

Tacabind™ 4069 Pellet Binder

Bentonite Replacement Performance



The Ashland Aqualon Functional Ingredients Tacabind pellet binder family of products results from our ongoing research program dedicated to developing new binder options which improve iron ore pellet properties at acceptable cost-in-use compared to bentonite.

Tacabind 4069 pellet binder is a proprietary water-soluble polymer, inorganic salt blend intended for use as either a partial or full replacement for bentonite or as a complete replacement for other organic binders used in the agglomeration of moist iron ore concentrate. Our taconite balling laboratory has the capability of simulating the balling process on a small scale using rotating airplane-tire equipment and customer-supplied ore concentrate.

We qualitatively evaluate seed and finished ball formation behavior and appearance and measure green ball physical properties such as:

- Ball size distribution
- Ball moisture
- Wet drop number
- Wet and dry compressive strength

We have evaluated the effect of water-soluble polymer properties such as:

- Molecular weight
- Type of chemical substituent added
- Amount of substituent added

We use outside laboratories to do prototype firing studies and test the physical and chemical properties of the fired pellets when that information is required.

The following summary table shows lab balling tests which demonstrate the utility of Tacabind 4069 pellet binder as (from left to right) a supplement for bentonite and then as major and complete replacement for bentonite.

Evaluation of Tacabind 4069 Pellet Binder on a North American Taconite Concentrate

Test No.	239	243	244	246	239	257	258	259	239	247
Starting Moisture	9.67	9.67	9.67	9.67	9.67	9.67	9.67	9.67	9.67	9.67
Binder Type	100% Bentonite	Bentonite/Tacabind 4069	Bentonite/Tacabind 4069	Bentonite/Tacabind 4069	100% Bentonite	Bentonite/Tacabind 4069	Bentonite/Tacabind 4069	Bentonite/Tacabind 4069	100% Bentonite	Bentonite/Tacabind 4069
Binder Dosage (lbs/long ton)	15.0	15.0/0.1	15.0/0.2	15.0/0.3	15.0	7.5/0.5	7.5/0.75	7.5/1.0	15.0	0.0/1.5
Wet Drop Number (average of 10)	11.1	11.3	13.9	17.6	11.1	9.2	13.1	13.2	11.1	16.4
Green Ball Moisture (%)	9.2	9.2	9.3	9.4	9.2	9.2	9.4	9.3	9.2	9.4
Dry Compressive Strength (lbs.) (average of 10)	10.1	12.1	13.4	13.0	10.1	9.1	11.4	11.6	10.1	7.9
Bentonite Reduction (Based on 15 lbs/LT)	0%	0%	0%	0%	0%	50%	50%	50%	0%	100%



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With good chemistry great things happen.™

Ashland Aqualon Functional Ingredients
A Commercial Unit of Ashland Inc.
1313 North Market Street
Wilmington, DE 19894-0001, U.S.A.
Tel.: (800) 5GO AQUA
Fax: (302) 992-7287
pharm-us@herc.com

Hercules International GmbH
Euro Haus
Rheinweg 11
8200 Schaffhausen
Switzerland
Tel: +41 52 560 55 00
Fax: +41 52 560 55 99
regeurope@herc.com

Hercules Industrial Chemicals Pvt. Ltd.
601, 6th Floor, The Corporate Centre
Nirmal LifeStyles, LBS Marg,
Mulund (W), Mumbai 400080
Maharashtra, India
Tel: +91-22-25927074/25923707/25923566
Fax: +91-22-25924008

Hercules Chemicals Singapore Pte. Ltd.
200 Pandan Loop
#07-01 Pantech 21
Singapore 128388
Tel.: +65 6775 5366
Fax: +65 6776 9690

Hercules Mexico, S.A. de C.V
Saltillo No 19, 7 piso
Col. Condesa C.P. 06100
Mexico City, Mexico
Tel.: 525-211-0111
Fax: 525-212-0883

aqualon.ashland.com



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PC-10806

HER. 51009 Rev. 10-10

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In the first case, the work demonstrates that even a few tenths of a pound/LT of our binder can noticeably improve green ball properties, especially wet ball plasticity (drop number). This could be of interest to plants using a straight-grate furnace system where the deep pellet bed can cause deformation and cracking which will then hurt fired ball quality. Supplemental addition of our product also gave a noticeable improvement in ball dry compressive strength. This improves ball integrity and reduces dusting in the critical period where water has been removed, but the pellet has not yet undergone the metallurgical changes that give its final strength. The work also shows that use of about 0.5-0.75 lbs/LT Tacabind™ 4069 pellet binder allowed reduction of normal bentonite dosage by 50% with no resulting decrease in green ball physical properties compared to the normal full dosage of bentonite. This would be of benefit when a mill has difficulty reaching the required silica specification in finished pellets. It also could allow the mill to save money on other silica reduction processes or allow use of ore with higher native-silica content. We have also shown that our binder can be used to completely eliminate bentonite with no significant change to ball formation behavior or ball size distribution. In this situation wet ball properties show improvement, but it is a challenge to maintain bentonite-like dry strength at economic dosages. This behavior is not uncommon for neat organic binders and our research and development team is seeking ways to improve dry strength.



As follow up to the lab work presented above, we completed pot-grate furnace evaluations and physical property tests of pellets for a number of the binder combinations. This showed no potential problems with air flow or temperature in furnace operation. Also, pellet compressive strength and after tumble abrasion tests were well above the established minimum specifications for this mine. Based on this work we were given the opportunity to test Tacabind 4069 pellet binder in a several-day mill trial. The mill trial confirmed the potential for Tacabind 4069 pellet binder to replace the competitive organic binder and to reduce the normal plant bentonite dosage by up to 75%. The trial results justified a second larger-scale run to confirm performance and to develop a more accurate cost-of-use estimate.

We appreciate the opportunity to share this information. Please contact an Ashland Aqualon Functional Ingredients sales representative if you have questions or otherwise require guidance in evaluation of Tacabind 4069 pellet binder.

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