BETTER UNDERSTAND BBL TECHNOLOGY

1. Vegetable oil and alcohol don't mix?

Vegetable oil and alcohol **do not mix** homogeneously because they **have different polarities** — that is, their molecules have different chemical natures:

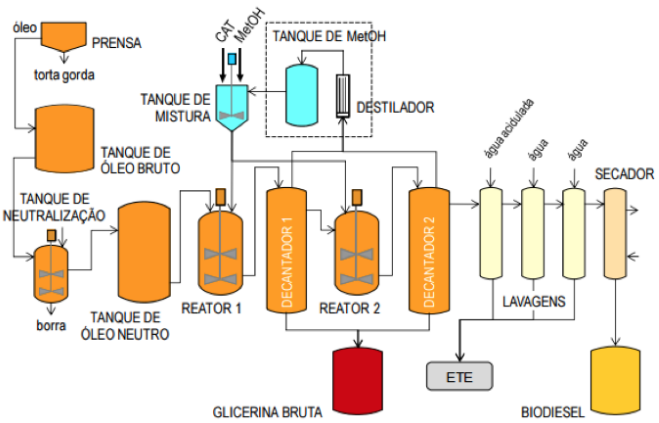
- **Vegetable oil** (triglyceride) is **nonpolar**: formed mainly by long chains of hydrocarbons (C–H) that do not interact well with polar molecules.
- **Alcohol** (ethanol or methanol) is **polar** as it contains hydroxyl groups (–OH) capable of forming hydrogen bonds.

In chemistry, there is a classic rule: **"Like dissolves like."**

This means that polar substances mix well with polar (e.g., water + alcohol), and nonpolar substances mix well with nonpolar substances (e.g., oil + gasoline). But a polar and a nonpolar — like alcohol and oil — **have no molecular affinity**: alcohol tends to form hydrogen bonds with itself, and oil remains aggregated by Van der Waals forces. Thus, when trying to mix the 2 components, **phase separation** occurs (two distinct layers).

2. Applied point of view (as in BBL technology):

To overcome this incompatibility, the **transesterification process (traditional biodiesel)** transforms triglycerides (vegetable oil) into **methyl or ethyl esters of fatty acids** — biodiesel —, molecules that have **a polar and nonpolar part**, becoming **amphiphilic** (similar to soaps). These new compounds mix well with both alcohol and mineral diesel, ensuring stability and performance.



In short: "*Vegetable oil is nonpolar, alcohol is polar; Like water and oil, their molecules have no affinity and therefore do not mix — transesterification is the process that corrects this difference in polarity."*

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3. Scientific turning point" of BBL technology.

Speaking in purely chemical terms, without revealing any secrets behind the BBL patent, what BBL does is **to correct the polarity incompatibility** between vegetable oil (nonpolar) and alcohol (polar) **through a physicochemical means of compatibility**, and not by chemical reaction of transesterification.

In other words, the secret is not in "transforming" the molecules (as in traditional biodiesel), but in **making them coexist in a stable way**. Here's the technical explanation:

4. The origin of the problem

As we have seen, vegetable oil and alcohol do not mix simply because:

- the oil is **hydrophobic** (nonpolar);
- Alcohol is **hydrophilic** (polar). In direct mixing, the alcohol tends to separate and form two phases.

5. The BBL Solution Principle

The differential of the BBL patent consists in **modifying the molecular environment**, by:

- **adjustment of physicochemical parameters** (pressure, temperature, sequence and agitation energy, controlled micro-emulsification with patented additive, which act as a stable "bonding bridge" between alcohol and oil);

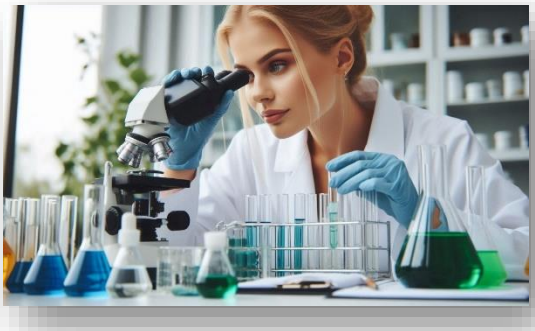
*These mechanisms generate a **stable emulsion**, where alcohol and oil disperse permanently and homogeneously, without generating by-products, forming a **balanced biofuel,** even at low temperatures**. A "drop-in" biofuel**, directly compatible with diesel engines **without requiring modifications or prior chemical reactions**. It can be **drop-in** with Jet Fuel, generating a **low-emission aviation fuel**, as already validated for testing by **Enac Italia**, in the "A **Roadmap for Sustainable Aviation Fuel in Italy" program.***

6. Final result

The final product — **BBL Green Diesel (BBL DX)** and **SAF**

- maintains **calorific value** and **viscosity** similar to fossil diesel;
- **reduces emissions** (CO, NOx, particulates and SOx);
- **it does not produce soaps or glycerin**, because there is no transesterification reaction;
- it is **thermally and chemically stable**, and can be stored and blended with mineral diesel in any proportion (tests on diesel vehicles, reached up to 50% of BBL DX in mixture with diesel of mineral origin).

7. In short, BBL's chemical "secret"



BBL has developed a **molecular compatibility technology**, which creates a **physicochemical bridge between polar and nonpolar compounds**, stabilizing a natural mixture of vegetable oil and alcohol without the need for chemical reagents or catalysts.

The technology represents a true **paradigm shift** in the field of biofuels. While traditional biodiesel relies on complex chemical reactions—such as transesterification—to make naturally incompatible molecules compatible, BBL introduces an **entirely new concept of physicochemical compatibility**, which allows **for stable coexistence between vegetable oil and alcohol**, without generating by-products or altering the original molecular structure.

It is a **disruptive** innovation, which eliminates costly and polluting industrial steps, replacing them with a clean, direct and energy-efficient process. The result is a **homogeneous, stable, drop-in biofuel** that can be used in diesel engines and jet turbines without the need for mechanical adaptations.

More than an evolution, BBL is a **scientific and environmental revolution**: it simplifies the production process, drastically reduces emissions and paves the way for a new generation of sustainable fuels — affordable, high-performance and capable of **reconciling man with the planet**.

*With **BBL**, the boundary between the chemical impossible and the technological possible finally dissolves—ushering in a new era in green energy.*

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