Soest Centrilab bv

Centrilab

Independent advisory agency and laboratory for chemistry, microbiology and technical engineering.

Review report of research

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Your ref.: Our ref.: GBB/cvk Soest: 10. September 1993
Review date 13. September 1993

Report: 335670 to -673

Concerning: Analysis of solid particles of a cooling water system and assessment of particle size segmentation.

Commissioned	:	Stork Bronswerk, Herr. W. Brunsting
Date of commission	:	26. August 1993
Carried out by	:	H. v. Lagen und G.B. Bons
Report by	:	G.B. Bons

3.2 Segmentation of particle size sample number: 335670

It was established with the aid of a microscope that the sample contained mainly particles with dimensions of approx. 5 to 10 microns (>90%).
The content of solid particles was 0.62 g/l.

The coarse solid particles in sample 335671 measure approx. 0.1 to 0.5 cross-section.

Analysis Certificate

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Stork Bronswerk Installatietechniek BV
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For the attention of: Mr W. Brunsting

Your ref.: Our ref.: GBB/mdv 337633 Soest: 2. November 1993

Sample	:	water sample, 1x cooling water system
Packed in	:	plastic bottle
Received	:	221093 from: Mr Brunstig
Make	:	Water sample Covra 19/10/93 W. Brunsting

Results:

Floating constituent particles >0.45 µ mg/l: <1
In accordance with NEN 6484

CENTRILAB B.V.

Thus:
Before application of the dirt separator it was shown that the water sample contained permanent dirt particles of 620 mg/1.
Almost two months after installation of the Spirovent dirt separator, the system water contained just < 1 mg/1 permanent dirt particles.

11.793/04-04/1

The complete report can be obtained under number: 93.05

waterloopkundig laboratorium
delft hydraulics laboratory

MICRO-BUBBLE DEAERATOR TEST RESULTS

M 1411

September 1976

Conclusion

Conclusion on the basis of the completed tests:

- in a period of between 4-6 hours the air content of the system water will drop to half the original value.
- intime an air bubble outside of the circulation will disappear by absorption.
- in view of the water temperature at the place of the micro-bubble deaerator it may be expected that eventually the air content will fall to $\simeq 4^0/00$

Thus:
No corrosion will arise at an air content level of $\simeq 4^0/00$.
The installation will not be further contaminated and the corrosion process will be stopped.

11.793/04-04/2

The full report can be obtained under number: 76.01

Department of Mechanical Engineering

Manufacturing and machining group for the processing industries

MEASURING CIRCUIT FOR THE TESTING

OF DEAERATORS

Technische Hogeschool Eindhoven

Conclusion

It can be concluded that the Spirovent is able to remove even the smallest of air bubbles within a few minutes.

For the operation of the air deaerator this appears to be of the utmost importance. As a consequence of temperature rises in the boiler, air dissolved in the water will be partly driven from the solution and transported with the liquid in the form of micro-bubbles.

Removing micro-bubbles using the deaerator had not previously been observed by us. The effect of this is however very considerable, because this results in water in cold zones being undersaturated with air, i.e. air will dissolve partly in that cold water when coming into direct contact and will consequently then be released from the solution in the boiler and will then be removed by the deaerator.

In this manner an air bubble, which is apparently trapped in a cold place in the circuit, will also be removed.

The operation of such a deaerator is thus evidently highly superior to conventional air separators.

11.793/04-04/3

The full report can be obtained under number: 79.02

waterloopkundig laboratorium
delft hydraulics laboratory

lowering of cavitation in a circulation pump through the application of the Spirovent® micro-bubble deaerator

research report

M 1641

June 1983

Conclusion

When taking the readings it was established that the Spirovent® micro-bubble deaerator removes bubbles that have come free in the circuit. If a Spirovent® is not present then air remains in the circuit; the air is present in a dissolved state with unsaturated water, and in the form of bubbles in the case of oversaturation.
All results from the readings indicated that after a small lowering of pressure in a circuit with saturated water, the strength of vibrations in the pump housing first increase and then, after a certain period of time, decrease once again. The bubbles that cause the vibrations in the pump housing are removed from the circuit by the Spirovent®.
The removal of bubbles by means of the Spirovent® is most speedily achieved at a high temperature and low flow rate. In the circuit of 8 / 1 it takes about 2,000 seconds to remove the bubbles at low temperature (20˚C). At a temperature of about 80˚C the removal of bubbles takes about 200 seconds.

11.793/04-04/4

The full report can be obtained under number: 83.03

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TNO-Report

Separation of solid particles with the Spirovent type Dirt/Drain

Reference number 91-375
Dossier number 112322-23183
Date October 1991
NP

Author:
Ing. J.W. Assink

Keywords:
– Particle separation
– water circuits

Intended for:
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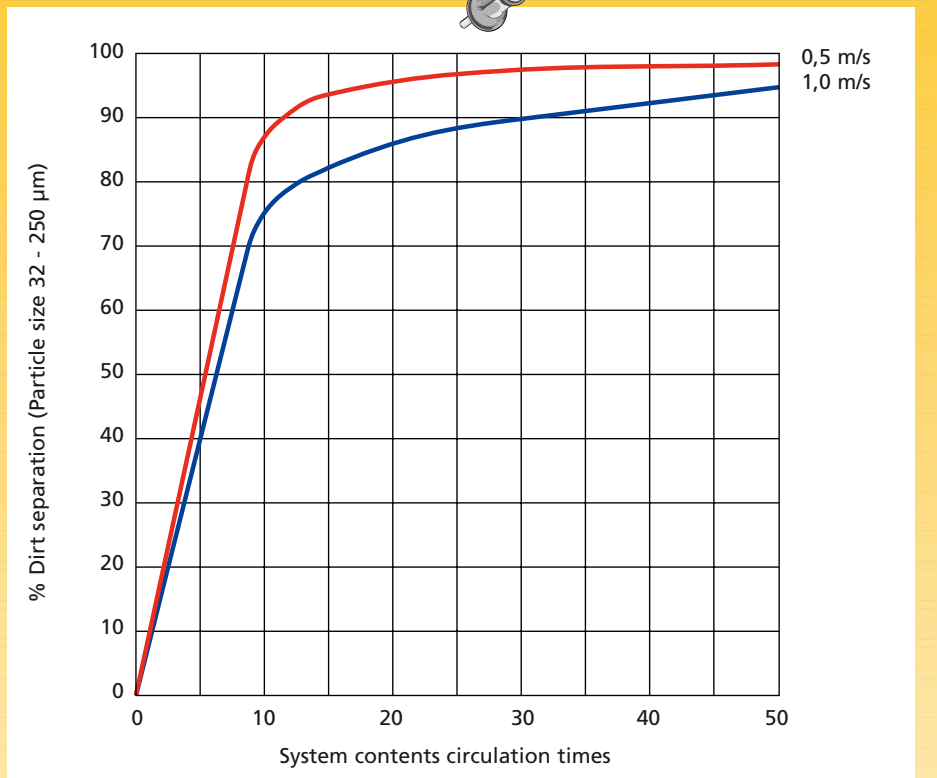

Conclusion

The particles are separated better as:
– the approach velocity is lowered;
– the particles are larger;
– the water passes more frequently through the Spirovent type Dirt or Drain.

11.793/04-04/5

The name Spirovent typ Dirt/Drain was changed at the beginning of 1997 to Spirovent 'Dirt typ Standard or Demountable.

The full report can be obtained under number: 91.04