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rail dock push-pull forks are too heavy for some trailers; (4) few grocery trailers are loaded with slipsheet unit loads; (5) a high percentage of the truck receipts are less than trailer loads which are typically not unitized, (6) a lack of incentive for wholesale distribution warehouses to use warehouse personnel to unload trucks when this function is usually performed by the carrier, and (7) labor and insurance contracts may prohibit warehouse employees from entering trailers.

How then, can unitized shipment of grocery products on slipsheets be implemented? Probably, the first step needed would be to transfer the unloading allowance, now included in the tariff, from the carrier to the warehouse receiver who will unload the trailer. This will probably provide the incentive needed to get warehouse distributors to request product shipment on slip sheets. As indicated by Glen Johnson, the equipment needed for slipsheet unloading is now available.

FOOTNOTES

¹Bouma, J. C. Truck unloading of manufacturer shipments at grocery distribution warehouses, U.S. Dept. Agr. ARS-NE-68, 23 pp. Feb. 1976.

²Bouma, J. C. and Shaffer, P. F., Feasibility of using a second unit load size for distributing groceries; from supplier to distribution warehouse. U.S. Dept. Agr., AAT-NE-2, 20 pp. Jan. 1979.

THE PROS AND CONS OF SLIP SHEETS

by

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Introduction

Thank you for the opportunity to present another paper to the Food Distribution Research Society. It's difficult to believe 20 years have passed since I became a charter member and presented a paper at the first meeting. It's also a pleasure to participate in a panel discussing a subject of great interest to all food distribution people.

I happen to be one of the three originators of the 40 x 48 inches pallet concept and I am one of the three co-developers of the Pul-Pac slip sheet system of unit load handling. At the time of the Pul-Pac development, Clark Equipment Company was in the pallet business and offering for sale three types of pallets; a permanent pallet which was plywood sandwiched between layers of metal and the construction was riveted

together; durable pallets were full four-way double-faced plywood types and expendable pallets were corrugated sheets with nine or twelve posts of rolled corrugation as support. So you see I have no axe to grind.

Origin

What is a slip sheet? The concept started in 1946 when we were trying to find a solution to a customer's problem. We were attempting to load a rail car with unit loads of bagged goods and retrieving the pallets. We did develop a successful roller pallet to displace the wood pallet under the unit load of bagged goods. But when we deposited the load in the rail car, the drop of some four inches from the roller pallet to the floor resulted in damage to the bags.

Also, at the same time, we had developed a pusher device as an attachment to a conventional counterbalanced lift truck to be used to push or shove unitized material off of a pallet. One day one of the engineers who was a co-developer approached me after visiting a paper mill with the observation that paper had tensile strength. With this discovery, then came the bright idea that since we had the pusher and since paper had tensile strength maybe we could put some mechanism on our pusher and pull a load on a sheet of paper onto a broad load plate to support the load during in-plant transport.

This is how the Pul-Pac became a reality. The initial prototype had a gripper jaw hydraulically operated which clamped down on the sheet of paper protruding from underneath the load and thus was able to pull the load onto the plate. The first demonstration took place in a courtyard of our Battle Creek plant and we used cases of bathroom tissue which happened to be the only cased item around in sufficient quantity and the paper we used for the load sheet was the type used to wrap machine parts for

shipment. A small crowd gathered to witness this "folly" but they were surprised when we were able to pull a load onto the plate and push it off several times without mishap and then they became quite enthused when we were able to stack the first load on top of the second and retrieve it without incident.

Slip Sheets

What is a slip sheet? Well, basically it's a flat sheet of material with tabs on one or more sides, used as a base upon which to assemble, store, handle and transport goods and materials as a unit load.

How did it get its name? We originally called it a load sheet. It seems like later in the 1950's some company developed a competitive technique for paper to substitute as a load base for a pallet except that this was a folded over sheet of paper board into which highly polished tapered chisel forks could slip between the sheets like putting a card into an envelope. This technique and folded over sheet was named "slip sheet" and this coined name became a generic term to describe all sheets of material, principally paper, as the substitute for the load base replacing the pallet. Another descriptive term, "push-pull" came along about the same time when one of the major users of this technique did not want to use the trademark name of "Pul-Pac" of Clark Equipment Company and so they coined the name "push-pull" to be an all inclusive descriptive term in writing specifications for the necessary handling equipment. So "push-pull" has become a generic term for the attachments on lift trucks to handle the slip sheets.

Unit Load Handling Without Pallets

Slip sheets are made basically from three materials. Paperboard, either corrugated or solid fiber type, and plastic

are the basic slip sheet materials. I can tell you from our early days of experimentation in the late 40's that we successfully used sheets of canvas and also sheets of corrugated iron on which we successfully handled unit loads of concrete blocks. However, I'm sure you can visualize the inherent potential for injury to a person if you have a storage area with protruding corrugated iron sheets.

We have experimented with many types of paper and material but essentially most slip sheets are made of heavy duty corrugated board or the solid kraft fiberboard of .060 inches in thickness. Plastic slip sheets are something of recent years and brought about by the need of material to be totally moisture resistant.

Disadvantages of Slip Sheets Versus Pallets

There are several disadvantages which you should be aware of so that you thoroughly understand the limitations with slip sheets compared to pallets. I will enumerate several of the slip sheet disadvantages not necessarily in any order of importance but only as they come to my mind.

1. Limited load weight. Normally a slip sheet is capable of handling loads up to about 5,000 pounds in gross weight. Anything greater than 5,000 pounds becomes an exceptional problem requiring special attention and handling equipment.

2. Limited stacking height. Slip sheet unit loads stacked three high is probably the most efficient. Four unit loads high is the absolute maximum, assuming a 54 inch high load because the visibility and depth perception required of the lift truck operator to grip the tab on the slip sheet and retrieve the load precludes stacking any higher.

3. Moisture. Corrugated and fiberboard paper slip sheets cannot tolerate moisture. Fiberboard can be treated with water repellent chemicals to give it some resistance to moisture but if they are exposed to soaking in a water environment, the tensile integrity is lost completely.

4. The skill of lift truck operator. Basically, a higher degree of skill is required of the lift truck operator to retrieve slip sheet unit loads, particularly from the stack. Almost any competent driver can be taught to retrieve or discharge a load at floor level but it requires skill and coordination to tier and retrieve unit loads from a stack.

5. Product damage. Careless or untrained lift truck operators driving one with a "push-pull" attachment can cause considerable product damage, either deliberately or by carelessness if not properly trained. I have actually seen the load plates on a "push-pull" truck driven half-way through a tier of cases spilling tomato juice on the floor.

6. Slower than conventional fork trucks. Basically, because of the degree of skill plus the manipulation of hydraulic controls, the "push-pull" truck will handle fewer loads in the same time cycle as a fork truck. Essentially, its about 15 percent slower than a lift truck is capable of handling palletized unit loads.

7. Restricted air circulation. A slip sheet being a solid sheet prevents any air circulation through or between unit loads. Some users have resorted to cutting holes in a slip sheet without compromising its tensile integrity and thus have been able to obtain limited air circulation from top to bottom through the loads.

8. Lift truck equipment. Until 1977 only counterbalanced lift trucks with

"push-pull" attachments were available to handle slip sheets. In 1977 Clark introduced the HWP-30P Powrworker hand truck equipped with a "push-pull" attachment to the trade. This was the first walkie hand truck with slip sheet handling capability. Since our pioneering effort there's been a few other companies who have followed with their own versions, and I would anticipate that before the end of 1979 almost all lift truck manufacturers producing pallet hand trucks will be in a position to offer some type of an attachment permitting slip sheet handling.

9. Restricted use in warehousing. Slip sheets cannot be used in storage racks unless the slip sheet unit load is supported by a rigid platform such as a wood pallet or plywood decking in the pallet rack. Likewise, it is impossible to store slip sheet loads in drive-in or drive through racks without putting the slip sheet load on a pallet.

10. Wider storage aisles. Because a Pul-Pac "push-pull" equipped lift truck must approach its load at a 90° angle versus a 60-70° angle possible when using pallets under a unit load, the aisle must be six to seven inches wider for the same weight loads to be handled on slip sheets. A larger truck capacity chassis also is required for slip sheet handling.

Advantages of Slip Sheets Versus Pallets

Now, let's look at the other side and I'm sure this is what you're most interested in hearing is where the slip sheets hold a distinct advantage over pallets in the unit load system of handling.

1. Lower cost. Undoubtedly, the greatest advantage is the lower initial cost of a slip sheet versus a pallet as a unit load base. The cost for a slip sheet can be

as great as 96 percent less than the cost of a pallet.

2. Less storage cube required. Because the slip sheet is .060 inches in thickness compared to approximately 6 inch thickness of a pallet, it sometimes can mean one more tier of cases or bags in a unit load. This multiplied in a stack of merchandise three loads high can mean greater cube utilization in a particular given storage area. Basically, slip sheets will provide 10 to 12 percent more cube utilization than will pallets in storage.

3. Lower center of gravity in a transport vehicle. While you may think that this is not significant, however, I can tell you the situation which occurred in the mid-1950's in Canada which was blessed with many high crowned roads in that period time. This particular user at the time was shipping unit loads of grocery items to retail stores on pallets. The combination of the high crown road plus the higher center of gravity on pallets reduced the road speed of the transport vehicles. They changed to using slip sheets and by reducing the center of gravity of the trailer load, they increased their average road speed by better than five miles per hour. Today, that is probably not as significant as it was then but it is something that should be recorded for your information.

4. Recycleable materials. Slip sheets being made from paper and/or plastic offer materials which are readily disposable and capable of being recycled. In fact, manufacturers of plastic slip sheets will actually reimburse the user at a pre-agreed price for the slip sheet when the user wants to return it and the manufacturer will recycle the materials.

5. One way unit load base. Definitely slip sheets have the distinct advantage over pallets, even disposable pallets,

strictly on an initial cost basis. But in addition, which we just previously mentioned, slip sheets are more easily disposed of than one way wood pallets. Another thing to consider is that some slip sheet users reuse the sheets several times. For example, one major grocery manufacturer uses his slip sheet for six round trips. This computes to approximately 20 cents per trip. To achieve this cost level would mean that comparable wood pallets would have to make 20 to 40 trips to achieve the same cycle cost.

6. No repairs. Obviously, slip sheets, be they made of paper or plastic, cannot be repaired, when once damaged they are discarded. Therefore, there is no maintenance required as there is with pallets.

7. Slip sheets tailored to requirements. It is very possible for the user to tailor the material and the cost of slip sheets to the load weight to be handled and the handling cycles required. Whereas with the pallet, this is not economically feasible, although it is possible.

8. Storage for empties. A stack of slip sheets six inches high will be 60 to 70 sheets versus 30 to 36 feet of pallets for the same quantity. Normally, a typical rail car shipment on pallets requires 56 unit loads. The same 56 unit load bases of slip sheets represents a stack of five and one-half inches high.

9. No return shipping charges. With slip sheets being a one way or limited cycle load base, there are no costs involved in returning slip sheets to point of origin.

10. Serves as a paper liner. In many rail car shipments the cars must be lined with paper both on walls and floors before products for human consumption can be loaded into the rail cars. Slip sheets will perform the dual function of being a paper liner as well as a unit load base.

11. Product damage. In some instance, there will be less product damage when

compared to pallets that are substandard because of protruding nails, splinters and the load shifting on the pallets. Whereas on a slip sheet, if there is any load shifting in the transport vehicles, the sheet and load move together.

12. No theft. Again, slip sheets are not subject to the degree of theft or diverting to other uses as are pallets and the monetary loss if theft occurs is considerably less.

These are the principle "pros and cons" of slip sheets.

Slip Sheet Users

Here are some companies who have used slip sheets somewhere in their operations for at least fifteen years, some as long as twenty-five years. Northrup-King Company, a seed producer and distributor, has used slip sheets since 1948 to handle bagged products. Here are some others who are long-time users:

Carnation Company
Del Monte Corporation
General Mills Company
Kellogg Company
Ralston-Purina Company
Libby-McNeil and Libby
H. J. Heinz Company
Hunt-Wesson Division of Norton
Simon
Packaging Corporation of America
Container Corporation - Division
of Mobil Oil
Mead Corporation
Kraft Company
Pillsbury Company
Green Giant Company - Division of
Pillsbury
Standard Brands Incorporated
Larsen Company
Grief Brothers Company
Tropicana Products Co. - Div. of
Beatrice Foods

--and many chain stores and wholesale grocery companies who receive their products from many of the grocery manufacturers in rail car shipments.

Here's a list of companies using slip sheets who started within the last ten years:

3 M Company
Seagrams
Nabisco Company
Citrus World
Holly Sugar Company
Witco Chemical Company
Quaker State Motor Oil
Crown Zellerbach Company
Hercules Incorporated
Morgan Packing Company
Reynolds Metals Company
Southwest Forest Industries
Kerr Glass Company
General Foods Corporation
American Home Products Company
American Consumer Industries
Armour & Company - Division of
Greyhound Corp.
McDonald's Systems
Coors Brewery

Coors Brewery was the first to introduce plastic slip sheets on a larger scale.

The United Fresh Fruit and Vegetable Growers Association have adopted slip sheets as a unit load base and they are expressing the base dimensions in metric measurements of 1000 by 1200 mm as being a standard.

What's in the Future

Slip sheets as a 100 percent medium as a load base for unit loads in the total distribution cycle will never happen or at most it would be less than one percent of the total.

Slip sheets will not replace pallets completely. Pallets will tend to remain captive within a facility. Products will be stored on pallets with a slip sheet between the top deck of the pallet and the bottom surface of the unit load. Slip sheet loads will be withdrawn from pallets and loaded into transport vehicles. At the destination the slip sheet loads will be retrieved and placed on pallets captive to that facility. The loading and unloading cycle may be repeated two or three times from the grower/manufacturer to the ultimate consumer.

A national standard on slip sheets is presently being developed. It encompasses terminology, materials, sizes, performance values related to materials in the slip sheet and testing. It is anticipated this standard could be accepted and published by mid 1980.