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**In 1982, the name of the International Superphosphate Manufacturers' Associations (ISMA) was changed to International Fertilizer Industry Association (IFA).*

STRETCH FILM

By P. VIGRE - Supra (Sweden)

A weatherproof pallet load increases the possibilities of rationalizing and cheapening the storing and distribution of fertilizers in sacks. During the autumn 1971 Supra tried different alternatives to ameliorate the transport qualities of the fertilizer pallet and its durability for storing outdoors under unfavourable weather conditions by covering with a plastic film. Different systems for covering with shrink film were studied in parallel with the stretch film wrapping which at that time was quite new on the market and relatively unknown. Information trials with a modified stretch film packing machine were made during December. The trials were encouraging and in March 1972 it was decided to mount a wrapping machine on trial at Supra.

During 1972 and 1973 a parallel development and test of stretch film techniques for fertilizer pallets containing 30 sacks or 1 500 kg were made. This year 5 complete stretch film wrapping machines have been mounted at Supra. The machines are of manufacture Mipac and made by Azenco JM, Jönköping, Sweden.

WHAT IS A STRETCH FILM ?Packing procedure

The machine can be directly connected to a roller conveyor. In the bottom of the machine there are separately driven roller conveyors, which at first take the pallet to a waiting position, if the interval between the pallets should be below 20 seconds. As soon as the previous pallet is wrapped the work cycle is repeated with the waiting pallet. The inlet pallets can be fed in a stream. No interspace is necessary as the machine separates them itself.

When packing, the plastic is stretched round the load and a bit of the pallet and welded to a cover. The stretching of the finished cover can be regulated within very wide limits for different needs.

Mipac is working with two film rolls, one on each side of the material to be wrapped. The film from the two rolls is welded together to build a wall in front of the load. The load is thereafter pushed against the wall and the film is rolled off the rolls. The film is stretched depending on how hard the brakes are applied to the rolls. When the load is pushed passed the wall the equipment will stretch the film around the load and weld it together. The wrapping is finished and a new plastic wall is ready to receive the next load.

Mipac is a machine for film wrapping, which at first is intended for stretch film wrapping of pallet loads. The wrapping with stretch film requires special stability of the machine, the construction of the welding jaws and the precision in execution, and these requirements have very well been met in Mipac.

The machine can also be used for conventional packing with shrink film. The capacity when working with stretch film is very high compared with shrink film plants on the market, more exactly 180 pallets/hour. If the machine is used for packing with shrink film, the packing capacity is still somewhat higher, about 200 pallets/hour, but in practice the shrinking oven/shrinking frame is, in that case, the deciding production factor.

The machine works with cut film and is completely automatic. The only normal service is given when changing rollers, which normally happens once a day - once a week, depending on the thickness of the film and the rate of use of the maximum capacity of the machine. Power consumption is low and the machine does not diffuse any heat into the room.

Top covering

The machine is originally (single machine) manufactured to cover only the sides of the load with film which is often quite sufficient. In certain cases also the top side of the pallet must be covered with film. This can be done in different ways and be adapted to the existing need. In the following, the method chosen by Supra will be described.

Complete waterproof covering (figure 1)

With tandem coupled machines plus top covering aggregate, an entirely waterproof packing with even top side without any welds is obtained. In that case two layers of thin film are used instead of one layer of normal thickness. The application of the top film is made between the two film layers, so that the moisture which may run from the top side of the load passes between the film layers down to the bed without contacting the load. This method is quite superior to other methods, when it concerns the production of a packing which is quite waterproof with a minimum of material. Because of its even top side the risk of damage to the packing when stacking will be considerably reduced.

The material

The film used is a s.c. stretch film and is normally a PE film with certain added ingredients, which give the flexibility wanted. After use, the material can be collected and used as starting material for the production of new film, which, from the point of view of the environment protection, must be attractive.

Some advantages

Because no heat is used there is no risk for e.g. of lamination against other plastic material below. No heating of the load occurs either, which is of great importance when packing materials sensitive to heat.

From the point of view of transport the stretch film is very suitable, because, remaining flexible also after packing, it allows the load to move without the film cracking, always during the whole time keeping it together in one unit. It is not sensitive to great climatic variations.

The machine does not spread any heat into the room, and for that reason it can be placed anywhere without special arrangements being necessary in the rooms.

Economically, packing with stretch film is an advantageous alternative, as the price is low compared with machine + oven for packing with shrink film. The installation cost is low, no air condition of the rooms being necessary. The consumption of material is lower than when packing with shrink film, and in addition, the capacity is higher. A closer calculation often shows that the cost per packed pallet can be considerably reduced compared with the cost when other methods are used (see diagram 1).

The method of stretching the film mechanically around the load, which has been developed during the last two years, is very reliable with small risks of the packing turning out badly. Variations in film thickness or in temperature in the room or on the load do not influence the process. The appearance and the strength of the finished packing can compare very well with that obtained with other methods.

After close studies we have found that the stretch film has good transport stabilizing qualities. In addition, the stretch film presents :

- a. no risk for lamination of the cover - the sacks
- b. the space needed is about 10 m
- c. no heat oven
- d. possibility of varying the thickness and colour of the top layer
- e. low investment costs
- f. low drive costs
- g. high capacity
- h. can be used for printed film
- i. no heating of the load, which is advantageous when fertilizers with AN-content are packed.

Market reception

The limited quantities which have appeared on the market have been well received. In no case the response has been negative. When checking in the trade it appears that the film packing has met the demand for stability, weatherproof and appearance. As in the case of shrink film part of the pallet loads packed in stretch film are damaged on the way to the receiver.

They must therefore be checked before storing outdoors. Possible damage is easily repaired with tape.

Specification of Mipac 1, manufactured by Arenco JM, Sweden

Dimension of the pallet, max 120 x 140 cm

Max load dimension, b-l-h 1300-1400-1800 (incl.pallet)

The machine can be built on demand also for other load dimensions.

Height 2990

Breadth 2850

Total length incl.transport
conveyor 4325

Max capacity with stretch film 180 pallets/hour

Max capacity with unstretched film 200 pallets/hour

Crew : The machine is completely automatic and works normally without staff. At change of rollers (normally after 500-2500 pallets depending on the film thickness) the service of one man needed.

Film thickness, 50-250 μ

Film breadth, max 1800

Max diameter of the rollers, 600 mm

Stretching of the film (per full film breadth), 0-500 kp

Max intermittent need of effect about 7 kw.

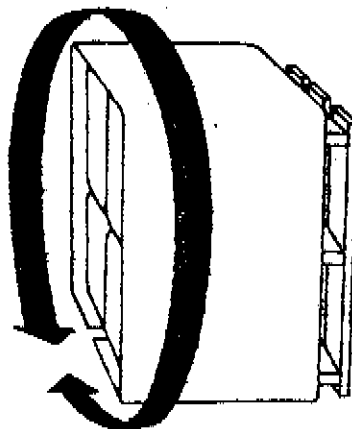
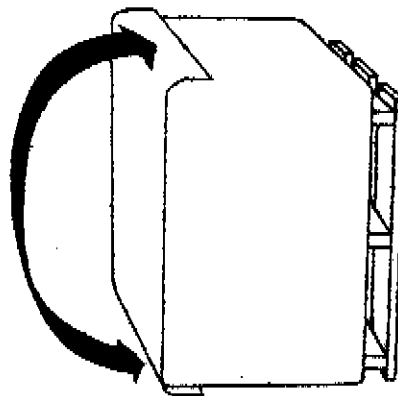
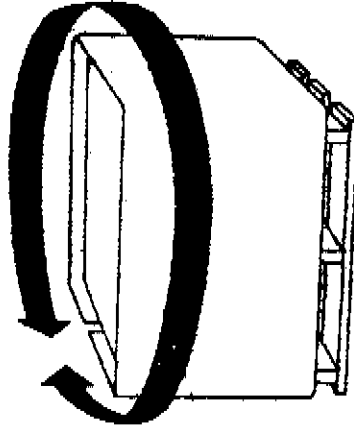
COMPARISON CHART COVERING COSTS OF DIFFERENT WRAPPING METHODS

Wrapping method	Max capacity pallet/h	Investment cost skr incl instal- lation	Deprecia- tion + in- terest/ year	Operating cost/year	Cost of material/ pallet skr (2)	Cost of labour/ pallet skr	Cost/ pallet
STRAPPING	-	-	-	-	3:50	2:50	See diagram
SHRINKFILM WRAPPING							
a. Manual application of ready made caps + shrinking in shrinking frame or oven	30 - 60	80 000 (1)	20 000	10 000- 16 000	3:90	2:10	"
b. Fully automatic wrapping and shrinking in tunnel oven or shrinking frame	60-120	230 000 (1)	57 500	10 000- 20 000	3:80	-	"
STRETCHFILM WRAPPING							
a. Mipac 1A without top sealing	180	135 000	33 700	-	2:20	-	"
b. Mipac IBB (tandem) with automatic top sheet applicator	180	210 000	52 500	-	2:60	-	"

1. Excl cost of air conditioning of the premises
2. Film thickness 120 μ standard pallet 80x120x125 cm

SUPRA 
Paul Vigre/Akp

The Mipac-method: The first film is stretched and welded.
The top film is applied. The second film
is stretched and welded.



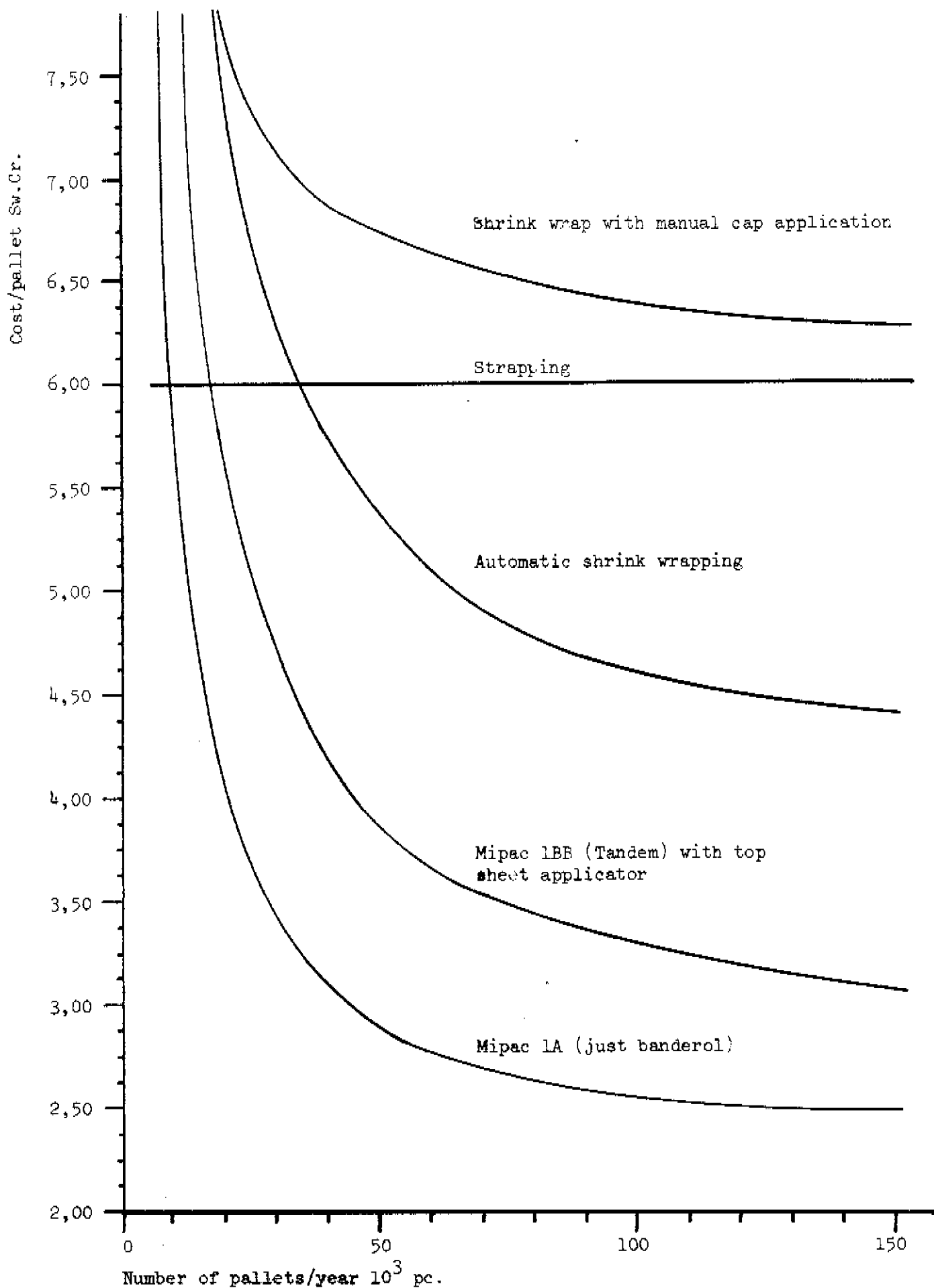


COST OF WRAPPING OF STANDARD PALLET
600x1200x1250 (LOAD HEIGHT INCL. PALLET)

Filmthickness 120 μ

1974-06-05

Paul Vigre/Akp



DISCUSSIONMr. VIGRE (Supra, Sweden)

The Swedish fertiliser Industry has for many years used pallet handling for all fertiliser in bags. The aim is to keep the handling costs low and therefore we try to keep the pallet load unbroken as far to the farmer as possible. A weather proof pallet load increases the possibility for the dealers and the farmers to use forklift trucks as the fertilizer can be stored outdoors. After penetrating tests, Supra decided to introduce stretch film. The reasons for that and the advantages will follow when we have become acquainted with the technique.

The main principle is to stretch an elastic film around the pallet load. The film being used is normally a PE film with certain additives mixed in to give stretching ability. The basic machines provide only a girth wrap. However the fertilizer pallet require a layer of film on the top as water protection. To achieve waterproof sealing from the top a combination of a tandem machine and a top sheet applicator must be utilized. Two layers of film are used. The top (off) layer of film is placed on the load between the two layers of girth wraps.

To illustrate the machine Mr. Vigre showed a short film of the stretch film wrapping equipment working.

The reasons for using the stretch film wrapping are low investment cost, low cost for electrical installations, no air conditioning, no heating of the product. We have a very high capacity and a low film consumption. It is fully automatic. No people at all except when you change film rollers. That machine takes a very short place in the store, around 10 m, and you can use different top material, a white top if you want to protect against sunshine, you can have free printed film, etc.

The limited quantities which have appeared on the market have been well received. In no case the response has been negative. When checking by the retailers and farmers it appears that the stretch film packing has met the demand for stability, weather proof and appearance.

Mr. VERSTEEGH (U.K.F. Netherlands)

The author, in a very concise and well written paper which he very modestly called "Stretch film", describes an interesting development in outdoor storage. He even illustrated it with a very good film. It is well known that, in our industry, storage is a big problem costing a lot of money both in investment and in handling. So any enlargement in storage capacity at low cost is important and attractive. Of course storage should be carried out under such conditions that the quality of the product should not be impaired. Next to shrink wrapping which has been practised by several firms, among which my own, stretch film wrapping is a much later development. The figures given in the appendix are very impressive and

may well cause a lot of comments. The capacity mentioned for the stretch film wrapping line is enormous. It probably means that several bagging machines are mounted on this line. The author's remarks on the reuse or recycling of the material is of great interest. Moreover in that field development should be governed by things such as these. In this connection an important question in my opinion is how the author expects to collect or get back his material to be able to recycle or regenerate it. This is an important element in all recycle processes and projects. How do you induce your client or the user to return the usually small amount of material to the supplier to enable him to reclaim or regenerate it ?

From the paper I had understood that the application of the top cover happened between the two side layer. On the film I noticed that the top cover is applied after the two side covers and even is sealed. It is not quite clear to me what the author means when on page 2 § 2 he mentioned a high capacity for shrink film whereas on page 3 § 4 he says that for stretch film the capacity is higher.

A development which may well counteract the development of wrapping both shrink and stretch as the growing tendency of handling and transporting in bulk. Has the author an opinion on this subject ?

I am sure the author has created a large interest in the subject and will have to answer a large number of indiscrete questions.

Mr. VIGRE

It is a big problem to get material back for recycling. I don't think that the plastic material is going back to the fertiliser factory or just being used back as plastic film for covering fertiliser. It's something we must find the way in the total recycling system in the country where you have plastic material from different sources going together in a system.

The top cover is placed between the two side films. It is very difficult to see it on the film because, as soon as the top layer falls down the pallet moves and meets the film wall and this will move as long as the film falls down and the top layer falling down and the welding go together. Besides this the stretch film is sealed to keep it on the pallet. As a security we make a small welding around the pallet level because the wind can be very strong when the train goes through the tunnel. It is difficult to keep the material on the pallet level, especially on rail.

Stretch film has a very high capacity. The bulk is increasing in Sweden too. Today we have just more than 20% of fertiliser in bags and the bulk is increasing. But we cannot forget that bagged fertilisers will still be living for many years, I think for ever, fertilisers going to the small and medium farms and there we have the real problems to handle fertilisers. The big farms with big buildings, big machinery can use the pallet in a convenient mechanization system. Just to help the small and medium farmers we must find something which can be done outside the building by means of the dealers' transport organization.

Mr. S.L. PENG (CRA, Brazil)

I have a question to ask to the author which has nothing to do with stretch film. I am just wondering whether you charge the pallets itself as a packing cost to the customer or do you have it recycled because if it belongs to you. If you are packing at 130 pallets an hour, you must have a large investment if you have to store that a few months' time.

Mr. VIGRE

The pallet is recycled, it goes sometimes out to the farms, sometimes it will be broken earlier and come back earlier. We have a lot of pallets in Sweden, may be too many, we have big costs to repair and maintain them. The Company owns a lot of pallets and also the retailer has a lot of pallets and the farmer too has invested money in pallets. So all the different people in the chain have some pallets and will arrange it that only the fertiliser factory has to repair them and that is a big work.

Mr. FROCHEN (COFAZ, France)

I would like to know if the adjustments of the machine are not too critical, in particular in view of the fact that the film is welded while stretched and that it runs the risk of being torn when the machine releases the film.

Mr. VIGRE

Of course we have a big problem just in the welding. The only critical moment is the welding. Therefore we have big jaws going together - I think it is around 10 cm wide - and releasing the tension during welding and then you have to cool it before the jaws go back and leave the tension to the welding. Just during the ten seconds for welding, cooling and cutting the tension is not in these 10 cm section where you have the welding.

Dr. JANICEK (Fertiliser Institute, Poland)

I would make only a little remark that in our opinion in Poland the best reason of the system for the future is the system of transportation in bulk because the bag is in all cases an obstacle on the way of full mechanisation of the distribution and application of fertilisers. Then we think that the development of distribution system will go in this direction.