

### What is PUROLITE<sup>®</sup> PD 206?

PUROLITE<sup>®</sup> PD 206 is a dry combined desiccant and ion exchange media specially formulated to enable maximum removal of residual glycerin and trace methanol and water, as well as salts, catalyst, and soaps from crude biodiesel. **PUROLITE<sup>®</sup> PD 206** is designed for use in "purification" vessels installed after phase separation and de-methylation. **PUROLITE<sup>®</sup> PD 206** improves productivity and lowers operation costs while enabling ASTM or EN specifications for B100 to be achieved.

### What are the benefits of using PUROLITE<sup>®</sup> PD 206?

**PUROLITE<sup>®</sup> PD 206** has high adsorption capacity and is a cost effective method of purifying crude biodiesel. This product allows efficient attainment of ASTM or EN specifications. **PUROLITE<sup>®</sup> PD 206** removes ionic and hydrophilic compounds in B100. It is a simple, low energy process to reduce or eliminate water wash steps and other inorganic processes. Higher biodiesel production can be obtained by reducing processing time compared to alternate purification methods. **PUROLITE<sup>®</sup> PD 206** is very efficient so it is strongly recommended that mechanical methods of separating be optimized before final polishing to insure maximum economic benefit from **PUROLITE<sup>®</sup> PD 206**.

### How much PUROLITE<sup>®</sup> PD 206 do I need?

Approximately 1500-2000 lbs of crude biodiesel (200-275 gal) with less than 0.05% (500 ppm) combined level of glycerin, water and methanol can be processed by one pound of **PUROLITE<sup>®</sup> PD 206**. If a system produces one million gallons of B100 annually with an average of 500 ppm of hydrophilic compounds (glycerin, water or methanol) approximately 5000 pounds of **PUROLITE<sup>®</sup> PD 206** will be required at a cost of \$0.03 per gallon of B100.

If the level of hydrophilic compounds averages 1000 ppm approximately 10,000 pounds of **PUROLITE<sup>®</sup> PD 206** will be required at a cost of \$0.06 per gallon of B100. This estimation will vary as levels of water, methanol and glycerin will change the loading and the operating economics. Each location should carefully consider economics for their system.

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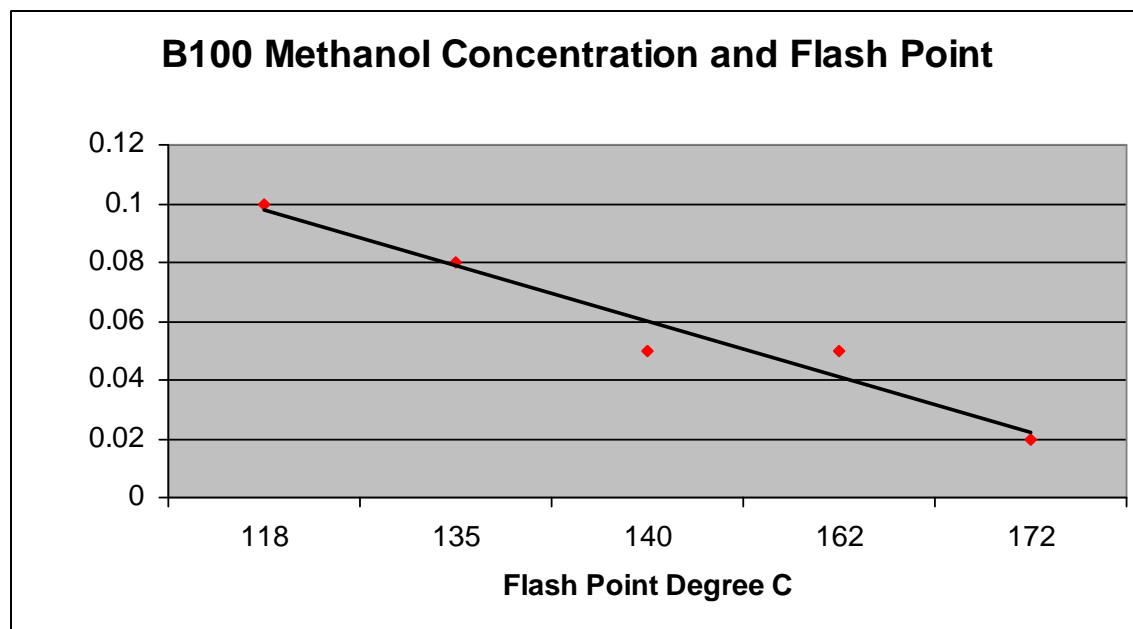
**PUROLITE® PD 206** has a finite capacity for removal of impurities. Hence careful monitoring of the crude biodiesel is needed to prevent premature exhaustion and achieve optimum economic performance.

#### How is PUROLITE® PD 206 used?

Two to three purification vessels (“lead”, “lag” and/or “standby”) containing **PUROLITE® PD 206** are normally installed in series. The lead vessel does the bulk of the polishing and the second or lag vessel does trace polishing. The standby vessel is used in case of emergency or when the lead bed exhausts. Raw biodiesel flows through the lead and lag vessels to maximize media loading and economics. When effluent of the second (“lag”) vessel contains increased glycerin levels this vessel is moved into the lead position, if available the standby vessel is placed in the lag position and the original lead bed is now in stand by. Media in this vessel is replaced and either placed in standby or in the lag position if only two vessels are used.

#### How does % methanol in B100 affect flash point?

Flash point is directly related to methanol levels. Methanol must be lowered to below .08% by weight to achieve the current ASTM standard of 130 °C flash points. This is best achieved by vacuum de-methylation. **PUROLITE® PD 206** will remove trace levels of methanol however glycerin and water will continue to be adsorbed and will displace methanol once the media adsorption is at capacity resulting in a depression of flash point.



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## What impacts performance of PUROLITE® PD 206

Higher level of glycerin, methanol and or water will exhaust adsorption capacity of **PUROLITE® PD 206** rapidly. Therefore it is important to ensure only residual levels of hydrophilic compounds are in the crude B100. Maintaining the efficiency of mechanical separation equipment and the completion of reaction is critical.

## How do I know when PUROLITE® PD 206 is exhausted?

**PUROLITE® PD 206** will adsorb methanol, water and glycerin until the adsorption capacity is reached. At this point methanol will be displaced first by water and glycerin then water will be displaced by glycerin. If methanol and water are properly removed, the "lead" bed should exhaust when glycerin begins to break through the "lag" bed or when turbidity increases in the effluent.

There are some simple field tests that may assist in determining breakthrough if water and methanol are limiting factors;

- **Effluent clarity** - which is a simple visual inspection through a glass container? If you can read news print through 4 inches of B100 clarity is good.
- **Water wash conductivity** – is simply taking 20 ml of B100 and 80 ml of deionized water. Shaking vigorously in a closed container or separatory funnel then allowing the water to separate before measuring conductivity. Catalyst and glycerin will contribute to an elevated conductivity.
- **"Frying pan" test** – simply requires putting treated B100 in a metal pan and heating on a hot plate. If there are bubbling or spattering as the B100 reaches 80C or 100C there is either methanol or water present.
- **Cloud point** – requires cooling B100 in an ice salt mixture until it turns cloudy then measuring the temperature as the solution warms. When the solution clears this is cloud point. A higher cloud point temperature indicates presences of glycerin.

## Can PUROLITE® PD 206 be regenerated?

Glycerin can be displaced from **PUROLITE® PD 206** with an excess of methanol or water. It has been demonstrated that methanol can then be subsequently stripped. Water removal will be much more difficult. If media loses ionic capacity converting to an original state at this time does not appear economical or safe.

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### What design Parameters for polishing vessels need to be considered?

Size and configuration of the vessels is dependant on individual plant operating conditions. Typically the vessels are sized for a flow of 3 bed volumes (BV) per hour (7 gpm B100 / 1000 lb **PUROLITE® PD 206**). Operation for 4-6 weeks before replacement of media is common.

**PUROLITE® PD 206** will perform at ambient temperature, saving on energy costs. The maximum operating temperature should not exceed 300°F or 150°C. (Deterioration of the resin increases with increasing temperatures)

Vessels should be designed with a man-way at the top and base of the vessel to facilitate loading and unloading of **PUROLITE® PD 206**. Providing a man-way located above the support bed or screen is recommended to facilitate inspection of the vessel and repair of internal piping and distributors/nozzles when necessary.

Sufficient purification vessel freeboard is recommended to allow for 150% increase in **PUROLITE® PD 206** volume due to swelling and minimize impact on upper distributor arrangement.

### What screen size is needed to retain PUROLITE® PD 206?

A support screen size no greater than 150 micron is recommended.

### How do I remove and recharge PUROLITE® PD 206?

An access port at the top and at the base of the vessels allows for easy installation and removal of **PUROLITE® PD 206** as this media has excellent flow characteristics both dry and when exhausted. New resin should be charged through the top port of the vessel. Media is transferred dry. Load **PUROLITE® PD 206** to occupy 40-45% of the vessel capacity. This will allow for swelling of the media as it adsorbs hydrophilic compounds. Purge all air from the media by back filling with biodiesel before putting media into service. This insures proper flow characteristics through the bed.

Spent **PUROLITE® PD 206** should be removed through the bottom port into a trash container or pumped with a diaphragm pump to a waste disposal container.

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## How do I dispose PUROLITE® PD 206?

**PUROLITE® PD 206** can be disposed of as a non-hazardous material, as long as methanol is removed. Consult with your local waste disposal supplier for specific requirements.

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