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Farming — proper care and maintenance of semen (embryo) tanks

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What is it?

A semen tank is about the same size and looks like a typical gas grill propane tank. However, the difference lies within its internal structure. The semen tank has a double-walled construction. The space between the inner and outer walls is under a vacuum and is usually filled with insulating materials. The inner chamber is filled with liquid nitrogen (LN_2) and is suspended from the outer shell. LN_2's temperature -320F is ideal for storing frozen semen or embryo. LN_2 acts as an inexpensive refrigerant in this capacity. Additionally, LN_2 is relatively inert so it will not oxidize or combust. Precautions should be taken when handling this chemical to prevent contact with bare skin.

Care, maintenance, and handling of a semen tank

Even though the semen tank appears to be a robust structure, proper care and maintenance is required to avoid damaging the tank and its contents. Each tank may contain several tubes (6, 8, 16, etc.) called "straws." Each straw can be removed individually and may be valued at more than $1,000 depending on the pedigree of the semen (embryo). These simple management practices should be followed to avoid damage or loss:

- Keep the tank elevated above concrete floors or other moist and poorly ventilated surfaces. A wooden shelf or platform is recommended. There are good reasons to use wood. Wood can be easily dried. This prevents corrosion damage from moisture accumulation under the tank. Wood also acts as a cushion to soften any sudden shock to the inner chamber.
- Never store the tank on straw or surfaces that may have been contaminated with animal urine or feces. The acidic contamination may corrode the semen tank. Microscopic corrosion pinholes can release the vacuum between the outer and inner walls. The tank temperature cannot be maintained if the vacuum is lost.
- Handle the fragile tank with care. The inner chamber is designed to be supported by the neck structure; a sharp blow to the tank may cause it to swing and crack the neck.
- Observe the tank daily. If a tank failure occurs, the nitrogen will be lost at a rapid rate.
- Monitor the nitrogen levels every week. Record the readings in a logbook.
- Nitrogen gas is colorless and odorless. Always use semen tanks in well-ventilated areas to avoid asphyxiation.

Common problems of a semen tank

The livelihood of farmers and ranchers is dependent upon the contents stored within semen tanks. A loss or damage to the tank contents can be devastating to operations. The semen survival is dependent upon the internal tank temperature. To ensure semen is stored properly, look for the following signs on the tank:

- When a major tank leak occurs, the outer structure of the tank will frost. This can happen when the inner tank, outer tank, or neck fails. If this happens, the semen must be transferred to another tank within hours.
- An isolated frost spot on the outer structure indicates physical contact between the inner and outer chamber. This happens when a dent compresses the insulating material, changing it from a heat insulator to heat conductor.
- Dent on the tank will have minimal effect on the internal temperature, but the LN_2 holding time will be shortened.
- Frosting around the outer neck structure or main cap indicates a slow vacuum leak. This will adversely affect the LN_2 holding time. The tank should be evaluated and repaired by a qualified vendor. This condition usually occurs in tanks that are 10 or more years old.

Filling a nitrogen tank

- Nitrogen tanks are filled through the neck opening. When filling a warm tank, add the liquid nitrogen slowly to prevent the liquid from being carried out by the high-velocity stream of gas venting out the neck. This gas formation occurs while the inner shell is cooling down.
- Fill the tank to three-quarters of the way full and allow it to cool for a few minutes before completely filling the tank.
- The first 48 hours of a warm fill is critical. The tank temperature equilibrium takes about 36 to 48 hours to stabilize. During this time, the LN_2 loss rate will be high and out of specification.
- Once a tank is filled to its desired level, it should be visually checked daily, and the LN_2 level should be checked and logged weekly.

References

- *The Care and Maintenance of Semen Tanks*, Select Reproductive Solutions (SS106-1013)
- *Storing and Handling Frozen Semen*, Penn State Extension (DAS99-10), Michael L. O'Connor, Professor of Dairy Science, Department of Dairy and Animal Science, Penn State

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