Reliable pallets

Carrying world trade on their backs

by John M. B. Mead

Although pallets are largely taken for granted, these humble, flat, structures can be said to form one of the basic blocks of global supply chains. Billions are currently in existence, a mark of confidence based on 50 years of worldwide experience.

Their success lies in their ability to satisfy the needs of every user in any conceivable handling environment, whether for simple movements, for storage or in guaranteeing safety in point-of-sale applications.

But their task has not been easy. Empty or loaded, pallets are handled by forklift trucks or pallet trucks, placed in automated racking systems, stacked pallet-load on pallet-load, moved on twin conveyors, loaded in shipping containers and moved through arctic and tropical conditions. In addition, they must support a wide variety of loads and strapping methods, and endure dynamic loads and impacts from equipment drivers in a hurry.

Moreover, the shortage and high cost of wood in some Asian countries has created further incentive for improvements. Corrugated paper pallets are used for lighter loads, and reconstituted wood materials are suitable for other purposes. Lightweight aluminium pallets have proved useful in airfreight applications.

Providing solutions

With the explosion of global trading, the necessity has risen to address formerly regional or local concerns in a wider international context. In response, ISO technical committee ISO/TC 51, *Pallets for unit load method of materials handling*, has developed and updated a wide portfolio of standards to meet these needs.

ISO/TC 51 deals with pallets of all materials, including those with integral superstructures (boxes) and slip sheets (thin unit handling devices usually made from kraft board, fibreboard or plastic).

Its standards specify sizes, performance, and give guidelines for repair and reuse, together with a full set of definitions.

Particular attention has been given to wooden pallets, which estimates indicate are by far the most common, used in more than 90% of applications worldwide.

Among the aspects ISO/TC 51 has standardized are assessments for all aspects of timber size, strength and damage resistance. The committee has also targeted fixings (nails), which as key strength factors their performance is crucial.

World of choice

The economics of operating reusable pallet systems favours wood in most circumstances. However, plastic pallets in a variety of materials and designs have been adopted to meet special operational needs.

Pallets must perform even under harsh conditions.

To define specifications and performance for the different types of pallets, we must take into account the uses and loads that a pallet may be required to meet.

For instance, a basic system may need only single-face pallets with three bearers to carry a load on a flat truck for one trip.
The pallets would not return once empty. When loaded, these pallets must have enough clearance to accept a pallet truck under the deck. They must not sag at the edges when lifted, as this could cause the load to slip. And they must be of a size that suits the truck and the storage conditions at either end. Finally, as a packaging material they must meet recycling requirements.

Many pallets are designed for single-load use and for a particular set of handling and storage. They are often custom sized to suit user requirements. However, if designed for general use, the pallets’ trip cost would be dramatically reduced if they are then reused, either by the recipient of the goods or by a pallet recycler who places them back on the market.

A day in the life

Because pallets are prime reusable packaging, many volume users take advantage of available pallet pools. But pallets in general pools must be able to perform in any combination of handling and storage, including worst case scenarios. This is what the daily challenges in the life of a pallet look like.

Empty pallets in a stack are moved by either a pallet truck or a fork-truck. The tynes of the forks need enough friction under the top deck to prevent the stack from moving. Similarly, there needs to be sufficient friction between the base and the top deck of the pallet underneath to avoid slippage.

When the stack of pallets is placed in a “destacker” at the production line, their size accuracy has to conform to the limits of the machine, with no protruding parts.

The pallets may be placed onto a twin track conveyor and the load automatically placed sack-by-sack or box-by-box onto the deck, perhaps with some eccentricity. Some dynamic load may arise in the process.

Pallets may then be strapped or wrapped before being conveyed to an automatic stacker and stored up to 30 meters high. The clearances for loaded pallets will have to conform to the equipment. The pallets will then deflect until stability is reached. The gaps needed for the retrieval of each pallet cannot be too tight. For cold storage, pallets must be able to withstand freezing temperatures.

A pallet with its loads may then be shipped directly in a container, and “pin wheeling” for size and accuracy may be needed to optimise the load. This requires entry capability on any of the four faces.

The container may then move through the tropics, subjecting the pallet to high temperatures and humidity. The pallet must be able to conform with specifications for size and performance even under these conditions.

The loaded pallet may then be stacked on top of another loaded pallet with an uneven top surface, and it must keep its stability.

At the start of each new handling phase, the pallet is inspected for safety to ensure no structural damage has occurred.

Throughout all this, the pallet must remain safe for humans and plants and not harbour any health threats. Wood pallets shipped to most countries are required to be treated to conform to the plant health authorities standard ISPM 15, established by the International Plant Protection Convention.

Safe arrival

So how does a user know that the load will safely reach its destination on a selected pallet? Dealing with all these interrelated issues has required considerable flexibility in ISO/TC 51. Defining the huge variety of terms used in the field has been a considerable task in itself. These can be found in ISO 445:2008, Pallets for materials handling – Vocabulary.

Pallets are largely taken for granted.

Size and accuracy are key. ISO/TC 51 has defined six sizes of pallets for use between the major trading regions of the world (ISO 6780:2003, Flat pallets for intercontinental materials handling – Principal dimensions and tolerance). Each region has independently developed its own standard size, and each infrastructure became modular according to those sizes.

The cost of change is currently prohibitive, so pallets of different dimensions will continue to require customized handling methods, for instance, a pallet of a size used for imports but not domestically, can be shipped as goods back to the point of origin. On the other hand, ISO standards specify uniform accuracy requirements, which facilitates handling.

Where pallets are assembled from components, their size and quality can be controlled with a series of standards. The performance of a wood pallet is significantly affected by the fixings used, and standardized tests can be used to demonstrate their capability.

Good everywhere

How can performance be assessed given the large variety of conditions in which pallets are used?

ISO/TC 51 has developed a comprehensive test standard for pallets of any material. ISO 8611 for flat pallets, is a three part standard providing guidance for methodology, performance and use selection and criteria, as well as maximum working load performance. It also advises on the effect of typical loads and strapping, on the unit load performance.

The criteria in the six tests for performance and the seven optional tests for durability have all been evaluated against real-world performance. Acceptable deflections and accuracy reflect current practices and safety requirements.

A pallet can only be said to pass the ISO tests if the conditions and load are specified and all the related criteria are met.

For reusable pallets, there is a repair and inspection ISO standard jointly developed with the European Committee for Standardization (CEN).

It must be emphasised that the safety of a reused pallet depends on the inspection process put in place by the user. Companies or agencies maintaining pools of pallets must assume responsibility for repair assurance

About the author

John Mead is Chair of ISO/TC 51, Pallets for unit load method of materials handling. He has worked in the pallet industry for 30 years, becoming CEO of the United Kingdom’s major group involved in manufacturing, controlling and repairing pallets, followed by a period with the industry in the USA. He has developed pallet quality and reuse programmes.