Mounting a Hand Held Computer on a Forklift Truck?

Choosing the right Mobile Computing Solution for your Warehouse Applications

This white paper explains how to build a credible business case for investing in wireless computing.
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1. Introduction

There are many aspects that have to be taken into account when selecting the right mobile computer for your warehouse applications such as the level of ruggedness, ergonomics, operating system, data collection – and wireless technologies. Another important aspect of evaluating devices is calculating the investment protection over the lifespan of the devices’ deployment. But the single most important factor is the end-users.

Why not just choose one type of computer and use it for all your applications instead of choosing the best device for each application? This white paper will assist you in answering this question, but first, let us better understand the two main types of mobile computers that are being used within logistics environments:

**Hand Held Computer (HHC)**
Hand Held Computers have been designed for portable/mobile computer applications in e.g. warehouses. Hand Held Computers are provided with a battery and an internal barcode scanner. Models are available with and without a pistol grip handle. The pistol grip handle offers an ergonomically safe way for intensive scanning applications. Hand Held Computers without a pistol grip handle are used for applications that require a lot of interaction (using keyboard or touch screen data entry).

**Vehicle Mount Computer (VMC or VMT)**
Vehicle Mount Computers are mounted on an industrial vehicle such as a forklift truck or an order picker. This mobile computer is usually connected to the power supply of the vehicle. Specifically for this set-up, the forklift truck computers are usually provided with an external data collection device such as a barcode scanner, RFID tag reader or barcode camera.

2. Product Characteristics

2.1 Level of Ruggedness
According to Venture Development Corporation’s (VDC) findings, rugged devices are found to be significantly less expensive from a Total Cost of Ownership (TCO) perspective that encompasses 5 years. VDC reports total cost of ownership annual savings of up to 17% in field profession applications and up to 32% in supply chain applications for rugged hardware deployments.
2.1.1 Drop Rating
The drop rating measures the ability of a device to survive repeated falls from a specified height onto a designated surface in full working function. In rugged device testing, the surface is concrete while the height can vary. The higher the drop height that a device can resist, the more rugged a device. A drop height of 125-150cm (4-5 feet) to concrete is considered a reasonable test of ruggedness. A high drop rating protects the enterprise against the inevitable device drop and the resulting downtime and maintenance costs to replace it.

2.1.2 IP Rating
An Ingress Protection Rating (IP Rating) is a standard used to identify to what degree a device can withstand exposure to solid particles and liquid ingress. An IP Rating is expressed in 2 numbers, such as IP65. The first number refers to the protection against solid objects or dust (max rating 6). The second number refers to the protection against liquids (max rating 8). A device with a high IP rating is an important consideration for use in outdoor applications.

2.1.3 Operating Temperature
Rugged Mobile Computers are designed to operate in extreme weather conditions including temperatures well below freezing. This is an important characteristic for use in outdoor applications and cold stores.

2.2 Ergonomics
The end-user is the single most important aspect you have to keep in mind when making your selection. He/she is often quite comfortable in manual logistics goods movements but maybe he/she is reluctant to new technologies. The user interface and ergonomics on the shop floor are very important to ensure warehouse operatives accept and support automation.

The suitability of the equipment for the environment is also very important. If the employee’s productivity is negatively influenced by the mobile computer (discomfort, unsafe work, ...), then low acceptance of the entire system will follow. Make sure you have the buy-in of your end-users by involving them from the very beginning: the selection process.
2.2.1 Hand Held Computers
The single most important factor for defining the ergonomic capabilities of your device is defining the logistics processes where the device will be used.

The next step consists of defining how the user interface has to look like. Specific function keys are often needed in order to navigate within your software application. Make sure these function keys are available on the Hand Held Computer of your choice. Take into account that certain user interfaces also use fixed screen dimensions. The Operating System (OS) is also often an element that does not change.

You can also make your selection based on the elements that will not change, the scan distance for example. A user of a Hand Held Computer will be able to scan up to a distance at which he or she can easily read the barcode label. Long-distance scanning is usually avoided as much as possible in order to avoid errors to the maximum. Normal scanning distance varies between 20 cm and 3 metres. The need for a touch screen and a keyboard on the Hand Held Computer will depend on the required additional information that the user needs to collect.

2.2.2 Vehicle Mount Computers
Vehicle Mount Computers are being used when it is impossible to move the goods by hand. Compared to Hand Held Computers, Vehicle Mount Computers need to be resistant against the vibrations that occur on forklift trucks and to voltage peaks & drops.

The scanning distance from a Vehicle Mount Computer varies between 30 cm to 4 metres. Larger distances need to be avoided as much as possible even though it is technically possible.

The screen of a Vehicle Mount Computers is always on and the unit always has power. This unit is permanently mounted in an ergonomically safe way. The mobile computer is always in the field of vision of the user while he or she drives his or her vehicle. The user can, at all times, keep one hand on the wheel and operate the fork carriage or the scanner with the other hand, which is what the user is accustomed to do.

2.2.3 HHC … used as a VMT
The number of breakdowns will increase when a Hand Held Computer is being used as a Vehicle Mounted Computer, because most HHC’s are less resistant against vibrations than VMC’s. A special holder/holster can help avoid the number of breakdowns but these are not designed to have its contents removed and replaced many times per day for e.g. scanning.
The age of a battery is expressed in the number of recharges. Removing and replacing batteries many times per day from a holster will negatively influence the life cycle of the battery. The user will have to deal with battery management and will always have to have spare batteries because the battery cannot be charged through the holster. Lack of using the right tools can also result in the loss of a session connection while changing the batteries.

It is easier for the user to place and replace the Hand Held Computer in a holster instead of a holder for use on a forklift truck. A disadvantage of this solution is that the user cannot immediately read the information on the screen because it needs to be removed from the holster first before being able to cancel the “sleep” mode.

Please also consider the following issues before using a Hand Held Computer as a Vehicle Mount Computer:

- A Hand Held Computer screen is made for an eye-to-screen distance of 50 cm on average. The eye-to-screen distance on a mobile vehicle is usually 70 cm to 100 cm.
- A Hand Held Computer easily weighs 600 grams. A barcode scanner - connected to a Vehicle Mounted Computer - attached on a RIL balancer weighs less than 100 grams for a forklift truck driver.
- The forklift truck operator should be able to see and use the screen and keyboard appropriately under different lighting circumstances.
- Vehicle Mount Computer displays and keyboards have continuous lighting, which has a positive effect on the total ergonomics of the forklift truck.

LXE has tackled these issues with the development of the MX3X, a compact and rugged computer which runs applications not requiring a full screen. Due to the horizontal half-screen, the MX3X is an ideal solution to mount on small vehicles such as picking trolleys, pallet jacks and forklift trucks. The MX3X comes with a unique and safe easy in/out vehicle mounting system allowing to perform equally well as a vehicle-mounted or handheld computer.
3. Environmental Characteristics

3.1 Working Environment
Every warehouse and every logistics environment has its own characteristics even though order picking, filling shelves and sending and receiving goods are comparable from a logistics point of view. The reason for this is that many details exist that will ultimately influence operation such as the way of stacking and the type of goods.

3.2 Safety
Safety is a determining factor when choosing equipment for a forklift truck or another motor- or electrically driven vehicle. The natural tendency of a warehouse employee to perform his or her work as quickly as possible should be taken into account. A Hand Held Computer with a built-in barcode scanner is a device that has to be operated with both hands in relation to certain interaction. Since this would be deemed irresponsible while driving, either the productivity would decrease or safety would become an issue. We are also referring to a movable device on a forklift truck that may fall off from that forklift truck or it may slide to a location that may create an unsafe situation. Therefore, a safe click system is a must.
4. Conclusion

A one-size-fits-all solution is often a fits-no-one solution and often seriously affects the overall performance of the end-users and the return on investment (ROI) of the project in a negative way. Cost should be evaluated for the entire product life cycle rather than a point in time, such as the point of purchase.

There are only a few situations under which a Hand Held Computer can be used for a Vehicle Mounted application in a productive way, e.g. when order pickers have little space. Too often, Hand Held Computers are selected for use on a forklift truck for the wrong reasons such as budgeting reasons. Not only the initial investment but also the total cost of ownership should always be taken into account when planning an investment in mobile computers.

LXE is one of the very few players in the market that has a proven track record in building compact mobile computers (LXE 2280, MX3-DOS and MX3-CE) that can be used for a variety of Vehicle Mounted applications in a productive way. The recently released MX3X can be mounted on any industrial vehicle and its innovative easy click system increases the investment value of mobile computers as it can be moved from one vehicle to another.

The MX3X is part of LXE’s exciting new X-Scale-based product line. It demonstrates LXE’s commitment to producing leading edge technology for real-time data collection. This state-of-the-art product line provides a lower cost of ownership and greater return on investment by aligning the customer’s business with future emerging technologies and applications such as voice recognition, RFID and area imaging. By standardizing these mobile computers on Microsoft’s® proven CE. NET Mobile architecture, these products also fully support the newest development tools available for rapid application deployment and device management. Please take the opportunity to explore all the leading-edge technology solutions provided by LXE at http://www.lxe.com.

5. Sources


*MX3X Vehicle Mount Computer* – LXE International – Datasheet 2004