

Agricultural processing brochure

Brochure content:

- Introduction
- Process description
- Other processing options
- Energy Advisory Services
- References

Processed meat groups:

- **Whole** meat products
- **Minced** meat products
- **Emulsified** meat products

Yield:
1.029kg
of meat will
yield
approximately
1kg of
Corned meat

South African farmers facing current economic realities are searching for new options to maintain or expand their businesses. One of the many opportunities to grow markets, turnover and profits is by adding value to farm produce. Options need to be selected carefully based on sound information and knowledge of the opportunities presenting themselves, taking into account the strengths and weaknesses of individual farms.

Introduction

Product group: Meat products

The deregulation of the meat industry has provided opportunities for livestock farmers to slaughter, process and market their own animals. Abattoirs on farms are quite common these days.

Alternatively, approved meat can be brought in for processing. Meat is a very versatile food substance with a wide variety of processed product possibilities. Processed meat products are classified into three broad groups, based on the size of the meat particle used:

- **Whole meat products** – muscle tissue is still clearly recognisable and defined in the end product (e.g. ham, bacon, pressed pork or beef);
- **Minced meat products** – meat structure has undergone a degree of breaking up, for example in a mincer, and the meat is no longer in a fibre form, but particle form (e.g. salami, fresh sausage, hamburger patties, meat balls etc.); and
- **Emulsified meat products** – the muscle tissues have been finely minced and are not recognisable any more in the fibrous or particle form (e.g. frankfurters, viennas, polonies and meatloaves).

Product description: Corned meat products

Corned meat products refer to cured beef or mutton cuts that are cooked or canned with optional added seasonings and starchy ingredients.

- Corned beef is cured beef with less than 20% fat, and may be processed without additions (solid pack)
- Corned mutton is cured mutton with less than 25% fat, and may be processed without additions (solid pack)
- Pastrami is seasoned smoked beef that may contain salt, nitrite and nitrate in a pickle mixture.
- Corned beef with cereal is cured beef with less than 20% fat, and it may be processed with the

addition of less than 6% starchy material.

These products manufactured under the SABS standard specifications may not contain mechanically recovered meat or added phosphates.



Photo source: www.google.com

Process description:

Deboning and trimming of meat for corned meat products.

Deboning is the careful and precise removal of meat from bones to enable reshaping, moulding and ease of cutting of meat after cooking. Trimming is the deliberate removal of undesirable pieces of meat, fat, sinew or glands. Deboned cuts are easier to cure and shape.

Preparation of brine for meat

Dry salt mixtures can be obtained commercially and require minimum preparation prior to use. As an alternative, brine can be prepared by selecting, weighing and mixing specific ingredients such as those listed below:

Other ingredients:	
Ingredient	Reason for inclusion
Salt	Taste, preservative, solution of salt soluble meat proteins, texture and adhesion
Nitrate/Nitrite	Colour development, taste development, preservative
Polyphosphate	Water binding, buffer systems
Sugars	Balance saltiness, colour stabiliser *
Citrates	Water binding, buffer systems
Non-meat proteins	Water binding, texture improvement
Gums	Water binding
Flavourings	Taste improvement
Starches	Water binding **

*Requirements of the South African Standards specification must be adhered to.

**Requirement of the regulation published under the Foodstuffs, Cosmetics and Disinfectants Act 54 of 1972 must be adhered to.

There are few rules to be adhered to when preparing your own brine.

1. The water temperature must not exceed 10°C.
2. A high-speed mixer is the most effective way to dissolve brine components.
3. The phosphate must always be added before the salt. If the salt is added first, the phosphate will not dissolve.
4. If soy isolate is used as a non-meat protein, it must be hydrated with water before any other brine component is added. If salt is added before the protein, it may lead to incomplete protein hydration.
5. After all the above rules have been complied with, the other components may be added in any sequence.

The brine ingredients can also be applied dry, where it is rubbed on or mixed with meat cuts.

The curing agents are solubilised in the moisture naturally present in the meat and penetration is as a result of diffusion (1 – 1½ day per kg product at 2 - 4°C)



Temperature also has a great influence on the duration of curing. Traditionally curing took place at **3 - 5°C.**

Curing meat

Curing involves the application of salts, together with colour fixing ingredients and seasoning to meat to attain unique properties. These properties include colour stabilisation, flavour modification, textural changes and a reduction of shrinkage during processing.

Several methods of curing meat are available. Traditionally meat was preserved by heaps of dry salt (the so-called *dry cure* method). The curing agents are solubilised in the moisture naturally present in the meat and penetration is as a result of diffusion (1 – 1½ day per kg product at 2 - 4°C). This method is rarely used today since it involves long periods of curing, drying and maturing.

The first major departure from the traditional dry cure method was the introduction of a solution of curing salts, called a *brine* or *pickle*, in which the meat was immersed (tank curing or *Wiltshire curing*). This method of soaking whole meat cuts in brine solutions overnight greatly speeds up the curing process while reducing the quantities of salt required. Small-scale operations most often use the immersion method, where the meat is rubbed with salt prior to a 4 - 14 day immersion period at 4.4°C.

The traditional Wiltshire cure has greatly been replaced by the *sweet cure*, which produces a blander flavour due to a lower salt content and added sugar. Sweet cure is widely used in conjunction with reshaped meat cuts.

The curing process is even further shortened through the injection of the brine into the meat. *Injection curing* involves pumping the meat with approximately 12 - 14% brine, followed by a 2 - 3 day immersion period in brine without added nitrate. This ensures more uniform diffusion of brine. Injection can be done with a single needle (small-scale production), or multi-needle mechanical injectors (large-scale operations). Injectors make use of a process called "stitching" or "pumping" whereby the brine is injected at pressures of no more than 4 bar. Manual injection is very effective when carried out by a skilled operator. Automatic multi-needle injectors are specially developed for highly uniform injection of meat cuts of similar weights.

The meat is generally pumped 12 - 14% above its weight with 72° Salometer (salinity of the brine) brine containing 17 - 22% salt, 0.1% sodium nitrite and 2% sugar. Spices are occasionally added to improve flavour. The cured meat is stored in stainless steel containers that are resistant to corrosion.

The curing temperature also has a great influence on the duration of curing. Traditionally curing took place at 3 - 5°C. The process can be accelerated to 15°C, but this requires very careful control due to bacterial growth.



Photo source: www.google.com

Brine diffusion

In the case of injection-cured meat, the brine is not immediately diffused evenly in the meat. Brine equilibration can be achieved by simply storing the meat for a few days (diffusion storage) so that brine diffusion can take place naturally. Brine diffusion can also be hastened by tumbling and massaging equipment that has been specially designed for this purpose.

Tumbling and massaging involves rolling meat inside a machine to bring about mechanical tenderising and/or to distribute curing solutions evenly throughout the product.

Take note: massaging and tumbling is only suited for deboned meat cuts.

A **massager** is a free-standing container with a rotating bar and oars inside. The meat is placed in the massager with about 5% free brine.

The duration of a typical massaging treatment is about 18 hours. Each one-hour cycle comprises of:

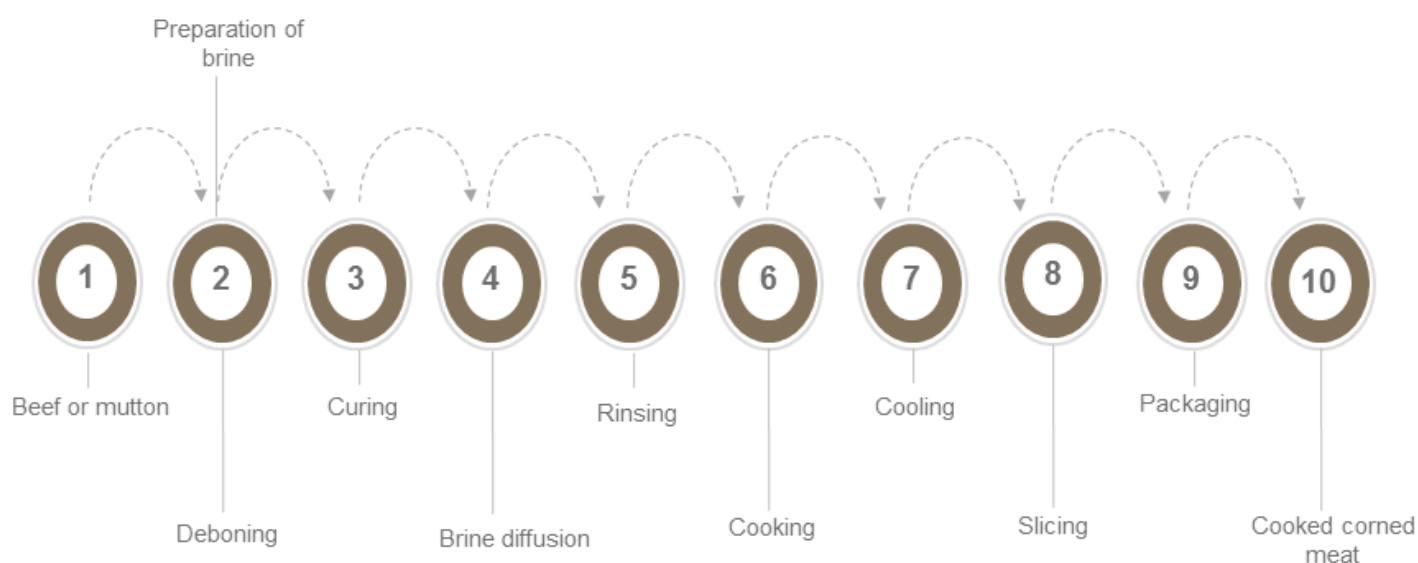
- 20 minutes rotation clockwise
- 20 minutes rotation anti-clockwise
- 20 minutes resting period

A tumbler is a rotating stainless steel container that tumbles head over heels. During the tumbling action the meat is constantly falling from top to bottom. It is thus a far more drastic process compared to massaging. The duration is usually shorter than massaging while the rest period is longer. Some companies tumble continuously for 1 - 2 hours followed by a 12-hour rest period, followed by a further tumbling cycle of between 30 minutes and 2 hours.

Other advantages of tumbling and massaging are:

- Applied energy increase extraction of proteins, which leads to better binding during cooking.
- Mechanical action causes limited muscle/tissue damage and that improves protein solubility and consequently water absorption. This leads to increased cooking yield due to reduced water loss.
- It improves the fragmentation of the end product if desired.
- Smaller pieces of meat can be used. These can then be pressed into different shapes and sizes for the convenience of the consumer.

Process overview



Rinsing of corned meat products

Excess curing solution is removed by rinsing the products with potable water. The rinsed products are dried with disposable paper towels.

Cooking of corned meat product

Corned meat products are cooked in steam cabinets or immersed in hot water. The simplest procedure is to set the temperature of the steam cabinet at 80°C and then to cook the product to an internal temperature of 72°C. Cooking time depends on the weight and dimensions of each individual piece of meat, but it is advisable to have similar shaped and sized pieces of meat in one batch. A rule of thumb is 25 - 35 minutes cooking time per 500g product.

Cooling of corned meat products

Cooling involves extracting heat from the product to decrease its temperature using an appropriate device such as a heat exchanger and a medium such as water, air or refrigerant.

The cooked product must be cooled to 4.4°C within 6 hours to ensure optimum quality. The hot meat is removed from the steam cabinet and cooled as quickly as possible under cold water showers. The cooled products are placed in a cold storage room for 12 - 15 hours to reach a final temperature of 0°C.

Slicing of corned meat products

Cooked corned meat products (e.g. beef-bacon) can be sliced prior to retail packaging. The thickness of the slice can vary greatly, depending on the intended use.

Packaging of corned meat products

Whole cuts and slices are vacuum packed for retailing.

Labelling of corned meat products

The products are labelled/printed with the necessary information.

Labelling in South Africa is controlled by legislation. Anyone who wants to use the information provided in this document must familiarise him/herself with all the applicable laws that apply to the producing, processing, manufacturing and storage of the products referred to in this document.



Other processing options:

Listed below are other processing options for *whole muscle meat* products not covered in this report, but available from Eskom. Other processed meat products are also available from Eskom.

Bone-in ham or gammon is the pickled whole hind leg of pork. The skin and fat can both be removed, or both are retained or only the skin removed. Smoking of the ham is optional.

Canned corned meat products are cured beef or mutton cuts that are cooked and canned and may contain seasonings and added starchy ingredients.

Cooked ham is usually deboned and reshaped ham that is cooked to coagulate the meat proteins and retain the new shape, although bone-in-ham can also be marketed as cooked ham.

Dry cured ham is manufactured using the traditional curing method whereby the meat is covered with dry salt. The salt and other curing agents are solubilised in the natural moisture present and penetration is as a result of diffusion.

Sweet-cure bacon is the boned rib and loin chops of pork with no fat removed. It may be either dry salted or brined and then smoked. It is sold raw and sliced. The meat to fat ratio should be no less than 3:1.

Wiltshire bacon is the generic term given to traditional tank cured bacon.

Canned bacon is Wiltshire or sweet-cure bacon that may be sliced or chopped into pieces and canned with or without added ingredients.



Energy Advisory Services

Eskom's role is to aid the client with basic information in the decision-making process. Thereafter the Eskom Advisor will fulfil the role of energy advisor as part of the team that is selected

Optimise your energy use:

Eskom's Energy Advisors, in regions across South Africa, offer advice to business customers on how to optimise their energy by:

- Understanding their energy needs.
- Understanding their electrical systems and process.
- Investigating the latest technology and process developments, including electric infrared heating and drying systems.
- Analysing how to reduce energy investment costs.
- Optimising energy use patterns in order to grow businesses and industries

Call 08600 37566, leave your name and number and request that an Energy Advisor in your region contacts you.

Alternatively, e-mail an enquiry to advisoryservice@eskom.co.za



Alternative funding

Five alternative funding product offerings are available to help reduce your investment costs for new agro-processing or agro-beneficiation businesses or to expand/improve an existing agro-processing or agro-beneficiation business.

For more info visit: [http://www.eskom.co.za/sites/idm/Business/Pages/ Alternativefunding.aspx](http://www.eskom.co.za/sites/idm/Business/Pages/Alternativefunding.aspx).

Literature sources

1. Forrest, J.C et al. 1975. Principles of Meat Science. San Francisco: W.H. Freeman
- Nickerson, J.T.R & Ronsivalli, L.J. 1982. Elementary Food Science. 2nd ed. Westport: AVI Potter, N.N. & Hotchkiss, J.H. 1995 Food Science. 5th ed. New York: Chapman & Hall.
2. Price, J.F. & Schweigert, B.S. 1987. The Science of Meat and Meat Products. 3rd ed. Westport: Food & Nutrition Press.
3. Rust, R.E. 1976. Sausage and Processed Meat Manufacturing. American Meat Institute Center for Continuing Education.
4. South African Standard Specification: Packaged meat products (processed or manufactured) SABS 885:1974. Pretoria: South African Bureau of Standards.
5. Varnam, A.H. & Sutherland, J.P. 1995. Meat and Meat Products: Technology, Chemistry and Microbiology. London: Chapman & Hall.
6. Google free images: Product and other photos were sourced from Google images using a filter: Free to share and use commercial

Disclaimer The reader's attention is drawn to this notice which contains a limitation of risk or liability of Eskom, and constitutes an assumption of risk or liability by the reader or an indemnification of Eskom. The reader acknowledges that he/she has made she/he aware of this disclaimer and is aware that the disclaimer limits the liability of Eskom. The aim of this document is solely to provide the reader with some basic information on agro processing in order to understand the extent of the operations involved. The reader should familiarise him/herself with all applicable laws that apply to the product growing, storage, processing and manufacturing. This information concentrates on the sequence and steps involved in the processing of the selected product, and explains the reason and necessity of each step. It is not a complete reference document on which calculation and design shall be based, nor was it ever intended to be. While Eskom has made every attempt to ensure that the information contained in this brochure has been obtained from reliable sources, Eskom does not accept any responsibility or liability for the accuracy, content, completeness, legality, or reliability of the information contained in this brochure, and the readers or users are required to also make their own independent enquiry, before relying upon same. All information in this brochure is provided "as is" with no warranties, promises and/or representations of any kind, expressed or implied, as to the nature, standard, accuracy or otherwise of the information provided in this brochure nor to the suitability or otherwise of the information for a purpose. Computer generated images, walkthroughs and rendered images used in this brochure are the artist's impression and are indicative of the actual designs. The imagery used in the brochure may not represent actuals. Eskom shall not be liable to the reader for any loss or damage of whatever nature (direct, indirect, consequential, or other) incurred by the reader as a result of any action or omission related to the information provided in this brochure. The reader shall indemnify Eskom against any claim or action instituted by a third party as a consequence of the actions taken in relation to the contents of the brochure, emanating from any area of law.