



HIGHEST YIELD WITH 100% BIODEGRADABILITY

PREMIUM™

A biodegradable polymer that works, whatever the application, whatever the soils

INFORMATION SHEET

Composition	Semi-synthetic polymer formulation based on cellulosic derivatives.
Active content	98%
Physical properties	White/creamy powder. Low molecular weight. Neutral pH for a solution of 10% of PREMIUM™. Solubility in water ≥ 10% @ 20°C Specific gravity : 1.1 Compatible with bentonite slurry.
Proportioning	15 Lbs of PREMIUM™ will yield 1,000 gallons of 40" mud depending on water quality.
Mixing water	PREMIUM™ can be used mixed with fresh, brackish or sea water.
Biodegradability	100%
Desanding-Desilting	PREMIUM™ will not glaze over shakers.
Quality Control	Viscosity, pH, filtrate, cake thickness and sand.
Toxicity	None.
Packaging	25 Kg (55 Lbs) multiply, poly. lined bags.
Storage and Handling	Keep floor area clean : very slippery when wet.
Spillage	Clean spill area with large quantities of chlorinated water.
Breakdown	Mud viscosity may be broken with strong oxidizers such as chlorine or a mild acid preferably in dry form.
Fire	Use Carbon Dioxide (CO ₂) foam extinguishers.



PRESENTATION OF PREMIUM™

PREMIUM is a high performance synthetic biodegradable polymer of a relatively low molecular weight compared to the other synthetic or natural polymers. Its basic composition derives from cellulose esters to which specific properties have been added. Because of its compatibility with mineral colloids, PREMIUM can be used as a base mud in any type of soil formation and in any type of geotechnical construction application; for example, PREMIUM is recommended for drilling potable water wells because of its very low B.O.D. count and has become an essential element in slurry shield tunneling because of its compatibility with clay slurries and desanding plants.

In its deep foundations application, a PREMIUM slurry has become a slurry of choice for drilled caissons and structural slurry walls. Wherever tremie concreting is involved, the cleanliness of the slurry is essential to the quality of the endproduct. This is even more important in the presence of high reinforcing steel density.

PREMIUM has no gel strength and no thixotropy. In a slurry trenching operation, all fines coming in suspension during the excavation process are continuously settling and progressively extracted by the digging tools as the excavation proceeds. This explains why, by the time the excavation is completed, most of the sand has been removed from the hole and only the silt fraction needs more time to settle. Carrying down the product of settled fines explains why a PREMIUM slurry can effectively seal porous formations such as sand and gravels despite the fact that newly mixed PREMIUM has a total API filter loss. Contrary to common drilling fluid polymers, PREMIUM will form a cake in conjunction with the fines encountered in the ground or with added colloids in the presence of purely coarse granular soils.

PREMIUM is very easy to mix and is ready within an hour. Since it takes 30 to 40 times less material than with mineral slurries, the storage and handling requirements are minimum and savings in labor obvious. The PREMIUM slurry can always be recirculated, cleaned and regenerated ; this eliminates expensive costs of heavy mud waste disposal. Only the leftover slurry needs to be disposed of at the end of the project. The slurry is processed to separate the liquid phase from the solids. The liquid phase is conditioned to meet local disposal criteria. The solid sludge is mixed with dry soil and disposed with the mass excavation material. Because of the lack of gel, the slurry will drain quickly from the excavated soil. The landfilling of spoil materials is significantly more economical since it does not require remixing with dry material. The biodegradability of the polymer eliminates any doubt about the classification of the spoil being disposed.

PREMIUM Quality Control: the quality control is similar to that of bentonite slurries but with more emphasis on pH, filtrate loss and filter cake thickness. Typical QC parameters are as follow:

New mud Viscosity : 34" Marsh
New mud pH: 9
New mud Weight.....: 62.5 pcf
New mud Filtrate: total
New mud Cake: N.A.
Sand Content: N.A.

In-trench Viscosity : 32" to 38" Marsh
In-trench pH.....: 7 to 11
In-trench Weight ... : 62.5 to 64.5 pcf
In-trench Filtrate.... : 15 to 40 cc
In-trench Cake..... : .5 to 4 mm
Bottom trench..... : 2% max.

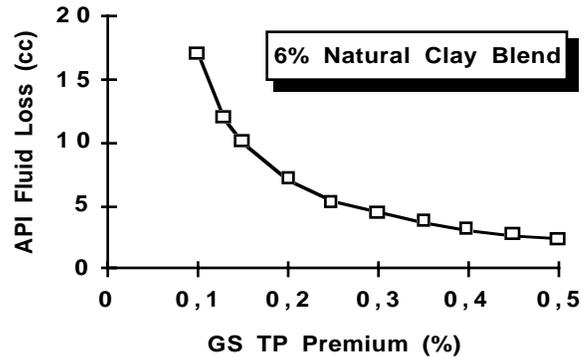
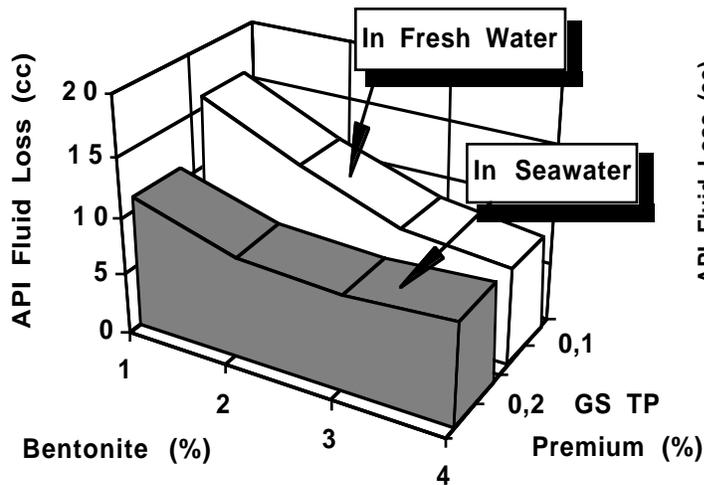


Fig. 2 : Filtrate reduction potential

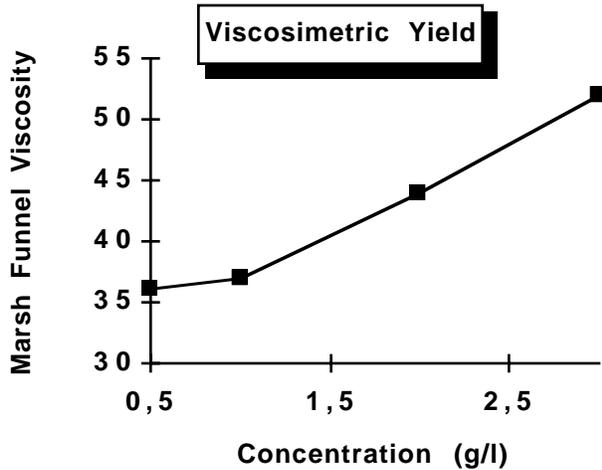


Fig. 1 : Water quality impact on filtrate
Fig. 3: PREMIUM performance in tap water

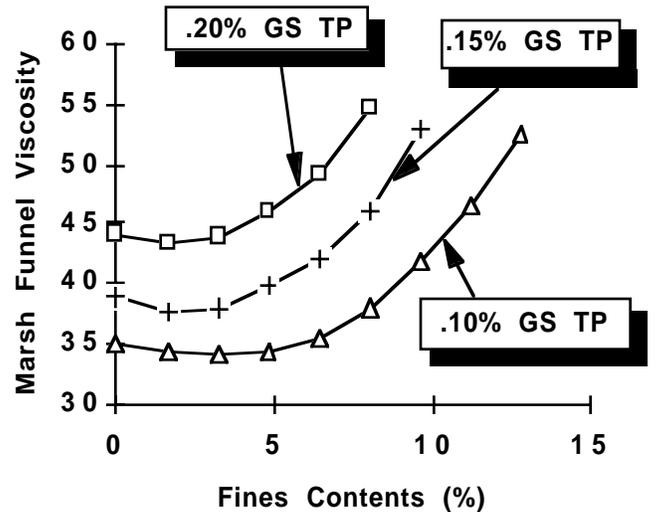


Fig. 4 : Colloids impact on viscosity

QUALITY CONTROL

Good quality control is essential for best technical performance and greater savings. Typically pH control (8-11), mud viscosity (33 - 38 sec Marsh), mud weight (63 - 68 Lbs/CF), filtrate loss (5 - 40 cc) and cake thickness (up to 3/16").

DISPOSAL

Release of spent slurries must follow all environmental regulation and local ordinances. Typically a spent slurry will need a pH correction before disposal. PREMIUM is a biodegradable polymer slurry. Settled solids contents follow solids disposal standards. Consult LIQUID EARTH SUPPORT, Inc. for specific information.

SAMPLE APPLICATION

Slurry Wall Federal Triangle (ICTC), Washington D.C. (Front right picture)

- Scope : 200,000 SF of 36" slurry wall
- Max depth : 105' with an average depth of 75'
- Stratigraphy : Silty clay, sand, plastic clay, coarse sand and gravel, decomposed gneiss, fractured gneiss.

* **Slurry** PREMIUM @ .15% + Bentonite @ 1.5%, Polymer Consumption = .17 Lb/SF
Viscosity = 32" - 38", Filtrate = 20 - 40 cc, pH = 8- 11



US REFERENCES

PREMIUM Biodegradable Synthetic Polymer

Structural Slurry Walls

Project	Location	Square feet built	Contractor
HUB SITE	Washington	2,000 SF	HYMAN
LENOX CLUB	Arlington	52,000 SF	HYMAN
DEER ISLAND	Boston	47,000 SF	NICHOLSON
WORLD BANK	Washington	106,000 SF	HYMAN
NUT ISLAND	Quincy	9,000 SF	ICOS
DEER ISLAND	Boston	48,000 SF	ICOS
ISLAIS CREEK	San Francisco	60,000 SF	ICOS/RODIO
PUMP STATION	Alexandria	6,000 SF	ICOS
FEDERAL TRIANGLE	Washington	220,000 SF	HYMAN
SHRINERS HOSPITAL	Boston	5,000.SF	MILLGARD

Bio-Polymer Drains

Project	Location	Square feet built	Contractor
CONVENTION CENTER	Atlantic City	12,000 SF	BARBELLA
BECTON DICKENSEN	Hackensack	20,000 SF	GRIFFIN
CHEVRON	Richmond	14,000 SF	INQUIP
SYNCON RESINS	Kearny	16,000 SF	GRIFFIN
POTASH CORP	Saskatoon	9,000 SF	HAUG
PHIBRO	Deer Park	20,000 SF	RECON
ROHM & HAAS	Houston	36,000 SF	RECON



HOW TO WORK WITH PREMIUM™

Storage

PREMIUM is packaged in 55 Lbs bags with a plastic liner. The shelf life is extremely long (years) provided storage is in a dry cool place.

Mixing Water

Tap or hydrant water varies from one place to another and with the hours of the day at the same source. Urban systems have a variable chlorine content. Chlorine affects adversely the performance of all polymers. We recommend to determine the time of the day at which the source has the lowest chlorine content before starting fabrication. When using natural bodies of water as a source, yield tests should be made to determine proportioning. Rain water is often acid. Check pH before using ponded water. For all foundation projects, it is recommended to bring the water pH to 9 with a softener. Using pH BUFF will raise the pH at a level where the polymer is protected from undesired biodegradation and from a certain level of calcium contamination. Sea water typically requires approximately 50% more polymer than fresh water.

Mixing

PREMIUM mixes easily and does not require a colloidal mixer and mixing can be done by dispensing the powder through a flash mixer, or by hand or using a lawn spreader over the return spout of the recirculation pump. Recirculation is necessary to homogenize and optimize the yield. The slurry will be ready within an hour. 8,000 gallons can be prepared by one worker in an hour. If the project at hand requires a blended slurry, regular yield bentonite slurry is hydrated separately at a 6% typical proportioning and blended in the PREMIUM slurry to represent 1 to 2% of bentonite in the blend.

Trenching/Drilling

The new slurry will not stay clean in the hole as fines will become suspended and it will look like any slurry. However, it will always remain very fluid since only fines can become suspended and there is no risk of flocculation. Since hydrated cement has a detrimental effect on all synthetic polymers, lean mix placed in pre-trenches should be excavated in the dry before starting trenching under slurry. We recommend using instead self-hardening slurries such as IMPERMIX which do not use Portland cement.

If the top layer of the excavation is made of fine cohesive materials, it is possible to start with brand new clear slurry. If clean gravels lay below, it is advisable to work the fine soil into the slurry to carry down fines in the more open layer. When the top of the excavation starts with coarse granular soils, recycled slurry should be used starting possibly with the bottom sludge from a holding tank. Once the open zone is sealed, revert to light slurry. It is advisable to have a generous storage capacity in order to work with different stocks of slurry.

In case of a sudden loss of slurry, since the slurry has no gel, any kind of solids, either excavated spoil or sand, can be dumped in the trench and will be at the bottom in a matter of seconds sealing the loss effectively. Re-excavation can resume shortly after and no durable effect will result on the quality of the slurry. The slurry will be clean again by the time the excavation reaches bottom. This is a major advantage over conventional bentonite slurries.



Cleaning

The cleaning is always limited to the cleaning of the bottom of the hole. The amount of cleaning is clearly dependent on the soil conditions, depth and tools used. Heavy mud or sludge may be present over a few feet. We recommend to remove the fine sand that may accumulate at the bottom with a smooth excavation tool and to extract the heavy mud with an airlift or a capable submersible pump, such as a TOYO, and to compensate with clean slurry. Whenever possible, a staging of the work allowing a 24 hrs rest period is recommended. As in all operations, cleanliness is the key to good workmanship.

Pouring

The tremie pour under PREMIUM slurry is the most satisfying experience for the bentonite slurry practitioner. The procedure is conventional. During the entire pouring process, the slurry viscosity will not vary, PREMIUM not being subject to flocculation. By remaining very fluid, the possibility of slurry entrapment is nonexistent and so is the chance for defects. If the guide-walls are at the finished concrete elevation, the concrete is raised a few inches over the guide-walls and leveled to its design elevation. The concrete appearing is "good concrete" since the slurry has no effect on the concrete. Concrete poured under PREMIUM never needs chipping which is an added saving. The entirety of the slurry displaced is recycled. Compared to bentonite slurry project, the cleanliness of the entire operation is remarkable. Remaining with a very fluid slurry in all circumstances, slurry lines which are typically 4" in diameter can be reduced to 3".

Regeneration

This is a very important part of the practice in order to stay within QC parameters and to optimize the PREMIUM. Typically, a returned slurry will show a higher pH, a viscosity which is either too high or too low, and a silt load that might be excessive. The returned slurry should be treated immediately for excessive pH with an additive such as LESAP which reduces the pH and precipitates part of the calcium. When subjected to a lot of calcium, lowering the pH to 7 with LESAP and subsequently bring it up to 9 with pH BUFF will provide the best protection. Viscosity, weight, filtration and cake thickness will indicate whether the slurry needs a rest to settle its fines, whether it needs to be cut with new slurry or if PREMIUM needs to be added directly. Since there is always a consumption of slurry, new mud is always added to used slurry. A good slurry management requires in storage capacity at least twice the volume of open holes in the ground.

Disposal

If all went well, only the volume of the last pour needs to be disposed of. The method will vary depending on a number of conditions:

- Time available
- Space available
- Local ordinances
- Cost of outside disposal
- Slurry condition



Since time and space is generally scarce on a construction site, time to allow a natural biodegradation to occur is rarely available. An acidification of the slurry is necessary to bring the pH to 6 if one wishes to generate the proper environment for biodegradation. A small amount of top soil or LENZIME should stimulate biodegradation in 48 hours. If such time is not available, a strong base or a mild acid will break the slurry within 24 hrs. Although we do not recommend the use of chlorine, it will also break down the polymer within 24 hrs. The purpose of biodegradation or chemical breakdown is to drop the slurry viscosity to close that of water to facilitate the phase separation and achieve as clear a water as possible. Settled fines can be mixed with dry soil or mixed with rigidifying additives such as GELLAR or STIFFNER.

The B.O.D. count of PREMIUM is extremely low (5 to 15). PREMIUM, in its pure slurry form, is sewer disposable when the pH is between 6 and 9. Assuming that no contaminants have been picked up in the ground, the whole issue is TSS or total suspended solids (turbidity). In the case where time and space are available, the neutralized used PREMIUM slurry will separate between disposable clear water and silt/clay sludge CLARIFIX 16 may be used to flocculate all fines and to release free water.

Technical Assistance

Field training can be provided by a qualified technician on demand.

Note: as of 1997, when biodegradability is not a compliance necessity, deep foundations such as drilled piers and slurry walls construction has turned to POLYBLEND-B, which is a synthetic polymer compatible with bentonite and performing equally or better than PREMIUM at about half the polymer cost. We have kept the information on the use of PREMIUM as a tutorial for blend slurries practice. The text could read POLYBLEND- B instead of PREMIUM and have the same validity. At this time, we recommend PREMIUM for leachate collection trenches where biodegradability and cleanliness are essential for the drain performance.

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