

TSB GEN 0003

TECHNICAL SERVICE
BULLETIN



**EXTRUSION STEAM EVENTS:
IDENTIFICATION AND
TREATMENT**



PROCEDURE AND RECOMMENDATIONS

If the extruder auger shaft is turning and the die is severely restricted or plugged, immediately stop the machine and clean it out. Do not start the extruder with hard material in the die. Actively plan and execute shutdowns to avoid this. Establishing operating procedures for handling planned shutdowns, shutdowns with high temperature clay in the die, start-ups, and severely restricted or plugged die is important to ensuring safety. If the auger shaft is turning and the die is plugged, the energy from the auger shaft could likely cause a steam event.

DANGERS

Steam events can cause major damage to the machine, creating hazards for people. The large amount of built-up pressure on the die can cause the hinged door to violently swing open, a rapid shear pin failure, a die holder stud failure, causing the entire die assembly to detach from the machine, or a core pin failure, resulting in projectile pin fragments. These are examples of what can happen due to a steam event. Failure of other die assembly components is possible.



STEAM FORMATION

When die flow is restricted or completely stopped, excessive friction builds up in the extruder. The augers are still turning at this point, causing extreme pressure to build up against the die. A large amount of energy is being exerted on the extruder, and that energy has nowhere to go except into the moisture in the material. Uneven moisture distribution in the material causes the formation of moisture “pockets.” Heat goes into these moisture “pockets,” causing the moisture to evaporate into steam and the pressure on the walls of the pocket to increase. The pathway for steam back through the barrel around the rotating augers can close suddenly and unpredictably. When this pressure is suddenly released, the steam has explosive effects.

PREVENTION

Shutting the extruder down with soft material in the die:

1. Turn vacuum off
2. Increase the water in the pug tub
3. Run the machines until the wetter, unconsolidated material exits the die
4. Cover the die to minimize drying
5. Wet or cover the material in the pug tub
6. If the shutdown is going to be longer than a couple days, clean out the die and empty the machine of all material

Shutting the extruder down with high temper dense material in the die and extruder:

1. Turn the vacuum off
2. Cover the die to minimize drying
3. If the shutdown is for longer than a couple hours, clean out the die and empty the machine of all material.

Machine startup:

1. Run the machines without vacuum until the moisture content is consistent
2. Ensure that the die is in working condition and is oiling properly at all locations (if applicable)

If die becomes severely restricted or plugged:

1. **Do not** allow the extruder to run for over 20 seconds
2. Clean out the die and empty the machine of material
3. Keep the die area clear
4. If the machine has run for longer than 20 seconds, allow it to cool before opening the die

OTHER CONSIDERATIONS

- Never add water to material in the pug tub or vacuum chamber once hard, dry material is in the die
- Do not rely on motor amps or belt squeal to predict a steam event
- The shear pin is not a safety device, it is a mechanical drive protection device
- The hydraulic die changer provides the ability to make die changes quickly and easily, which may affect the mill operator's decision to clean out the die
- The hydraulic die changer offers the ability to change the die without having people around the die.
- Steam pressure events can occur with either compression or constant volume augers.
- The temperature of the extruder barrel is not representative of what's going on inside the barrel.
- Pressure can build suddenly and where the pressurized region will occur is unpredictable.
- Die lubricant pressure is not always useful when there is no flow through the die.
- Volatiles in the material can result in an explosive event under the same heat conditions.