 = 7.7 lbs.

T-45 BD Macro

T-45 BD Macro:	3 months continuous operation
Feedstock:	RBD + CD (Crude degummed) 50:50
Quantity T-45 BD Macro installed:	1,500 lbs. (680 kg)
Mode of Operation:	Operated in primary or lead column
Resin life:	3+ months
Biodiesel Processed (gallons):	750,000 gallons
Biodiesel Processed (Metric Tonnes):	2,625 MT
Gallons / 1 lb. of T-45 BD Macro:	~500 gallons / lb. T-45 BD MP
Lbs. (kg) of T45 BD Macro / MT BD 100:	0.6 lbs (0.3 kg) / MT BD 100
<i>Competitive Literature:</i>	<i>3.1 lbs (1.4 kg) / MT</i>
Cost to operate T-45 BD Macro @ \$8.50/lb:	1.7 cents / gallon
<i>Competition:</i>	<i>3.5 cents / gallon</i>



THERMAX INC.
40440 Grand River Avenue, Novi,
Michigan 48375, USA
Tel# 248-474-3050, Fax# 248-474-5790

CHEMICAL DIVISION

An ISO-14000 Company

TI/T-45 BD & T45 BD Macro Operating Notes/01/20/09

The data included herein are based on test information obtained by Thermax Limited. These data are believed to be reliable but do not imply any warranty or performance guarantee. We recommend that the user determine performance by testing on their processing equipment. We assume no liability or responsibility for patent infringement resulting from the use of this product. For handling, Safety and Storage requirements please refer to the individual Material Safety Data Sheets available at our offices.