



## BENTONITE FLUID LOSS - (ASTM D 5891)

### Overview:

Fluid or Filtrate Loss is considered by many to be one of the more meaningful bentonite quality control parameters. While the test has its origins in the drilling fluid industry, it does have applicability to the Geosynthetic Clay Liner (GCL) industry, as it is a very quick method of determining a bentonite's ability to perform as a hydraulic barrier. A low fluid loss value generally indicates a low permeability value.

### Test Procedure Summary:

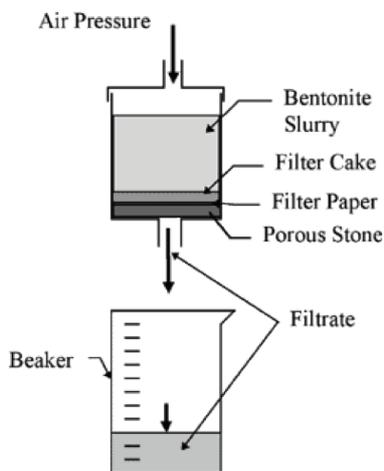
Fluid Loss is a measure of bentonite slurry's ability to form a low permeability filter cake. Its primary application in the drilling industry is to indicate the drilling mud's ability to seal a porous formation along a side-wall of an exploratory bore-hole. A bentonite's sealing ability is critical in drilling applications as the drilling fluid will otherwise flow into the formation if the bentonite mud cannot seal the porous layer. The result would be the diminished ability to bring the cuttings out of the hole as well as the loss of the drilling fluid itself.

ASTM D 5891, a Fluid Loss test procedure to be used when evaluating bentonite clay suitability for use in geosynthetic clay liner products is carried out in the following manner.

The test is performed in a 75mm cylinder, approximately 60mm in height. A porous stone is placed at the base of the cylinder, with a thin filter paper placed over it, and together they represent the porous formation.

A predetermined ratio of bentonite and water is mixed into slurry (typically 6 % slurry) and poured into the cylinder. The cylinder is then pressurized approximately 700Pa. As water (filtrate) drains from the bottom of the cylinder, a filter cake forms on the filter paper, retarding the flow of filtrate.

Filtrate is allowed to flow for the first 7.5 minutes of the test, at which time the flow is collected for the next 30 minutes. The volume collected or total fluid loss in 30 minutes is measured and reported in millilitres (ml). A lower amount of filtrate collected indicates the bentonite is more effective at sealing and therefore less permeable.



## Quality Assurance Test and Frequency:

**Bentofix**<sup>®</sup> specifies a minimum of one (1) fluid loss test for approximately each 50 tonnes of bentonite supplied which equates to two tests per production lot of Bentofix<sup>®</sup> (2 for every 18,000 square meters of product produced). As this is a quality assurance test on the base bentonite, not the finished GCL, it is inappropriate to test this parameter based on a frequency per square meter.

Fluid Loss may be tested more frequently if it is required, however, the ASTM Guidelines for GCL Quality Control (ASTM 5889 Standard Practice for Quality Control of Geosynthetic Clay Liners) suggests the 1/50 ton frequency that has been adopted for the Bentofix<sup>®</sup> program.

## Bentofix<sup>®</sup> Specified Value:

While the bentonite clay utilized in **Bentofix**<sup>®</sup>, as well as most other GCLs, typically meets a fluid loss in the range of 12ml - 18ml, a value of 18ml is the Bentofix maximum target value, and a value that will indicate proper performance of the Bentofix GCL product.

## Terms

"Filtrate" - The free liquid or fluid (water) released when the bentonite slurry is pressurized.

"Slurry" - A bentonite mud, also referred to as drilling fluid.

"Filter Cake" - A build-up of bentonite clay against a semi-porous surface.

## Summary

Whilst the determination of Fluid Loss is a very useful tool in characterising the general quality of Bentonite being delivered to a manufacturing facility and prior to production of the geosynthetic clay liner itself, the test itself, is somewhat variable and as such the Fluid loss Value should not be a specification value in projects that by itself would cause rejection of any delivered product by an imposed CQA audit process.

Should the Fluid Loss be higher than the specified value (generally  $\leq 18\text{ml}$ ) then under the specification it should clearly allow for a retest of the property, allow for appropriate permeability testing or indeed accept the product should the test frequency and prior site specific test results indicate compliance with statistical acceptance limits imposed for the project (typically an allowance of 2.5% of product delivered- MARV).

Note. Bentonite Fluid Loss may be artificially lowered by introducing a polymer into the bentonite at time of manufacture of the geosynthetic clay liner. This has been proven in the past and has good short term performance when tested using standard test methods for acceptance of bentonite and geosynthetic clay liners.

The use of polymer modification to any bentonite geosynthetic clay liner should be clearly notified to the purchaser and should clearly be noted on all data sheets and technical information relating to the polymer modified product.

The polymers are generally water soluble, have little long term performance substantiation, may have doubtful polymer distribution throughout the bentonite (less than 1% addition by mass of bentonite) and there are no means to verify the addition of polymer, the distribution of the polymer or indeed the application rate of the polymer.



Any acceptance testing of the geosynthetic clay liner must be done prior to the addition of polymer and the bentonite, in the unmodified state, must meet the requirements of fluid loss as well as all other items of the specification requirements.

Ensure that polymer modification has not been undertaken on the natural bentonite to enhance the properties of the geosynthetic clay liner without full disclosure by the manufacturer with respect to polymer type, safety data sheet, dose rates and long term performance data relating to the contained environment within which the GCL is being placed

Bentofix® is a registered trademark of NAUE GmbH & Co. KG GmbH.

DISCLAIMER: All information provided in this publication is correct to the best knowledge of the company and is given out in good faith. The information presented herein is intended only as a general guide to the use of such products and no liability is accepted by Global Synthetics Pty Ltd and Global Synthetics QLD Pty Ltd for any loss or damage however arising, which results either directly or indirectly from the use of such information. Global Synthetics Pty Ltd and Global Synthetics QLD Pty Ltd have a policy of continuous development so information and product specifications may change without notice.

APR.16



**SYDNEY**

P: (02) 9725 4321

F: (02) 9725 4304

E: [info@globalsynthetics.com.au](mailto:info@globalsynthetics.com.au)

**BRISBANE**

P: (07) 3865 7000

F: (07) 3865 4444

**PERTH**

P: (08) 9459 4300

F: (08) 9459 4311

**MELBOURNE**

P: (03) 9791 1772

F: (03) 9791 1776

**ADELAIDE**

P: (08) 8384 8894

F: (08) 8384 3886