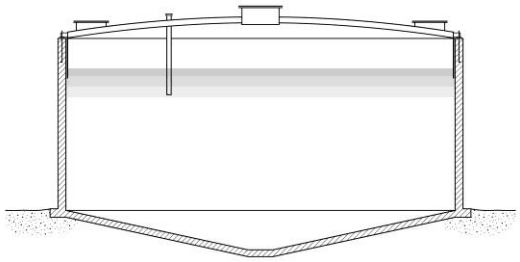
WALKER PROCESS EQUIPMENT
Division of McNish Corporation

Anaerobic Digester Covers

This paper deals with the various types of Digester covers, how they function and where they are used. There are four basic types of covers: Fixed Cover, Floating Cover, Gasholder Cover, and Combination Cover.

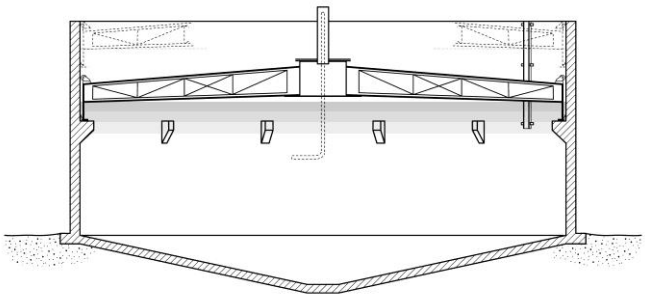


Fixed Covers

Fixed covers are used in digesters with no variation in total volume and are often used on the primary digester in a two-stage system. The sludge volume can be varied but only by varying the gas volume at the same time so as to keep the total volume constant. If gas is to be pressurized for use, it must also have a companion floating cover connected by gas lines.

Fixed covers are anchored to the top of the digester tank and normally there is a static or constant sludge level. Thus the rim plate only need be as deep as the tank freeboard plus the tank operating pressure and an appropriate seal depth to contain the gas. A typical rim plate depth might be approximately 2'-6" with 1'-0" freeboard. A fixed cover has only one steel membrane over its structural framework.

The advantage to this type of cover is lowest cost. The disadvantages are: it will not pressurize and store gas by itself, will not depress scum, and provides little insulating value.



Floating Cover

Floating Covers float directly on the sludge, allowing variable sludge levels. However, practically no gas storage is available and the gas volume is relatively constant. A floating cover provides for submergence of scum and again is often applied on the primary digester in a two-stage system. The floating cover floats on the liquid surface.

Floating covers have a minimum rim plate depth since they float directly on the sludge. This depth is generally about 3'-0". A floating cover embodies both a ceiling plate and a roof plate, forming an attic space, in which are the trusses. Rollers are mounted on the cover roof to provide for travel.

The advantages of this cover are; scum suppression, good insulation due to the attic space, support trusses not subject to digester interior corrosive products, and is very stable. The disadvantages are it is the second most costly of the four types, and it cannot store gas in any appreciable amount.

When used with a gasholder it should be ballasted at 2" water column pressure higher so it "pushes" gas to the gasholder.

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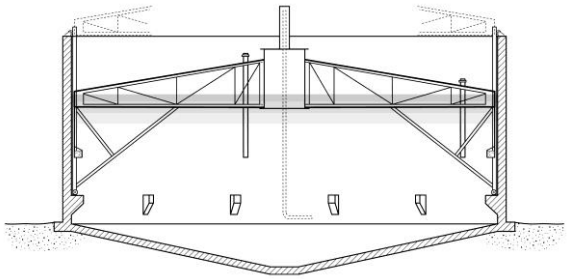


Gasholder Cover

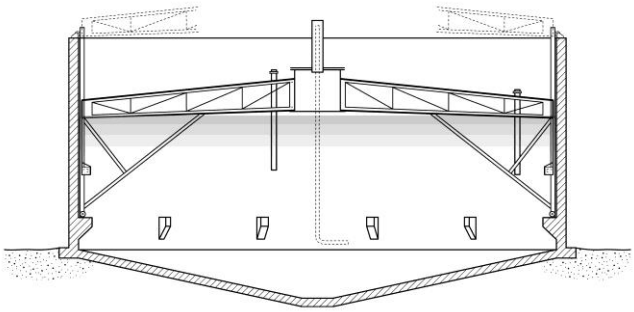
Gasholder covers provide for gas storage by riding on a constant pressure, variable volume gas bubble. Normally this type of cover is used with a constant sludge level and this is the most economical design, and would be applied on a second stage digester.

As a two-stage digestion system, it is desired that all digestion occur in the first tank while the second tank is used for supernatant separation and gas storage.

Gas storage is a necessity since most gas burners will operate on an on-off cycle and in this manner gasholder serves as a "surge" tank.

The rim plate depth on a gasholder cover is determined by the required gas storage volume or travel. Generally, a 5' to 7' deep rim plate is sufficient for most applications. This cover also has one steel membrane over its structural framework. Rollers and long columns are provided for cover travel and to maintain stability throughout its travel range. Note that the ballast is located at the bottom of the skirt to lower its metacenter and increase its stability.

The advantages are; it is less costly than any cover other than the Fixed cover, and that it stores gas for usage by the boiler or other energy producer. The disadvantage is that it has little insulating value.



Combination Gasholder/Cover

The combination cover is the least understood of all, and is probably used for the wrong reason in most instances. In reality, this cover combines features of the Floating Cover and the Gasholder. This can be visualized in two manners:

1. The combination Gasholder/Cover is a Floating Cover with a longer skirt, columns, and with the ballast moved from the attic to the skirt bottom.
2. It is a Gasholder with a ceiling plate added to the bottom of the truss.

Its use may be the most misunderstood part. Some specifications require a Gasholder that will suppress scum and therefore, require a submerged ceiling plate. But, when gas is stored (which is the majority of the time), the ceiling plate is not submerged and therefore not "submerging scum".

The advantages are; it has better insulating qualities than a Gasholder due to existence of an attic, and the trusses are not exposed to corrosive interior of digester.

The disadvantage is it is the most costly of all covers.

Common Features: The above four sections dealt with differences between cover types; following are features commonly used on any digester cover.

A. A gas dome located at the center of the cover provides a gas reservoir from which gas can be withdrawn without also removing entrained liquid, scum, foam, etc.

B. Sampling wells, usually one near the center, one at about 1/2 radius. These wells have quick-opening hatches, with seal pipe extending below liquid, so that samples can be withdrawn without losing gas.

C. Pressure relief and vacuum-breaker valve, mounted atop the gas dome for the purpose of relieving as upon over pressurization, and allowing atmospheric are to enter if vacuum exists when cover on corbels. Basically, this is a safety device, protecting the structure.