BEAR RIVER ZEOLITE

BRZ™ FOR PELLET PRODUCTION

PELLETING PROCESS

The pelleting process involves agglomerating and extruding finely divided, dusty, unpalatable, and difficult to handle feeds, into elongated pellets by compacting them and forcing them through dies (small holes) using heat, pressure, and moisture. The process gelatinizes the feed.

REASONS FOR PELLETING

Livestock make better gains when fed pellets, rather than a mash TMR, for the following reasons:

- **The heat generated by conditioning and pelleting make the feed more digestible by breaking down the starches.**
- **The pellet concentrates the feed.**
- **The pellet minimizes waste.**
- **Pellets provide a well-balanced uniform diet that prevents the animal from picking and choosing ingredients.**

BENEFITS OF USING BRZ™ ZEOLITE

BRZ™ IS A DESICCANT THAT ALLOWS THE INCREASE OF TEMPERATURE AND MOISTURE IN PELLETING
(Increased steam [moisture] and temperature are fundamental in the pelleting process)

- Increases gelatinization to increase digestibility by breaking down starches and improve pellet durability.
- Kills mycotoxins.
- Sterilizes weed seeds.

LOWER INCLUSION RATE

- Use 0.5 to 2% BRZ™ by weight instead of 3 to 5% bentonite or lime.

INCREASES PRODUCTION EFFICIENCY

- Greater amounts of moisture and temperature reduce friction through dies to enable a production increase of up to 35% with no greater power consumption.
- Reduces the electric unit cost of the pellet.

PREVENTS BUILD UP AND BLOCKAGE OF FEED STUFFS

- BRZ™ is a natural flow agent due to its absorption of moisture and oils that helps prevent feed stuff from clogging and bridging during pelletization.

REDUCES MOLD

- Pellets with 0.5 to 2% BRZ™ showed no mold after several months in storage. Mold formed on the control pellets without BRZ™.

INCREASES PELLET MILL DIE LIFE

- BRZ™ lubricates to reduce abrasion.

INTENSIFIES PELLET COLOR

- BRZ™ makes a brighter green alfalfa pellet.

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BRZ™ PELLET PRODUCTION

PRODUCT DESCRIPTION -40 mesh BRZ™

Steam is injected into the conditioner tube above the pellet machine to increase temperature, reduce friction, and facilitate pelletizing. BRZ™ holds up to 55% of its weight in moisture. This reduces resistance through the dies and allows up to 35% higher pellet production throughout with no increase in power costs. Typically 0.5 to 2% BRZ™ will replace 3 to 5% bentonite. The increased temperature enhances gelatinization and produces a more durable pellet.

FEED BIN FROM BLENDER
0.5-2% BRZ™ is mixed with feed mash

VARIABLE SPEED AUGER
Determines feed rate

BOILER
Determines temperature and moisture of conditioner

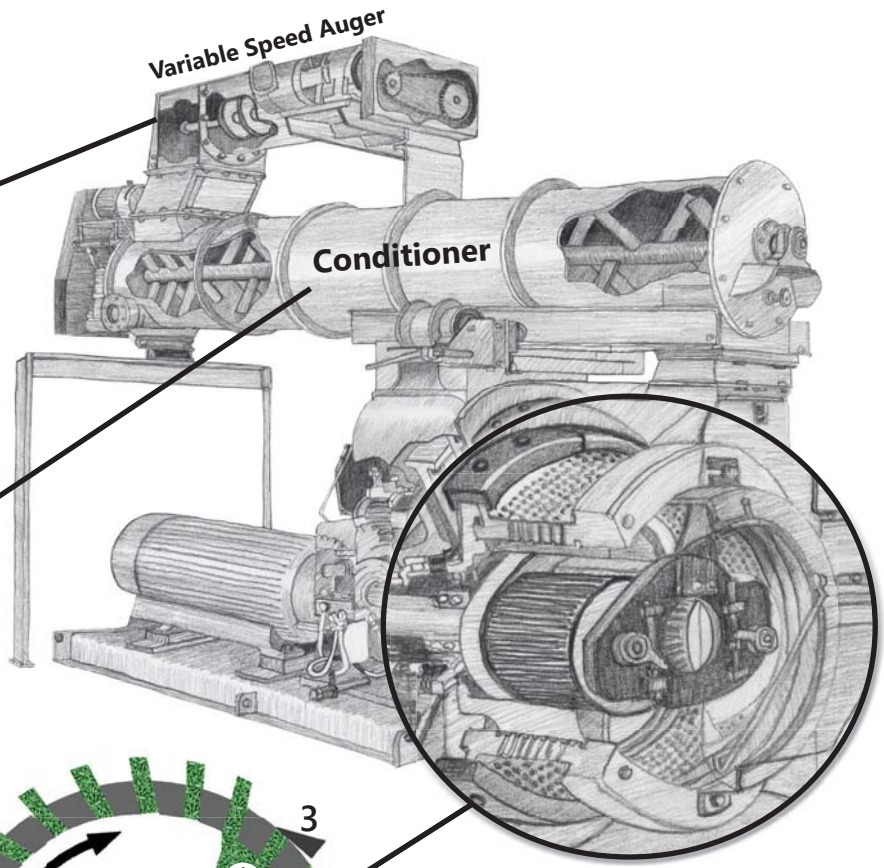
CONDITIONER
Horizontal shaft with paddles, should be kept full, gelatinizes

PELLET MILL
Direct drive from motor, has dies and horizontal rolls

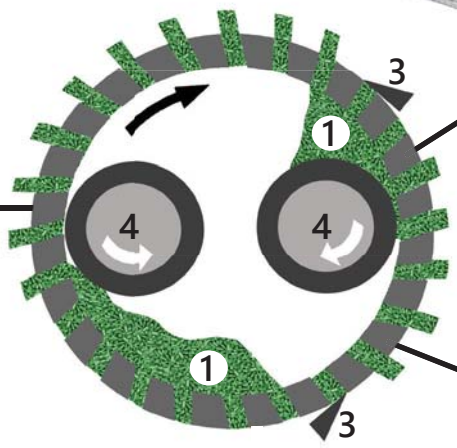
COOLER
Generally an updraft type

LOAD OUT BIN
Storage of finished pellets

GEAR DRIVE PELLET MILL



Pellet Mill (close-up view)



Typical die & roll assembly used for producing pellets

1. Meal or Mash
2. Pellets
3. Blades
4. Rolls
5. Die

PELLETING PARAMETERS

MIXER: The feed stock is mixed with a variety of devices including ribbon blenders, paddle mixers, etc.

SCALPER: This can include screens, magnets, and other devices to remove rock, string, paper, iron or other metals, and feed lumps from the feed stuffs.

SUPPLY BIN: This can include one or two bins that should hold three times the daily capacity of the pellet machine. The hopper slopes should be greater than 60° to prevent bridging and erratic flow.

STEAM CONDITIONING: Steam is added to the feed in the conditioner to (1) lubricate the feed for faster production, (2) to lubricate the dies for longer life, (3) to lubricate to reduce energy costs, and (4) to gelatinize starch for nutritional value. **BRZ allows for more steam because it is a desiccant.** The amount of steam is determined by the type of feed.

PRODUCTION RATE: The production rate is increased by increasing temperature and steam (moisture).

PELLET DURABILITY is determined by:

Protein: High protein translates into good pellet durability and high production rates.

Density: Low protein and high density will give good production rates and poor pellet quality.

Fat: Either animal or vegetable fat are used. More than 2% fat will adversely affect pellet durability.

Fiber: High fiber is hard to compress and decreases production rates. However, high fiber contains more natural binders that result in good pellet quality.

Texture: Generally finer textures provide better adsorption of moisture and higher production rates. Coarser feeds provide natural breaking points, poor pellet quality, and fines.

Starch: High starch formulations increase gelatinization that enhance the amount of binder and pellet durability.

Moisture: High inbound moisture to the mill enhances pellet durability and this is where adding BRZ helps, because it is a desiccant.

PELLET MILL CONSIDERATIONS

Pellet dies: There are various sizes of holes and hole lengths through the cylindrical shaped die that effect production rates.

Rolls: There are two rolls that force the mash through the dies. The adjustment of the spacing between the rolls and the dies is very critical to extend die life.

Blades: These are adjusted to cut the pellets off to a desired length.

Speed reduction: The speed of the conditioner must be slowed to 90 rpms. This can be accomplished by gear drives or pulley reductions.

COOLER: Pellets from the mill have temperatures as high as 190° F and have 17-18% moisture. The pellets are reduced to 15°F above atmospheric temperature and to 10-12% moisture in the cooler where an airstream passes upwards through the pellets.

PELLET MILL CONTROLLER: The manual operation of a pellet mill is extremely complicated, and can only be successfully run by an experienced operator. The relationship between bound and added moisture and temperature is complex. The pellet mill choke point is at 18% total moisture. Efficient operations are all run using pellet mill controllers.

PELLET MILL TESTING RESULTS - 28 May, 2002

INTRODUCTION

On 28 May 2002, a comparative test of BRZ™ and another zeolite that is currently being used as a pellet binder were conducted at the Ag Canada Research Station at Lethbridge, Alberta, Canada. 10 kgs. of the other zeolite were used per metric tonne and 8 kgs. of BRZ™ were used. The particle size distribution of the two samples was as follows:

PARTICLE SIZE	OTHER ZEOLITE	BRZ™ ZEOLITE
Greater than 100 mesh	18.7%	0.0%
100 x 200	9.0%	51.3%
200 x 325	25.0%	25.6%
Minus 325	46.3%	23.1%

TEST RESULTS

PARAMETER	OTHER ZEOLITE	BRZ™ ZEOLITE
Inlet temperature	106°F	131°F
Outlet temperature	157°F	148°F
Temp. increase due to friction	51°F	17°F
Capacity of pelletizer	75%	95%
Amperage	25 to 35	25 to 30
Outlet moisture	10%	9.9%
Pounds per bushel	49.4	49.25 and 49.5
Pellet durability index (PDI)	95%	95%

CONCLUSIONS

- The inlet temperature was run 25°F higher with the BRZ™ due to the greater water absorption. The higher inlet temperature using the BRZ™ resulted in 1/3 of the friction compared to the other zeolite (17°F compared to 51°F). The temperature is controlled by injecting steam to the conditioner tube of the pellet machine. The operator increases the steam until the machine begins to plug. The indications of plugging include a squealing noise from the pelletizer as the rolls tend to skid over the dies, an increase in amperage, and a burning odor. The other zeolite used began to plug the pellet machine when the temperature reached a little more than 106°F. The BRZ™ did not start to plug until the temperature was above 131°F. The BRZ holds 55% of its weight in water; the other zeolite holds only some 20% of its weight in moisture – this is the reason that the BRZ™ is a more effective pellet binder.
- The lesser friction using the BRZ™ resulted in a 20% increase in the capacity of the pelletizer.
- Although the amperage was slightly lower using the BRZ™, the unit amperage cost of production was significantly less with the BRZ™.
- The BRZ™ afforded a greener color than the other zeolite.
- The outlet temperature of the BRZ™ was 9°F lower than the other zeolite. This is extremely important, because in most pellet operations, the limiting factor is the cooler capacity to cool the pellets.