Optimización de la combustión = Ecología y Ahorro

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RB-23 ACTION OF **“rb bertomeu” beco DC** ADDITIVE ON THE CONDENSATION WATER IN TANKS & VESSELS AND ON THE WATER OF DIESEL OIL

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ACTION OF THE "rb bertomeu" beco DC ADDITIVE ON CONDENSATION WATER IN TANKS CONTAINING DIESEL OIL AND ON THE WATER CONTAINED IN THE DIESEL OIL

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One of the effects of the additive for diesel oil in Cogeneration, Marine applications and Machinery **"rb bertomeu" beco DC** is that of aiding the decantation water contained in the diesel oil, in addition to the obvious improvements to combustion and reduction in corrosion to the engine.

Diesel oil contains small amounts of water at the moment it is taken from any supplier. The water content may vary from one batch to another, but the usual specified maximum is 1,000 ppm, although the actual content is usually lower than this maximum value.

Once it has been stored in tanks or storage deposits, the water content of the diesel oil may increase with condensation of water vapour from the air inside the tank. This air, which is always present in tanks y storage deposits, contains a certain amount of water vapour, depending on the temperature and the relative atmospheric humidity. As the atmospheric temperature varies throughout the day (a higher temperature during the day, lower during the night), the air contained in the tanks and storage deposits becomes saturated with humidity and thus the condensation of LIQUID WATER takes place, and this is absorbed into the diesel oil. The consequence is that after several successive occurrences of condensation, the initial water content of the diesel oil increases steadily, and it becomes ever more necessary to employ a chemical agent to help decant the water. This study includes calculations based on practical assumptions relating to the amounts of water condensation that may be expected in smaller storage deposits or fuel tanks.

The total amount of water contained in the diesel oil (that caused by condensation) must be perfectly decanted and removed to avoid its pernicious effects on the injectors of the engines: the seizing up produced by the minute water droplets taken up with the diesel oil if the water has not previously been separated.

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A seized-up injector, as well as needing to be replaced, causes a drastic reduction in its capacity to atomise the diesel oil while it is in place. This in turn causes poor combustion of the diesel oil, with the consequent loss of potential energy and the appearance of polluting black smoke in the engine's exhaust gases.

As mentioned, the additive **"rb bertomeu" beco DC**, aids the process of decantation of the water to the bottom of the fuel tank or storage deposit. Once at this stage, there are various methods for its removal:

1- In <u>storage tanks</u>, the water decanted at the bottom must be eliminated by bleeding (by gravity or pumping with a submergible pump) until the level is below that of the extraction pump which supplies the vehicle. If this operation is not performed, the water (in greater or lesser amounts) will pass into the next part of the application (cogeneration plant, machine, etc.), causing a greater operating load on filters and removal systems.

2- In the <u>supply circuits of diesel oil to engines</u>, whether cogeneration plants, marine applications, or heavy machinery. In all these, the system of filtration of the diesel oil incorporates separation of the water by centrifuge, by which the water separated is accumulated, to then be eliminated automatically when a certain level is reached, or to be eliminated by manual bleeding when the control panel indicates the maximum level. It is important that the water phase is well separated from the diesel oil phase to optimise the potential of the centrifugal separator. **This separation of water from diesel oil is complete when the diesel oil is treated with the additive "rb bertomeu" beco DC.**

The following tables and examples show the magnitude of the problem of water condensation in storage deposits and fuel tanks:

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TABLE 1: Water Content in 1 m^3 of air, with a Relative Humidity of 70% and with Relative Humidity of 100%, expressed in ml. of water in liquid form.

Temperature ºC	with 70% R.H.	with 100% R.H.
0	3,6	5,1
5	4,2	6,0
10	5,8	8,3
15	8,4	12,0
20	11,7	16,7
25	15,7	22,4
30	20,1	28,7

TABLE 2: Condensed Water in 1 m^3 of air, with Relative Humidity (RH) of 70 %, as the temperature falls. Expressed in ml of water in liquid form.

	Initial air temperature						
Final Air Temp.	30º	25º	20º	15º	10º	5º	0º
30º	---	---	---	---	---	---	---
25º	---	---	---	---	---	---	---
20º	3,4	---	---	---	---	---	---
15º	8,1	3,7	---	---	---	---	---
10º	11,8	7,4	3,4	0,1	---	---	---
5º	14,1	9,7	5,7	2,4	---	---	---
0º	15,0	10,6	6,6	3,3	0,7	---	---

TABLE 3 : Condensed water in 1 m^3 of air, with Relative Humidity (RH) of 100 %, as the temperature falls. Expressed in ml of water in liquid form.

	Initial air temperature						
Final Air Temperature	30º	25º	20º	15º	10º	5º	0º
30º	---	---	---	---	---	---	---
25º	6,3	---	---	---	---	---	---
20º	12,0	5,7	---	---	---	---	---
15º	16,7	10,4	4,7	---	---	---	---
10º	20,4	14,1	8,4	3,7	---	---	---
5º	22,7	16,4	10,7	6,0	2,3	---	---
0º	23,6	17,3	11,6	6,9	3,2	0,9	---

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PRACTICAL EXAMPLE Nº 1 :

Let us imagine a diesel oil storage tank of m3 containing 6,000 litres of fuel (filled to 20 % of capacity). The remainder of the tank, 24 m3, is full of air. Let us also suppose that the relative humidity of this air is to be found in the range of 70 % and 100 %, and that the temperature variation between day and night are of 25º C and 5º C respectively. Let us calculate the quantity of water that can condense before the next filling with fuel.:

A) If the relative humidity is 70 % :
Table 2 when it passes from 25º to 5º C = 9.7 ml of water/m3 of air.
9.7 x 24 m3 of air = 232.8 ml = 0.23 litres of water

B) If the relative humidity is 100 % :
Table 3 when it passes from 25º to 5º C = 16.4 ml of water/m3 of air.
16.4 x 24 m3 of air = 393.6 ml = 0.39 litres of water

Therefore, the condensed water will vary between 0.23 and 0.39 litres according to the relative humidity of the air of the atmosphere, which would represent 38 – 66 ppm of water relative to the 6,000 litres of diesel oil given.

When the tank is refilled with diesel oil, the saturated air will be expelled through the outlet valve, and it will become filled with new air as the fuel is consumed, beginning a new cycle of condensation. After 10 cycles of emptying and refilling, the tank will have accumulated between 2.3 and 3.9 litres of condensation water, in addition to the water present in the diesel oil supplied.

This condensation water, along with that of the diesel oil, must be quickly decanted and eliminated by bleeding by gravity or pumping, to avoid its being extracted by the pump along with the fuel.

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PRACTICAL EXAMPLE Nº 2 :

Let us imagine a diesel oil fuel tank of a machine with a capacity of 600 litres, which only contains 100 litres of fuel.

The air content is: 600 - 100 = 500 litres = 0.5 m3

Considering the same assumptions for temperature and relative humidity as in the previous example, the quantity of water that would condense before filling with fuel is as follows:

A) If the relative humidity is 70 % :
Table 2 when it passes from 25º to 5º C = 9.7 ml of water/m3 of air.
9.7 x 0.5 m3 of air = 4.85 ml of water

B) If the relative humidity is 100 % :
Table 2 when it passes from 25º to 5º C = 16.4 ml of water/m3 of air
16.4 x 0.5 m3 of air = 8.2 ml of water

As in the previous example, this quantity of water will gradually increase in volume after several cycles of emptying and refilling, provided that the necessary temperature changes take place.

The water from condensation would be equivalent to 48 – 82 ppm, with respect to the 100 litres of diesel oil being considered.

All the decanted water (from condensation and the water originally in the diesel oil) must be eliminated by bleeding via the decanting filter incorporated in the majority of heavy plant vehicles.

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