

Trends for improving the slaughter line for beef meat

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The basic requirement with high capacity mechanized slaughter lines, is that their construction permits all operations, which are to be done on the carcasses, are made on the line without detachments change of rhythm of the line or speed as well.

In modern slaughter lines involving a high degree of mechanization of transport and production operations, bleeding, dehiding, eviscerating and cutting the carcass in two, are made during movement of the carcass, without any interference of the line itself.

The operation of rehandling the carcasses, in the present technical level of these lines, is done manually while the carcasses are not moving.

This point makes these lines still not up to date in connection with the requirements for a non stop line, with a full synchronisation and keeping the regular distance between the carcasses.

There is a division of the line in two sectors. The mechanization of transport in this case is effected with two transporters, which makes it heavy, expensive and unpractical.

Very often, one of the most important effects which should be shown — the synchronization of the transport of the carcass along with the rest of the parts separated from the carcass itself — the legs, head, viscera and others, could not be achieved, thanks to the still unsolved moment of the still sector for the rehandling, which in turn creates difficulties for the veterinary inspection.

For the full toilette of the carcass, including dehiding and separation of the subproducts, it is necessary to free the part of the carcass through which the carcass itself is attached to the line, namely the hind leg.

This is usually done by the operation «rehandling».

Well known are a number of devices and methods for the accomplishment of this operation. According to their mutual points, they could be grouped into three groups:

Group I

The operations are done in horizontal position of the carcass, already bled on the ground, or lowered bled from the transport line.

After the operations on the legs while the carcass is on the ground, by some hoisting device using hooks, the carcass is lifted to the transport line.

In this country, the said methods have found their natural application with the small slaughter plants, where the work with big animals is still done with hoisting devices. With the vertical work on the carcass these methods are not employed in the socialistic countries.

Such methods are employed in some slaughter lines in the west countries. The meat plant in Essen, export plant Hamburg, Bochum and others in West Germany.

Characteristic is the method in the meat plant in Magdeburg DDR, where the carcass after being debled is placed on a plate transport system in the floor, where the necessary operations are done and from there is hoisted to the line itself.

The horizontal work with the carcass is applied in the constructions of the American firm Albrecht Nell — specialized company for the production and assembling of the meat packing industry and slaughter halls.

The said system is used in the constructions of the modern meat packing plants in Jugoslavia »Gavrilovich» and »Venac» in the town of Novi Sad.

The horizontal position of the carcass while the rehang operation is done, involves quite a few disadvantages:

The lines are expensive and the exploitation is complicated by involvement of additional devices for lowering and hoisting the carcasses.

The number of the non productional operations is augmented as well the needed surface and the weight of the metal construction itself. The horizontal position of the carcass, makes necessary the workers to stay bended, in an unnatural position, which in turn handicaps the output and quality. The principle of line production is not followed, and in turn the regularity and veterinary control are highly effected.

Group II

This group puts together the cases in which, the slanting sections of the lines are used. With the denivelation achieved, the weight of the carcass is transferred from one to the other hind leg while the operations are effected on a free hind quarter.

This method is applied while the hoisting is done by one hind leg or by both legs together.

In our country the method was experimentally introduced in the combined slaughter hall in the meat plant in Karlovo.

On the same principle works the line in the central meat plant in Hamburg.

The testing assembly, which did not show good results, is that constructed in Rotterdam, Holland, where this method is combined with a special assembly for nonstop deviding the carcasses.

The method with a loop for both hind legs while hoisting is introduced in the Soviet Union, West Germany, and the meat packing plant in Sofia.

The described in the second group method for rehangng, is widely applied in the Can-Pack lines, introduced in the meat packing industry in the United States and Canada.

The systems categorized in the second group show the following disadvantages:

The constructional design of the denivelation in the production of the hanging transport lines involves a complicated and heavy construction. The fact, that especially in this section of the line the weights are the greatest and the dynamic loads in letting the carcass fall on the slant are very high, leads to an overloaded and complicated carrying construction in the point of rehangng. For achieving the necessary height of the line, after the slanting section, it is necessary that the carcass is hoisted to a considerable height, which in turn needs a bigger height through the building itself, longer transport lines, complicated heavy carrying construction and assuring the necessary height of the work places for the operations on the carcasses.

To a great extent is augmented the number of the nonproduction all operations. These are effected with force for moving the carcasses on the slants, while additional brake or starter devices are put in operation. The fixed distance between the two lines in the rehangng is the same for the two end books, but it does not always answer the best position for the tendons of the hind legs. This leads to the necessity of picking hooks with a different length of the loops after the size of the carcasses. The fact, that in this case there is an additional physical force applied in putting the hooks, hinders to a great extent the work process.

The imperative reverse row of events in employing the operation rehangng with a common loop — first opening the Achilles tendon, followed by further operation on the parts of the leg under the jumping joint, show a very conspicuous inadequate sanitary hygienic situation. Operation on the hind legs in a static position of the carcass, renders the whole process un-rhythmic and creates possibilities for piling of not processed materials.

Group III

This group is characterized with the fact that by use of singularly acting hoisting and lowering mechanisms, the weight of the hanged material is transferred from one leg to the other. Between this operation the free leg is being processed, after which it is hanged again by means of a hoisting device to the transport line.

In this group could be attached, the so called Dresden way of hanging, which with some modifications is introduced in the lines in Rousse and Var-na. In this case the hind legs of the carcass are tight by means of a double chain. On the same principle is constructed the slaughter line in Nurnberg and other places.

As drawbacks of this method of rehangng could be showed the following:

The assembly of the auxiliary devices for mechanizing the process of rehangng, needs additional heavy construction.

The operations effected by the auxiliary devices are in general hindering the line and manpower output.

The cost of these devices, is sometimes very high. This in the offerings from four big European firms, for the construction of a similar line for 200 animals per shift, the respective prices for the auxiliary devices for the rehangng to the mechanized line, are the following:

Stohrer, Austria	\$ 1738
Laska, Austria	\$ 383
Grenco, Holland	\$ 260
Seffelaar Looyen, Holland	\$ 1355

The different firms offer different devices, giving the speed and layout. These are usually devices of the type of manually operated hoisting rams, electrohoists, sectional elevators, conveyors of a limited lenght and others.

With lines of a bigger capacity this amount is respectively augmented several times. In this case we should accept that no matter what kind of rehangng we have, there is always a break in the line in a given section, where it is the place for operating and rehangng, in which case with the all mechanized vertical lines for processing big animals, there should be two separate conveyors or constructing the line itself in two different heights.

From the data of the said four firms, the cost of an additional conveyor would amount to \$ 4000—7000, while the additionally loaded construction up to 40 % would have an additional \$ 280—340 for the two different hights.

In general, if this method of rehangng is eliminated with a high capacity mechanized line for big animals, could create the realization of an economy for the whole line, only for the constructional part, of \$ 8000—10000, calculating on a all over cost of the line including all mechanization of the transport and operational work, devices for the veterinary inspection, sanitary hygienic assemblies and transport accessories to the hanging line as hooks, cats and others — of \$ 70000 to 80000, for a line with a capacity of 200 animals per shift.

The patented construction of the Institute, which assures a nonstop work of the conveyor for the rehangng operation, could in principe be used for certain processing of swine and sheep.

The elements which constitute the basic construction of the patent do not essentially differ from the construction of every other mechanized line — chain, tooth-rollers, stress station, power station, actual line — tube or profile and supporting construction.

In the sector after bleeding, the hanging transport line is divided in two parallel sectors. Along the zone of the parallel sectors are given slants along which by the power of the conveyor line (chain) is effected the liberation of the hind legs or their clamping anew in the line, always in the vertical hanging position of the carcass, for one leg or the other, while their processing is done while the leg is absolutely free.

The sequence of the operations effected could be given in the following order:

1. Preparing the carcass for hoisting on the hanging transport line.
2. Bleeding.
3. Processing the first free hind leg.
4. Processing the front legs.
5. Processing the head — separating it from the body.
6. Processing shoulders and neck — beginning the dehidng.
7. Processing the second hind leg — automatically freed from the line.
8. Attaching the processed hind leg to the line.
9. Delivering the carcass for the next operations, dehidng, eviscerating, veterinary inspection, devidng in two and others.

The separate operations show, that the new patented process gives the opportunity for improvement of the method for rehangng as follows:

- The total construction of the line in one plane, gives opportunity for unifying of building constructions.
- The construction of the line offers possibility for automatic freeing and attaching the hind legs to it.
- Processing of the hind legs is done under conditions of complete freedom.
- The rehangng operation is done while the carcasses are moving on the conveyor.
- The rehangng operation does not require a change in the distance between the carcasses hooked on the conveyor line.
- The tact and rhythm on the line are kept unchanged for the whole length of the line itself.
- The method creates the possibility at the same time while operations for the rehangng of the hind legs are done, to proceed with the processing of the other parts of the carcass.

All these prepositions are giving the possibilities, that the line be constructed with the following advantages to lines in existence:

1. The last operation, which up to now has been compulsorily made in

a still sector of the line — rehangng — is included now in the general movement of the line, while achieving the same unchanged distance between the carcasses.

2. The height of the carrying element of the hanging transport along the whole length of it from the hanging of the carcass to its entering the refrigerator is same, which in turn diminishes the necessary building volume, renders the construction lighter and results in economies on the construction as a whole.

3. Eliminated are all auxiliary operations — hooks with different length, additional non productive operations in servicing the hoist-lowering devices, transport operations with considerable physical efforts, pushing through non conveyor sections and others.

4. There is no need for the auxiliary devices and mechanizations as hoists, electrohoists, winches, frictional lowering mechanisms. This fact lowers the construction and exploitation costs and on the other hand limits the number of the operations themselves.

5. The non stop processing of the carcasses in vertical position, leads to better sanitary hygienic conditions.