

Agricultural processing brochure

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Processed meat groups:

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

Yield:

0.583 kg lean meat will yield approximately 1 kg of Russians

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 for livestock farmers the means 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 particles 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: Russians

Russians are cooked, smoked sausages made of minced pork, beef and fat, embedded in a meat emulsion, flavoured with paprika and stuffed in pork casings. The meat emulsion gives the product a firm texture.

Another related product, called *cooked salami*, is prepared in exactly the same way as Russians, but stuffed in large casings with netting to resemble the traditional (fermented) salami. Cooked salami is not a fermented product.

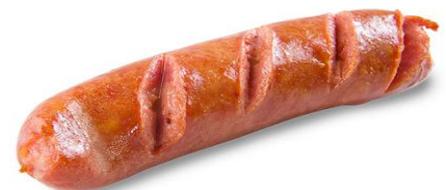


Photo source: www.gql.co.za

Process description: Ingredients for Russians

Meat: A mixture of lean and fatty pork and beef (cured or uncured) is used. If the meat is too lean, fat can be added.

Fat: When additional fat is required, pork lard can be added, provided that it is not older than 3 days and contains no skin.

Ice and water: Ice or potable water is included into the formula to control the temperature during mincing. The quality of the water used both as an ingredient in any meat product, as well as a cooling agent, is of major importance. Potable water is defined as water free from suspended matter and from substances that could be harmful to the products or to human health, must be used. In addition, the water should be treated (by flocculation, filtration, chlorination or other acceptable processes) to ensure compliance with the following microbiological requirements:

- Total count shall not exceed 100 per ml;
- Coliform organisms shall not exceed five organisms per 100ml, and
- Faecal coliform shall not be detectable in 100ml of the water

Edible offal (where permitted) such as heart, liver, tongue and kidney must be limited to 5% by mass of the product and must be declared in the ingredient list on the label when used.

Casings: Pork intestines (size 32 - 34) are the most popular choice for Russians, but other natural casings can also be used. Natural casings are produced from the cleaned intestines of sheep, pigs and cattle. Pig and sheep intestines are sold in bundles of about 100m, packaged in dry salt. These intestines are stored at 4°C and rinsed in cold water before use. The casings are allowed to soak for 45 minutes at room temperature.

Natural casings are delicate and easily broken during stuffing or linking and could therefore be substituted by edible collagen casings. Natural casings are permeable to moisture and smoke, and thus shrink during processing, thereby remaining in close contact with the surface of the sausage.

Other manufactured (synthetic) casings can also be used and include the following:

- Cellulose - close to natural casings, but must be removed before consumption
- Inedible collagen - very strong
- Plastic casings are not suitable since they are impermeable to smoke and water, and therefore not suitable for Russians. Cooked salami is stuffed in large artificial casings with netting.

Other ingredients:

Ingredient	Reason for inclusion	Inclusion levels
Salt	Taste, preservative, solution of salt soluble meat proteins, texture and adhesion	0 - 5%*
Nitrate/Nitrite	Colour development, taste development, preservative	100 - 160ppm**
Polyphosphate	Water binding, buffer systems	0.2 – 0.5%**,*
Sodium ascorbate	Reduction of curing time, colour stabiliser - only in minced/chopped products	500ppm**
Citrates	Water binding, buffer systems	0.006 – 0.1%**
Non-meat proteins	Water binding, texture improvement	2.0 – 3.5%**,*
Gums and starches	Water binding	2.0 – 3.5%**
Flavourings	Taste improvement	
Sweeteners	Improve water retention and taste	0.5 – 1.0%**
Natural binders	Improve water retention, water binding and texture improvement	8%*

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

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



Mincing of meat for Russians

The lean meat (80/20 = 80% meat and 20% fat) and fatty meat (50/50 = 50% meat and 50% fat) are separated before mincing since they require different mincing operations. Lean meats are minced to a finer consistency than the fatty meats.

The 80/20 pork and beef is passed through a 3mm die (aperture size of final sieve plate in mincer) while the remaining fatty beef and pork (50/50) is passed through a 13 mm die to form a very coarse mince. The temperature of the meat and fat during mincing should be below 5°C to ensure clean-cut particles.

Chopping of ingredients for Russians

The finely minced lean meat is placed in a bowl cutter together with the salt, curing agents and half of the water. Chopping is halted as soon as the mixture reaches a temperature of 8.5°C. At this point the mixture should be a uniform, sticky and suitable for emulsion stabilisation.

transformed into the emulsion in which the coarse minced meat particles can be embedded. It is particularly important that the meat extenders and starches should be added after protein extraction has taken place, since they are hygroscopic and will absorb a lot of moisture, making it less available for the solubility of proteins.



Chopping is halted when the mixture reaches a temperature of **8.5°C**

The minced fat, meat extenders, starches and remaining ice water are added and chopped until a the temperature increases to 12 - 16°C. At this point the minced meat and other ingredients have been

The remaining coarsely minced meat is added last and chopped only for a few seconds until a uniform mixture is formed. Excessive chopping will result in the loss of the coarse texture of the meat and fat that is desired for Russians.

Stuffing of Russians

A great variety of stuffing equipment is available to the meat processor, varying considerably in capacity. Hand-driven models generally offer from 5 to 15 liter capacity. Continuous fillers are also available and, although very expensive, the best option for large-scale operations because of their versatility. Continuous fillers are equipped with additional equipment such as portioners, link twisters or casing clipping units. Fully automated hydraulic fillers range from 50 to 500 liters.

undesirable discoloration. Stuffing temperature of the meat mixture is a critical factor. As the temperature increases, the fat starts to smear, producing a very unattractive product. A temperature of 1.5°C is ideal.



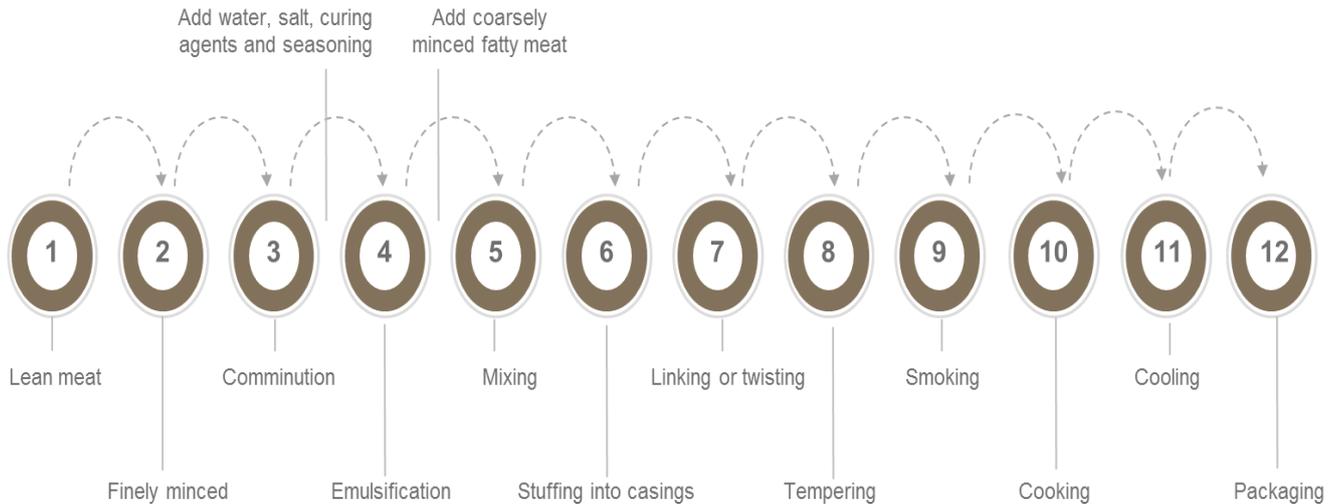
Variety of filling equipment is available to the meat processor

Hand-driven fillers are ideal for small-scale operations but require a skilled operator. As the casings are filled with meat, it should be carefully supported and allowed to slide off the filling funnel. To prevent uneven or overstuffing, the sausage casing is held firmly between the fingers of the operator.

Natural casings should be rinsed in water and stripped of all excess water before being placed on the stuffing nozzle. Excess water in contact with pork meat causes

Cooked salami is stuffed tightly into large casings with netting and the ends clipped with metal clips or tied with strings.

Process overview



Linking of Russians

Linking involves twisting the length of sausage at specific intervals to create a partitioned product. The length of the link depends on the demand and end use of the Russian. Linking can be done manually or mechanically, provided the casings are of good quality.

Tempering of Russians

Tempering involves allowing a semi-processed product to stand for a specific period of time before processing is resumed. This allows certain reactions to take place in the product that would facilitate or aid subsequent processing procedures.

The linked sausages are hung on racks at room temperature to provide for the development of colour of cured meat pieces (if included), and to allow for the surface to dry naturally.

Tempering can be accelerated at 50 - 55°C for 20 minutes at low humidity. This can take place in a drying or smoking cabinet.

Smoking of Russians

The original purpose of smoking is to flavour, colour and preserve meat. Today the preservative effect is less important.

Russians are smoked for 30 minutes at 65°C. Smoking enhances the flavour of the Russians and partially cooks the meat. Traditionally, meat was smoked in barrels over burning wood. Today, smoking is a much more controlled process that requires a smoking cabinet where smoke can be generated by controlled combustion of moist sawdust or a rapidly moving steel plate against a log. Smoke is then carried into the smoke chamber by fans. Smoke can be given an electric charge and electro-statically deposited on the meat surface. Cold smoking is used with smoked meats combined with other techniques e.g. salting and drying.

Oxygen is one of the factors which needs careful control during smoking since it has a definite effect on the amount of smoke generated and thus the colour and flavour of the meat. Other important process parameters are the temperature of smoke and the humidity inside the smoke cabinet. Air circulation is critical since it influences oxygen supply, temperature and humidity.

The recent interest in alternative methods of smoke application arose from the consumer's demand for healthier food. Air pollution, time constraints and the need for more critical quality control were also contributory factors.

Cooking of Russians

Cooking is necessary to coagulate proteins and to fixate the desired shape and colour of the product. The smoked Russians are cooked in a steam cabinet or through immersion or spraying with hot water.

Cooling of Russians

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

Packaging of Russians

Packaging is defined as the containment of a food product in a protective barrier that prepares goods for transport, distribution, storage, retailing and end-use.

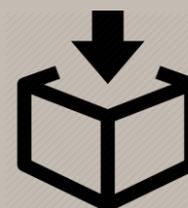
Liquid smoke flavouring in the form of an aqueous or oil solution of natural hardwood smoke has been successfully introduced into the market. Liquid smoke is available in various acid strengths.

As the acidity increases, so does the smoke flavouring potency. It may be applied directly into the meat mixture or used as a surface application. The penetration of surface applied liquid smoke after is greatly enhanced at temperatures around 37°C. Although liquid smoke has its advantages, it is left to the processor to decide which method is preferred.

The minimum processing required is at 76 - 82°C, until an internal temperature of 70 - 72°C is reached. Cooking time depends on the weight and dimensions of the sausage.

The cooked Russians should be removed from the steam cabinets or cookers and cooled immediately under cold water showers. The cooled Russians are then taken to a cold room for storage and further cooling to below 4°C.

Russians are usually packed in shrinkable vacuum bags. This protects the product from fat oxidation while kept under in refrigerated storage for retail display. Russians can also be sold without retail packaging.



Labelling of 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

Below is a list of minced meat products not covered in this report, but available from Eskom.

- **“Droë wors”** is minced and seasoned meat (beef or venison) and fat that is stuffed in a thin, natural casing and left to dry naturally.
- **Fresh sausage** is prepared from minced meat that is uncured, seasoned with salt and spices, and stuffed into casings without smoking or cooking. Examples include “boerewors”, beef sausage, pork bangers and mutton sausages.
- **Frozen hamburger patties** are shaped, minced meat products containing added ingredients and seasoning that may be crumbed and flash-fried before freezing.
- **Hamburger patties** are minced meat products containing added ingredients and seasoning which is pressed into a round, flat shape. Variations include bacon burgers and lamb burgers made of pre-cured pork and lamb respectively. Other variations include cheese patties and microwave patties.
- **Salami** is a fermented chopped meat product. Fermentation reduces the pH to below 5.3. The product is also dried to remove at least 20% of the moisture.
- **Uncooked smoked sausages** can be cured or uncured, seasoned, stuffed into casings and smoked but not cooked before sale.

Energy Advisory Services

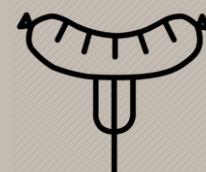
Eskom's role is to aid the client with basic information in the decision-making process. Thereafter the Eskom Advisor will fulfil the role of energy advisor as part of the team that the farmer selects.

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- Understanding their electrical systems and processes
- Investigating the latest technology and process developments, including electric infrared heating and drying systems
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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>

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