Delta Services Industriels

AIR-MIX

CONTROLLED AERATION GENERATOR
FOR TEST RIGS, ENGINES AND GEAR BOXES

TECHNICAL BROCHURE

INTRODUCTION: THE OIL AERATION PROBLEM

The presence of air in the fluid of a working hydraulic system can cause significant performance problems. Mixed air may be in an entrained or dissolved state and it can directly affect such fluid parameters as density, bulk modulus, sonic velocity, etc.

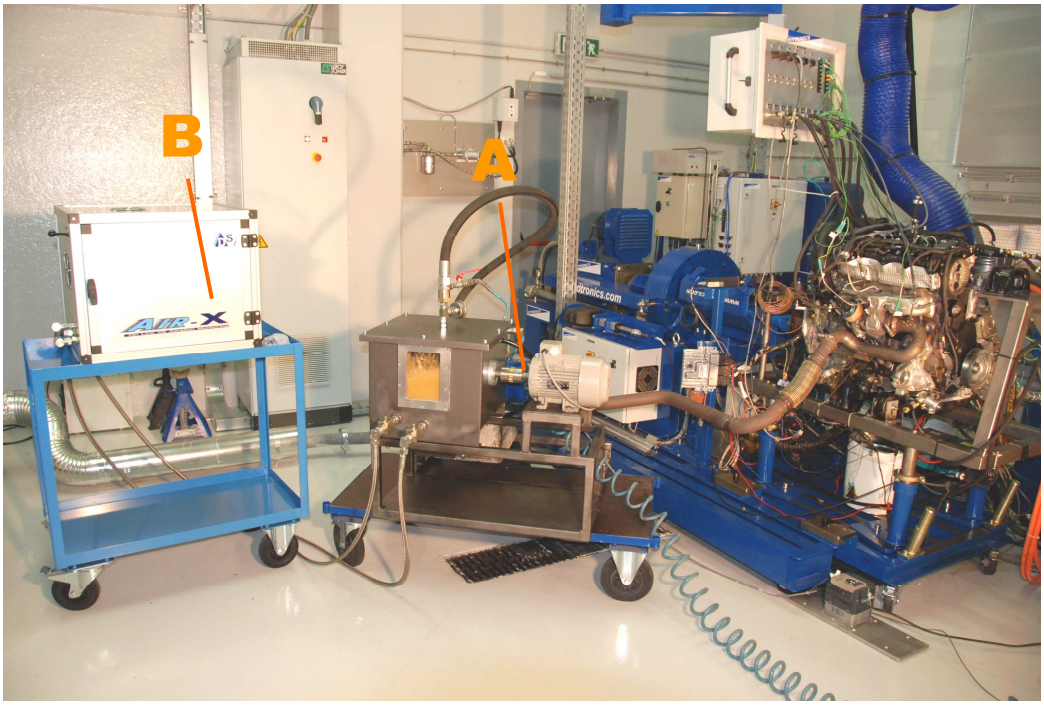
Consequences can be the following :

- Loss of lubricity
- Higher oil temperatures
- Wasted horsepower
- Cavitation problems
- Noisy operation

There is a need for mechanical engineers to better understand the behavior of engine and gearbox systems (or components) when lubricant aeration is increased. In real operating conditions, high aeration levels can occur in particular situations, i.e. when the engine is tilted (off-road applications), when oil level decreases in the sump, when engine speed is kept high over long periods, etc.

AIR-MIX is an innovative tool that combines two subsystems:

- An aeration generator (A) that covers a wide range of aeration levels between 0 and 25%
- Our standard "Air-X" equipment (B).for on-line measurement of oil aeration (separate brochure available on request)

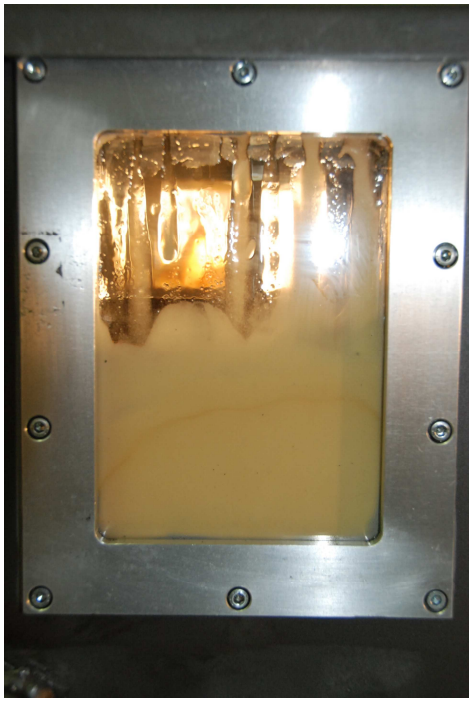


AIR-MIX equipment for supplying aerated oil to an I.C. engine, installed in a test cell

The generator delivers a *very homogeneous mixture of oil and air,* not simply a mixture of oil and bubbles. It is operated and controlled through the Air-X measuring system to deliver a pre-defined and regulated aeration level to the mechanical system under test (engine, gear box or any component test rig).

Basically, aerated oil is supplied at atmospheric pressure, in such a way that the dissolved air fraction is limited to a few percent. There is also a possibility to increase pressure in the output line in order to increase the ratio (dissolved air / undissolved air) up to 100%. Maximum output pressure of the generator is 10 bars. Oil temperature is regulated in a range between 0℃ and 150℃

To cover a wide range of applications, the aeration measurement can be performed either directly in the output line of the generator, or at a selected point in the mechanical system under test (i.e. engine sump, gallery, oil feed line to turbocharger, etc.). Whatever the sampling point, the generator will increase automatically the aeration level in the supply line *until a pre-defined value is reached at the sampling point*



Homogeneous mixture of oil and air produced by AIR-MIX

AIR-MIX equipment is convenient for the following purposes:

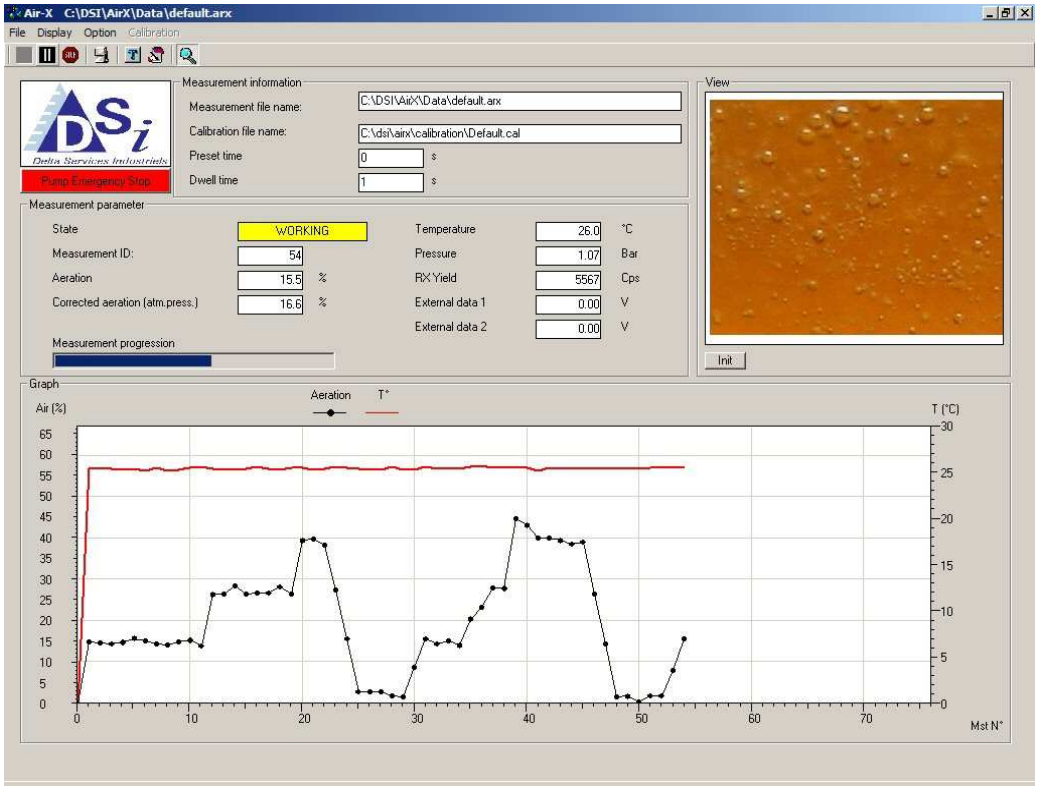
- **To study impact of aeration on undergoing mechanical systems.** Applications cover small component test rigs up to complete mechanical systems such as gear boxes or I.C. engines. **AIR-MIX** can also be used to supply part of a mechanical system with aerated oil while other subsystems operate in normal conditions with non-aerated oil.
- **To study impact of aeration on wear and cavitation. AIR-MIX** can be combined with TLA/RNT equipment for on-line monitoring of wear of a critical part (i.e. line bearings, conrod bearings, turbocharger bearing, etc.)

- **To compare lubricants.** **AIR-MIX** allows comparing aeration levels produced by various lubricants for pre-defined operating conditions of the generator. There is also a possibility to compare dissolved fractions and, therefore, to compare Bunsen coefficients.
- **To investigate lubrication limits**. **AIR-MIX** can be combined with TLA/RNT equipment for on-line monitoring of wear of critical parts. Aeration rates can be increased slowly until wear debris appear in the lubricant.

USER'S INTERFACE

"Air-X" equipment (see specific technical brochure) is the heart of the system. It measures on-line aeration levels at any point in the mechanical process and controls the generator until a predefined aeration value is reached at the sampling point. Oil is sampled continuously in a measuring chamber and dwell time for data acquisition can be selected between 1s up to several min.

All measurement data (oil temperature, oil pressure and aeration level) are automatically recorded and displayed on a graphic during operation of **AIR-MIX**. Extenal signals such as oil temperature, etc. can be superimposed on the graphic. A dedicated routine is also provided, which allows converting results to a .csv or a .txt format.



User's interface with graphic display of aeration level and external parameters

TECHNICAL SPECIFICATIONS

Performances:

- Aeration range (generator) : 0-25% homogeneously aerated oil
- Measuring range (Air-X system) : 0% to 100% air
- Oil volume in generator tank : 10 l
- Oil volume sampled for aeration measurement: ~0,5 liter
- Acquisition time : programmable from 1s up to hours
- Operating T°range : 0℃ to 150℃
- Pressure range: up to 10 bars
- Aerated oil flow (produced by the generator):
  - Variable from 1 to 20 liters/min. (higher flow as an option)
- Oil flow in the aeration measuring chamber:
  - Variable from 0.5 to 5 liters/min.
- Hydraulic connectors: metric, JIC or BSP (on request)
- Accuracy in terms of aeration results:
  - At 10 s acquisition time : 0,5%
  - At 100 s acquisition time : 0,2%

Power requirements: 110-220VAC/60-50Hz (on request) - Power consumption < 20 kW

Specific models are available for applications where high flow rates are required

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