



WiFNE

Water in Fuel Nano Emulsion

CASE HISTORY

Some experiences made by the AVKEM staff.

For the emulsions, additives formulated and produced by ITI srl and since 2014 by AVKEM srl have always been used.

Q8 QUASAR NAPOLI

STABLE EMULSION - Water - diesel nano emulsion plant for refueling large customers. In operation from 2002 to 2008, flow rate 2,400 l / h - 24 hours, production required 6,000 Klt / year.

TERMINAL IGNAZIO MESSINA GENOVA

STABLE EMULSION - Diesel nano emulsion plant for refueling the terminal's operating fleet, stackers, trucks and cars. In operation since 2007 and for a duration of 8 years, flow rate 1,450 l / h - 24 hours, production required 1,500 Klt / year.

SAVINGS - Economic 150 K € / year. Emissions - concerning the monitoring carried out on two of the oldest vehicles by ARPAL (Environmental Agency) and ASL: NOx - 23%, PM - 28%, PM10 - 42%, Fumes -82%

In the monitoring of the entire port area carried out by ARPAL, in the Messina terminal it found an overall reduction of 30% in atmospheric emissions.

First generation plant, placed in container



MESSINA LINE - Ship Jolly Indaco

ON DEMAND EMULSION - TEST performed on one of the 4 on-board generators of 500 Kw each. Fuel on board and used for emulsions, ISO F DMA marine diesel. The tests were carried out with water percentages from 13% to 22%, and 1% of additive. The test was monitored by the Ismar Chimica spa laboratory in Genoa.

RESULTS: reduction in consumption, Fuel - 12.3%; Emissions - NOx -26.7, PM10 -52.4, PM -43%, Smoke -80%



PORT COMPANY of LIVORNO

STABLE EMULSION - 8 hours TEST carried out on an operating vehicle; Stacker with 1200 Kw Perkins engine and 80 ton lifting capacity.

RESULTS: Emissions: NOx - 34%, PM - 28%, PM10 - 44%, Fumes -60%

ANSALDO ENERGIA

ON DEMAND EMULSION - TEST

The test was aimed at defining both the savings achievable in terms of fuel and the reduction of pollutants in the emissions produced by a 180 MW turbogas powered by Fuel OIL, in relation to the amount of water introduced into the nano emulsion.

Duration test 1 week, where daily series of tests were repeated varying the percentage of water (18% - 24% - 32.2%). During the night the turbine was powered by METHANE GAS.

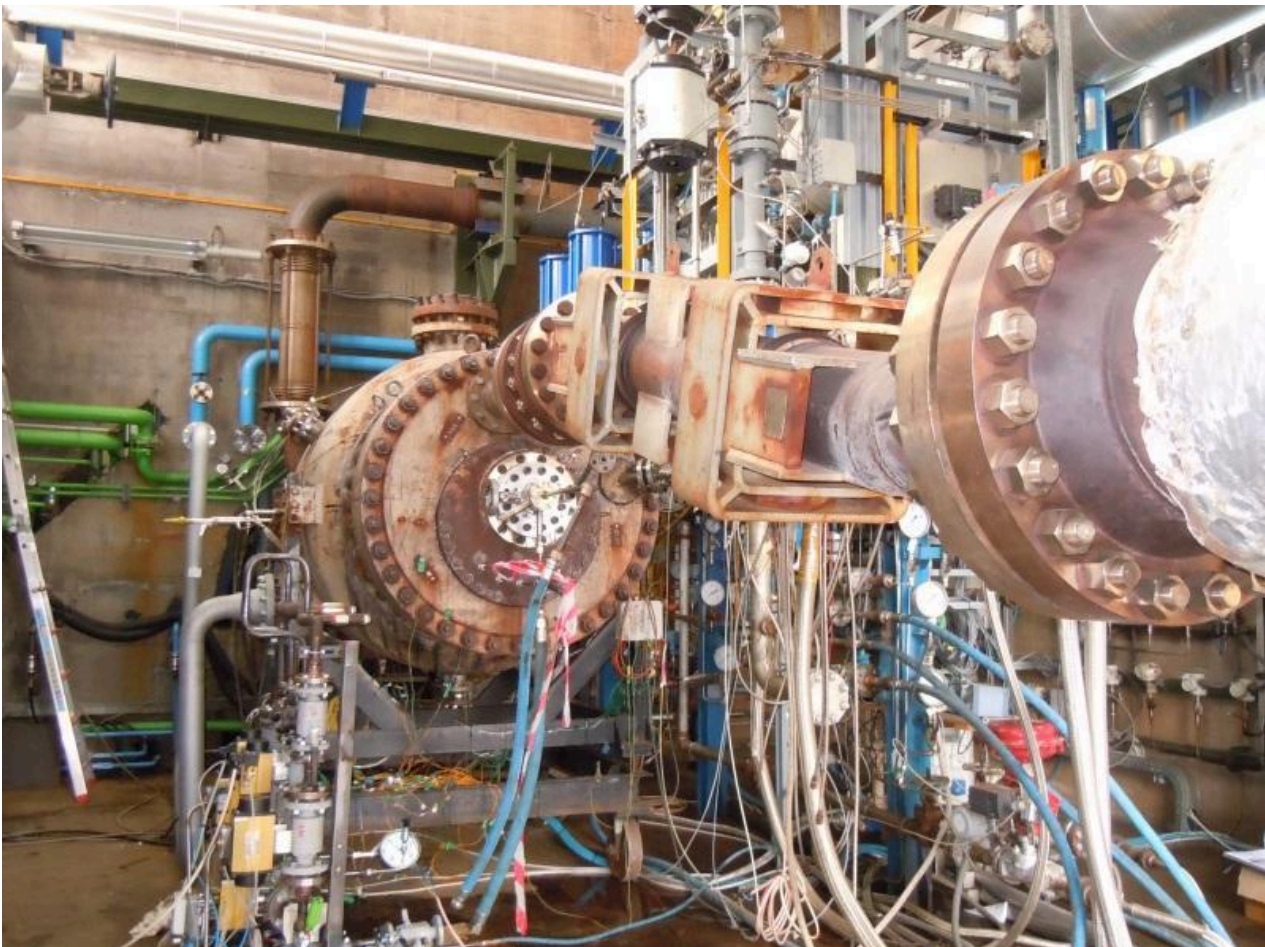
In all phases of the tests, the following parameters were constantly monitored:

- Delivery flow to the turbine
- Return flow from the turbine
- Actual consumption, as the difference between the delivery and return flow
- Atmospheric emissions - NOx, Pm, Pm 10; CO2, O2, CO,

- the parameter relating to the emission of Black Smoke was not detected due to operational difficulties.

SAVINGS - Economic estimates -6.8%. Emissions: NOx - 28%, PM - 24%, PM10 - 56%, Fumes not determined but visibly estimated at over -64%, CO -8%, CO2 -18%, O2 + 10%.

The emulsifier was ordered by Ansaldo for an emulsion of up to 24% of water, and supported up to 34%. In turbines it is possible to emulsify with water percentages higher than 50%.



Emissions and Filters

The reduction of the emissions indicated, or higher, depending on the percentage of water introduced into the emulsion and tolerated by the energy production plant, can allow:

- for NOx to fall within the legal parameters without the use of DENOX filters
- where requested, allow to significantly reduce the size of the DENOX filters which, in addition to being expensive, are very bulky and in many units can be incompatible with the available spaces
- to reduce the consequent civil works, carpentry and filter support piping

Maintenance

- reduction of the problems of residues and corrosion due to the direct injection of water or steam into the boiler
- elimination of sediments and encrustations of turbine blades
- significant reduction in the maintenance of the DENOX filters due to less dirtying.

ILVA STEEL PLANT IN GENOVA

ON DEMAND and STABLE EMULSION - TEST carried out on power generators and locomotive engines, with stable diesel emulsion.

Test result - POSITIVE

RESULTS: Economic on a consumption of 1,200 Klt / year there is a saving of 320 K € / year:

- on Generator (on demand emulsion): NOx- 38%, PM - 28%, PM10 - 43%, Fumes -82%;
- on locomotive engine (stable emulsion): NOx - 32%, PM - 22%, PM10 - 38%, Fumes -65%

AOC SANTORO IN GENOVA PORT

ON DEMAND EMULSION - TEST performed on the boiler / burner of the steam production plant. The goal was to contain the emissions coming out of the boiler. Fuel used was a mixture of 20% diesel and 80% HFO. The tests were carried out with water percentages ranging from 15% to 22% and an additive of 1.5%.

RESULTS - Emissions - NOx reduction from 840 ppm to 570 ppm (-32%). It was agreed that 500 ppm could be reached, as requested by the client, by making some changes to the boiler, which proved unsuitable.

CARNIVAL WAREHOUSE IN ALESSANDRIA

ON DEMAND EMULSION - TEST carried out on the 200 Kw power burner / boiler system prototype. The fuel used was HFO-BTZ with a consumption of 33 kg / h. The tests were carried out with water percentages from 13% to 22% and 0.5% additive.

RESULTS: Emissions (Test monitored by CETENA): NOx - 31%, PM - 24%, PM10 - 54%, Fumes -84%.

ALSO - GENOA PLANT

ON DEMAND EMULSION - Company for the production of products and by-products derived from used vegetable oils.

Supply of a new concept emulsion plant to emulsify vegetable oil by-product with high calorific value mixed with sunflower or rapeseed oil, to power a 1 Mw internal combustion engine for energy production.

RESULTS: 4% reduction in consumption, NOx - 27%, PM - 28%, PM10 - 52%, Fumes - 84%



LAVEGGIA GROUP

ON DEMAND EMULSION –

Preliminary test with a manual plant for the generation of nano emulsions with vegetable oils, to power a 0.5 Mw and 1 Mw motor for energy generation.

RESULTS: consumption reduction of 4.5%, NOx - 29%, PM - 29%, PM10 - 54%, Fumes - 86%

Supply of the water - fuel emulsion system for the generation of nano emulsion with vegetable oil.

RESULTS: reduction of consumption by 4.8%, NOx - 29%, PM - 34%, PM10 - 56%, Fumes - 88%

SANDRI Srl

ON DEMAND EMULSION - test for the generation of nano emulsions with animal fat oil (chicken), to power a 0.5 MW motor for energy generation.

RESULTS: reduction in consumption of 4.1%, NOx - 65, CH4 in ppm and mg / mc 37%, Fumes - 84%

Plant to be supplied soon. (See video in web site)

BOLZANO ENERGIA

ON DEMAND EMULSION – TEST carried out at the Bolzano Energia site for feeding with nano emulsion of water - Cashew vegetable oil for a Wartsila engine of 6 mW.

RESULTS: the best results were obtained with the dosage of nanoemulsified water, at 12%: consumption reduction of 4.4%, NOx - 36%, PM - 40%, PM10 - 55%, Fumes - 81%, Temperature at discharge - 50 ° C.

Furthermore, at the end of the test it was possible to ascertain:

- cleaning the ceramic filters of the denox filter
- cleaning the exhaust manifolds

