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## Freight Handling. In : Encyclopedia of Transportation

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## Freight Handling

Ever since the Roman times, trade flows have always relied on the development of new transport infrastructures. Famous routes have included the *Mare Nostrum* or the Great East Road with its Jade and Silk Routes, and later, those connecting the Medieval Fairs of Flanders, Lombardia, the Hanse and the Ile-de-France region. The revival of the Mediterranean basin and the discovery of the New World further accelerated those trends. While these developments have strongly rested upon the work of those in charge of transport operations, the workers who handle and shift the freight to be stocked or delivered have played an equally important role. Ship suppliers, dockworkers, dock labourers, longshoremen in the U.S.A., stevedores in Great Britain or wharfies in Australia, timber rafters on the Lumber River in North Carolina, permanent packers and casual meat porters at the Paris Central Food Market, hucksters, street sellers, four season merchants, rag-and-bone men in the UK or junkmen in the U.S.A, and indeed warehouse assistants all over the industrialised world – have all been (or still are) the backbone of the freight chain.

Throughout the 19<sup>th</sup> and 20<sup>th</sup> centuries, the emergence of major infrastructures around the globe – e.g. the Pacific and Missouri Pacific Railroads, the St-Louis-San Francisco Railway, the Suez and Panama Canals, the Transsiberian, the Jingbao Railway, the U.S Routes and Golden Gate Bridge, the Railway connecting Zouerate to Nouadhibou in Mauritania, the Mont Blanc, Seikan and Channel Tunnels, or the Pearl Bridge in Japan – was closely followed by the expansion and diversification of transport modes.

Until the invention of the container by Malcolm Mac Lean in 1956, the transfer of goods would require some significant physical activity. When the crate containing the goods was separated from the truck trailer frame and when merchant ships were tailored to transport the freight, packaging became standardised (ISO TC104) which led to the development of intermodal transport and to the industrialisation of port operations.

Following this short historical reminder, this entry will now turn to the numerous tasks performed by freight agents in the haulage and logistics sectors. This will be followed by a focus on the organisation of handling activities with especial attention to the constraints and enabling factors including details about the tools and equipment commonly used by agents. The final section on the intensification of work and its consequences will end with an attempt to briefly outline future perspectives.

In the United States, according to the Bureau of Labor Statistics, freight handling falls within the Transportation and Material Moving Occupations sector which includes two categories: (1) Hand Laborers and Material Movers (3,315,400 in 2010) and (2) Material Moving Machine Operators including construction and transportation (669,000 in 2010). Even though they are not recorded as such, Delivery Truck Drivers and Driver/Sales Workers (1,262,600 in 2010), together with Heavy and Tractor-trailer Truck Drivers (1,604,800 in 2010) also undertake freight handling duties as part of their work. This group of workers also includes maintenance technicians, handling engineers and logistics related staff (logistics coordinators, order assistants, etc.) in charge of finalising the distribution of freight.

Freight handling includes the loading and unloading of vehicles in a wide range of settings: transportation scheduled and air courier terminals, ports, platforms supported by e-commerce (trucking and courier, parcel delivery services), combined rail-road, waterways-road or multimodal water-road-rail platforms, as well as product supply and household delivery services.

In all these modes, workers handle manufactured goods or bulk materials (raw food such as grains, building materials such as gravels, sand and wood, and even garbage in some

instances). In the case of bulk handling, goods are either solid or liquid and remain unpackaged or undocked. Manufactured products may be packaged, placed on pallets or in containers. “Heavy parcels” (engines, turbines, rockets, etc.) which constitute exceptional freight are kept separate.

Depending on the platform from which they handle the freight, agents may undertake a variety of operations such as container stuffing, stowing, loading, unloading, transshipment, stacking, degrouping (i.e. container emptying) and preparing the distribution. Even if the containers require some checks, as well as cleaning and maintenance, many intermediary tasks have disappeared as freight from different shippers is now generally combined in one single shipment.

Freight handling may occur either at the beginning or the end of the supply chain, or between several transport modes or shuttles. However, it always occurs when the load reaches its breaking point in the transport chain. Agents working at the terminals of major exchange routes tend to handle mainly bulk or containers whereas those working on end of circuit platforms are most likely to handle parcels. In any case, agents’ performance is measured against the flow of traffic in these nodes of the transport network.

Their activity is constrained by two factors. First, the volumes to handle vary significantly over time and unless the means of production are adjusted, the operations may cease to be profitable. These operations are already under strain because they require significant investments (particularly on terminals) and also because they are subjected to important locational competition. Moreover, the operational planning prepared on the day preceding the arrivals does not make it possible to deal with all the events that may jeopardize the smooth running of the system.

Second, next to dysfunctions intrinsic to operations, handling is exposed to the same hazards as the transport modes (density of traffic, mechanical problems, deteriorated infrastructures, bad weather conditions, etc.). The agents’ performance is therefore also affected by external factors. A particular challenge, then, is to ensure that the site does not get overloaded and that waiting times are kept to a minimum. The production system thus crucially needs to be reactive and adaptable.

The system’s ability to adjust mainly depends on the means of production and on its labour force. Before the container revolution, the organisation of production used to rely on temporary piece-workers (particularly for unqualified jobs) so as to adjust capacity to demand. Hence to be hired, dockworkers, longshoremen, stevedores and wharfies had to wait for the ships to arrive. Even today, many handling operators employed on parcel services platforms or in warehouses, are hired a few days before or on the eve of the freight being delivered. When specialist skills are required (i.e. for reach stacker drivers, crane operators or container crane operators), it is not always possible to rely on temporary staff. In case of late arrivals or unusually high freight volumes, permanent agents may be called upon unexpectedly. Agents’ ability to use multiple skills allows the system to adjust. In many inland ports, agents can be assigned to different positions (container crane, reach stacker), tasks (freight handling, container cleaning, checks and approvals) or sites for a day, half a day or even a few hours. The agent may also be assigned to a different time slot than his usual one. Thanks to multi-skilling, the task of supervising production can be shared between foremen and frontline operators (team or quay managers). This arrangement is vital given that the dynamics of the situation result from a combination of what happens on the site and in the local vicinity, from the temporalities of the various processes (shipping mode and handling

operations) and the vagaries of the transport chain. Inversely, foremen may occasionally carry out handling operations to relieve frontline operators from a heavy workload.

The tools used for handling are determined by the environment, the goods and their packaging. Agents are specialised accordingly. On container or bulk terminals, crane operators may be in charge of steering fixed or mobile container cranes or gantries under the foremen's supervision through a system of shared information. Forklift truck operators use mobile quayside container cranes, straddle carriers to pick up the containers or reach stackers to lift them up. Driving or moving on the site without causing undue risks for people or goods requires a skilful mastering of the engines which can only be acquired after a long training period.

If we now turn to parcel delivery services, depending on the level of package standardisation, two types of platforms can be distinguished: a non-uniform and a standardised one.

Unless processes are standardised, agents have to handle a great variety of parcels both in terms of length, volume and weight. In addition, there may be varying levels of fragility, value or dangerousness. Since incoming goods are rarely grouped, agents are required to prepare pallets. Inversely, they may be asked to "depalletize" the freight when the existing pallet has been deteriorated. Thus, there is still a certain degree of manual handling and stacking. Handling agents commonly use rolling equipment such as sack trucks or dollies. But most of the time, they use pallet trucks for horizontal handling on more important distances between different spans. Forklift and stacking trucks allow both horizontal and vertical handling. The second type of parcel service concerns express delivery, in which parcels are standardised. A conveyor belt reduces the need for agents to constantly move around. In some cases, it may lead to task automation (hence to job losses).

Even if there is still much paperwork to deal with (loading sheets, train composition, orders), the transfer of information has undergone a significant evolution with the introduction of information systems. Unless the goods are recorded upon their receipt, the risk of them going astray is high. The recording is done through a scan when the systems of each agent (loader, carrier and handling agent) are compatible. One of the most noteworthy changes is the use of voice picking at the end of the supply chain which allows the warehouse order assistants to receive the instructions from the information system itself. As his approvals go through, the agent obtains the code, the quantity and the localisation of the goods to be prepared on his cart. Through a screen installed in his reach stacker, the operator receives similar information about the containers.

The global economy has led to an increasing use of just-in-time and intermodal operations, thus multiplying ruptures in the supply chain. This prevailing trend in the production system reduces time adjustment margins in case of unexpected events. Today, information systems increasingly facilitate the identification and traceability of goods. The capacity to control the system is much higher, jobs require much more sophisticated skills and recovery times are lower. The combination of all these factors leads to an intensification of work.

For all the modes, handling the vehicles immediately upon their arrival or seeking to reduce waiting times is particularly important when the cost of immobility is high, which is the case for cargo ships. Consequently, agents have to work on irregular or staggered shifts. Their work also entails significant physical efforts (recurring heavy workloads, painful postures) and exposure to a range of environmental factors, e.g. important heat variations, bad weather conditions when working outside, engine noises and vibrations, and toxic products, particularly when handling bulk material. The prolonged exposure to these harmful factors

leads to many long-term health risks such as Musculoskeletal Disorders and occupational diseases such as cancers.

In addition to these long-term health risks, significant accidents can occur on the platforms used for handling activity. This is because there are conflicts over the usage and sharing of space. With the exception of automated chains, the platforms are characterised by numerous vehicle movements. Even if most of the time, there are traffic schedules, the vehicles can crossover or encounter pedestrians. Visibility is limited because of how space is laid out with merchandises being piled up and hiding machinery or agents. Vehicles and machinery often collide or fall over during checks or installation of twistlocks. Moreover, slips are frequent because of leaks. In the case of hand operations, the mishandling of merchandise can cause sprains. The portorage or falling over of parcels can cause lower back pains and vertebral compression fractures. More generally speaking, objects falling down or spatters can sometimes lead to work incapacity.

Despite the slowdown due to the worldwide economic crisis which started in 2008, the global traffic of containers keeps on growing. Private operators are thus tempted to automate a great part of their handling operations so as to increase the processing capacity of operations outside normal business hours. Irrespective of the mode and container being used, new Automatic handling systems (Automated Stacking Cranes, Automated Guided Vehicles, Automatic Postal Parcel Turning Machine) have appeared. These systems are adapted to standardised operations both with regard to merchandises (parcels or containers) and signage (i.e. shared data sheets and information systems). Yet they require human intervention whenever the situation differs from what is expected because of problems such as failing or erroneous information, damaged parcels, twistlock deficiencies or overloads, as is often the case in transport systems. Such contingencies are unlikely to disappear in the foreseeable future, notably because of the growing significance of e-commerce. Consequently, attempting to supersede the human factor through machinery would be highly damageable for freight handling and hence for the transport system at large. The interaction between human agents and their environment will thus remain a subject of scrutiny for academics and practitioners alike.

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See Also: E-Shopping; Intermodal Freight Transport; Intermodal Terminals; Just-In-Time Systems.

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