SPIK SZMA

Helping Customers "Reach for Business Value"

ISO 9001:2000

Application of mobile devices and barcode marking for manufacturing

An example for Shutdown and Safety valve repair process at Kirishi Oil Refinery

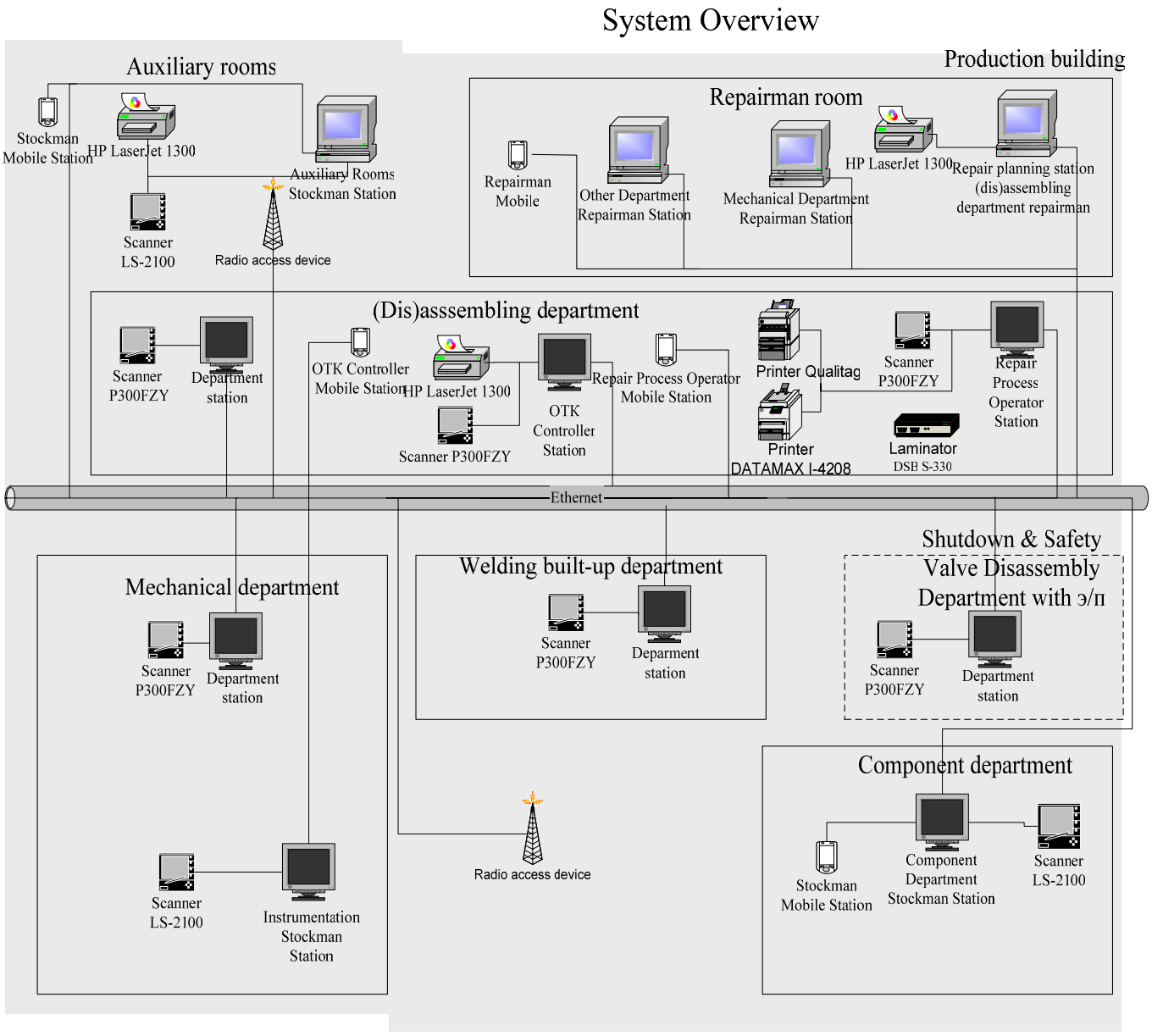
Overview

St. Petersburg, 2004

Bar-Code System for a shutdown & safety valve repair process

A Bar-Code system for a shutdown and safety valve repairing process requires management of a complex set of dynamically interrelated data/information and staff activities. This same set of information must also be integrated with the enterprise accounting and document storage and retrieval systems along with supporting historical statistical analysis.

The system overview below identifies the various workstations on which data is input by different departments throughout the valve repair life-cycle.



1. Technologies Applied

The system provides quick and accurate data input. The required level of automation is attained by using state-of-the-art technologies:

- Bar-code Marking Systems
- Mobile Devices

1.1. Bar-code Marking Systems

1.1.1. Objectives of using bar-code marking systems

Bar-code marking helps to resolve two major issues related to data input:

- Data entry speed
- Data integrity

If the volume of registered units is high, greater than several hundred units per day, a bar-code system becomes critical to ensure accurate data entry.

Using bar-code, units can be marked with a tag including not only the number but also other useful information printed in normal type to be read with the naked eye. This and the lower price make bar-code marking more cost effective than radio frequency identification (RFID).

1.1.2. Bar-code Printing

Existing tag printing devices can generate tags for a wide range of applications:

- metal tags should be used for harsh industrial applications with high temperature and corrosive environments;
- plastic tags can be used under normal plant operating conditions;
- paper tags can be used for office applications.

1.1.3. Bar-code Reading

It is also necessary to provide devices for data reading and input. These are bar-code scanners. Depending on operating conditions bar-code scanners can be of the two types:

- industrial
- office.

Depending on the type of connection there are two types:

- wire bound
- wireless (collecting terminals).

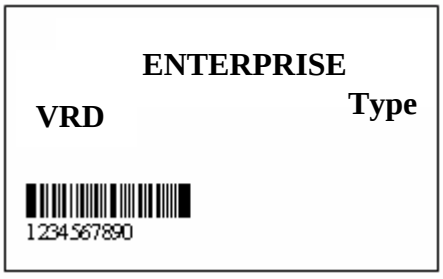
1.1.4. Example of how a Bar-Code System was used to automate data entry in a shutdown & safety valve repair process.

The information is input automatically by using bar-code scanning instead of keyboard input.

Bar-code marking was used to identify the following system components:

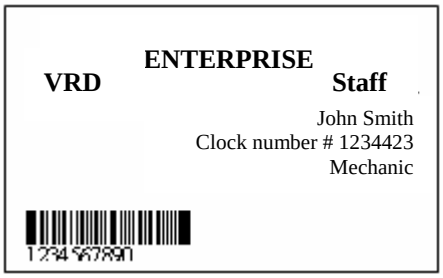
- valves;
- staff;
- temporary component identifier;
- storage location;
- production process.

Valve Identifier (descriptor number) fully identifies the unit in the system. It is printed on the metal tag attached to the valve when it arrives in the repair division.

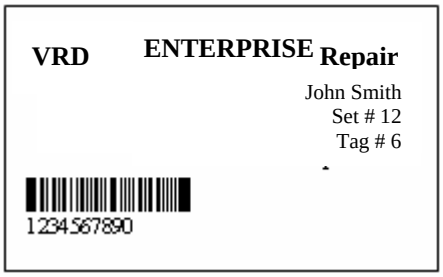


VRD – valve repair division
Type – unit type (shutdown valve, safety valve)
Enterprise – Kirishi Oil Refinery

Staff Identifier (badge) is a field in the staff personnel data table. Badges are used for staff authentication in the manufacturing area.



Temporary Component Identifiers are tags attached to the component during the disassembly process. These tags are combined into sets containing up to 10 tags and are printed for the (dis)assembly personnel. Each worker will have several sets.



Mobile Devices

1.1.5. Objective of using mobile devices

Mobile devices provide the user with access to necessary data regardless of location. Mobile devices include pocket PCs, pagers, and cell phones. However, pagers and cell phones provide only reception of event notifications. Pocket PCs are the only devices that can provide full data access and interaction with real-time events. Thus, we will consider only pocket PC-based solutions.

Mobile devices for enterprise control systems resolve two important issues:

- interaction with real-time production information;
- access to information regardless of location.

Interaction with real-time production information:

Thanks to pocket PC-based solutions, dispatchers and other stakeholders interested in SCADA tracking results can easily move around a facility and/or remote locations. They can be sure to be notified in case of any critical event. After being notified they can take measures to resolve problems even before returning to the dispatch room.

Information reception:

Pocket PC-based solutions may be used to request specific information based on certain criteria. This function can be used by managers to get information when a PC is not accessible i.e. during meetings, or by technical staff to receive technical information during valve repair or setup work.

Typical mobile device applications

- Access information from remote locations and to interact with this information and other staff members;
- Provide staff with real-time information regardless of their location;
- Enter information directly into the system in a timely manor and avoid taking intermediate notes, i.e. during the inventory procedure.

The Economic Value of Mobile Devices

- Optimize management decision making;
- Increase the efficiency of technical staff.

1.1.6. Required Equipment

To use mobile devices, two types of devices are required:

- Mobile device itself;

- Gateway from the radio network to the enterprise computer network.

Gateway from the radio network to the enterprise computer network

The gateway known as the access point, provides access to the mobile PC network via radio.

For inside applications, IEEE 802.11b supporting devices are better suited, since they provide a communication distance up to 300 meters, have a strong noise immunity (can be used under industrial conditions), and their licensing procedure is simple and well-defined.

Spectrum24 4131 Access Point:

Minicomputers

Using minicomputers the staff can input and receive data in/from the system. Data is entered via keyboard, as well as using a built-in bar-code scanner, which facilitates quick, reliable and easy data input.

Typical pocket PC with radio access and built-in bar-code scanner for industrial applications.

1.1.7. Application of mobile devices in the shutdown and safety valve repairing process

Mobile devices in this application have the following features:

- Provide enterprise officials with the information required whenever and wherever s/he needs it. E.g. the repairman having found a component can determine the date of its delivery, its repairing staff and its current status, without returning to his/her working place;
- Provide the operator with the capability to input delivered valve data in the place where s/he is. Thus the operator can take as many components as are delivered to the division and can be sure that all information is stored in the system;
- Provide the stockman with an opportunity to efficiently dispense and receive valves directly from and into inventory while physically arranging them on the shelves.