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# Closed Ends

## End Closure Systems in Cellulose Casings

The closed end of a stick is designed to perform two functions. (1) Provide a closure which hold the casing as the emulsion pumps out of the stuffing horn during the automatic stuffing operation. (2) The closure also prevents a very fluid emulsion from leaking out of the stuffed strand while it is hanging on the machine.

There are multiple factors which may influence the design of a closed end, making it a surprisingly complex part of the final product. In this section, we will revise these factors.

## Factors to be considered when designing a Closed End

### Stuffing equipment.

In an automatic stuffing operation we usually find two world-wide systems (FAM-like: Townsend, Hitec, Link-master, Cato, and Handtmann PAL/AL) with various different models.

In general, to stuff, link and hang sausages in a continuous operation, each system will need a specific closed end according to the inherent features of the operation.

For example, in PAL/AL machines the stick is loaded onto the stuffing horn, the tube revolves and places the stick in front of the brake and then pushes the stick forward before the stuffing operation starts. In this situation, the closed end must be capable of passing through the brake before the stuffing starts. With the FAM machines, the closed end is pulled out by the action of both, the horn and linking chains. The chains will take some of the closed end out depending on its position. In this case the closed end size has to be carefully designed.

### Machine setting. Stuffing conditions.

The closed end is a critical point as it receives the first blow of pressure and must be capable enough to withstand this force without breaking

and preventing the emulsion from leaking at the same time.

If the stuffer is not finely tuned (good clamps adjustment, correct chuck and horn size, right follower pressure...) we may encounter problems with the closed end.

A bigger chuck size will result in less pressure on the closed end; therefore, we can use a shorter closed end without experiencing the problem of leaking. Overstuffing (i.e.) increases the pressure on the closed end and could require a longer closed end.

Moreover, we should keep in mind that the setting for each machine may be slightly different. In FAM types (i.e.) the first blow of pressure varies from one machine to another (especially in old machines). Although the emulsion could have the same characteristics, the closed-end requirements to contain it will change. In many cases we must find a satisfactory compromise.

## Formulation and viscosity of the emulsion to be stuffed

There is a great variety of meat products. Each of these products has a different recipe as well as a finely or coarsely ground consistency. We will find recipes with a high percentage of lean meat, others will have a high percentage of fat. Some recipes include a mixture of pork, and others only chicken. The percentage of water is also variable.

The use of different ingredients and the percentage used in the formulation will affect the viscosity of the mix, making it 'soupy' or stiff. To avoid emulsion leakage; the more 'soupy' the emulsion is, the longer the closed end requirement will be.

In general, emulsions with a high percentage of water, and formulations rich in chicken meat, will need longer closed ends.

On the other hand, stuffing conditions and stuffing temperatures may range from low (below 0ºC) up to high temperatures. The higher the temperature, the more 'soupy' the mix.

Another factor is the mix blending-stuffing interval. Long intervals between the preparation of the mix to the stuffing operation may vary the viscosity (it will lower it).

## Sausage length.

Sausage length is also important when designing a closed end. Different sizes may need a different closed end length. The shorter the sausage the shorter the closed end will be.

To summarise, we have to note that it is important to check all the factory conditions affecting the closed end, so we can determine the type and length of the closed end required.

In some cases we can make some closed ends by hand and run them in real production conditions to get a first impression of what the needs are as the customer.

Most importantly, do not jump to quick conclusions about the type of end closure required since in many cases it is more complicated than it looks at first glance !!

## Closed end Systems in Cellulose Casing

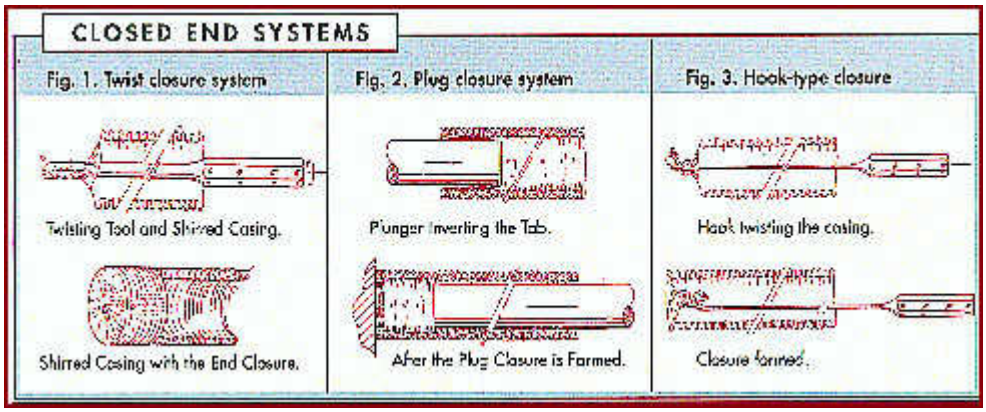
In order to ease the stuffing process, casing manufacture companies have developed different systems for closing the end of the stick. Although all of them aim to offer a safe closure for an automatic stuffing operation, the manufacturing procedures are different.

All systems are based on research and generally protected by patents.

Fig. 1.Twist closure system.

Fig. 2. Plug closure.

Fig. 3. Hook-type closure.




## Types of Close Ends in Viscofan Cellulose Casings

VISCOFAN S.A has developed different types of closed ends, all based on the inversion of the casing into the end of the stick:

### 1. Open end ( no closure):

Suitable for manual or semiautomatic stuffers, where the stick is loaded manually.

### 2. Standard closed end:

This is the most commonly used type of closure(95% of the cases). Not all calibers have the same closed end dimensions: the smaller the inner diameter the smaller the closed end is. This is based on the fact that as the inner diameter decreases there is less room for the closure and less need for it.

### 3. Special closed ends:

**Short closed end:** Designed for less than 5cm long sausages(‘Cocktail‘ Type).

**Long closed end:** Designed for more than 20cm long sausages(‘Jumbo‘ sausages) or shorter sausages with ‘soupy‘ emulsions. If a stiff emulsion is used, the standard close end might also work.

**AL/PAL closure:** Modifying the stuffing conditions in AL machines allows any closed end to be suitable. However, to ease production and to avoid any problems we may encounter, an AL/PAL closure has been designed according to the specific features of these models. The knot-type is also commonly used although it should not be considered the only alternative. We always recommend the AL/PAL closure in these machines.

**Knot-type:** Together with the above close end, this type of closure is usually utilised in Handtmann PAL/AL machines, in which the very first blow of pressure delivers the exact portion weight making the first portion suitable for use.

The knot-type closure is not recommended in a FAM type machine. Firstly, it requires fine tuning in this type of machine. Secondly, the length in the first sausage must always be the same and we need to avoid air inclusions in the sausage when stuffing commences. Lastly, the knot poses a difficulty in the hanging operation when withdrawing the excess emulsion of the first sausage after the tying of the sausage.

**Tailor-made closure:** Designed for special customers.

## Problems we may encounter Related with the Closed End

When investigating a closed end problem, it is very important to identify either if it is a closure failure or a breakage.

### Close End Failure

The type and length of the closed end is an important feature to be considered when a failure is suspected. Should this be the case we will measure the closed end length.

### Breakage

Since the closed end is positioned at the beginning of the strand, if there are problems of breakage related to the closure, these problems will occur at the beginning of every stuffing cycle.

We have to take into account that there are other possible causes of breakage that can cause problems similar to those related with the closed end. These might include, casing clamps too tightly closed, small chuck, or a high follower pressure (>18 psi). It is also important to determine if the problem affects the whole strand and only appears to be associated with the closed end because it is the first part to be stuffed.

In general, we will find that in smaller calibers the closed end is more critical than in bigger calibers. The reason is simple: when stuffing big

calibers we use bigger horn sizes and meat pumps work at lower speed, not compromising the closed end.

We can summarise several causes of breakage related with the closed end:

**1. Strand bent at the closed end.**

Rarely, we may find that some strands are bent specially at the closed ends so when the follower pushes the strand, if not centred, it will break it against the chuck walls. It may happen more frequently in small calibers(13EUR/14USA, 14EUR/15USA). If you come across a problem related to bent strands change the caddy or case for a new one.

**2. Very tightly made closed ends.**

In this case, when the feeding pump starts, instead of deshirring the closed end, a portion of the strand without deshirring may get entangled in the linker or break against the chuck. This effect can be aggravated if the clamps holding the stick are too tight. To solve the problem, release the clamp tightness. We can also check ourselves how tight the closed end is, by using a rod and trying to push it out.

**3. Chuck twisting continuously in Frank-A-Matic type machines.**

The FAM´s have two different possibilities of running: one is when the chuck stops twisting at the end of every stuffing cycle and there is another when the chuck is twisting continuously. The first one is better for the casing (mainly for the closed end). The reason is that when the stuffing horn gets into the strand it pushes the closed end out before the pump feeding starts. It is only a fraction of a second but may be enough for the closed end to get entangled at the chuck. This problem can be minimised using a special type of closure. Nevertheless, try to persuade operators to change this feature on FAM.

**4. Closed ends very long.**

When stuffing starts and the horn pushes the closed end out, if too long, it may get entangled in the linker. Should this be the case a shorter closed end will have to be tested.