On the move

ABB's mobile control room for quick and effective problem solving

Pierre Öberg, Christoffer Apneseth

Advances in communications technology have certainly made the world seem a very small place. Sophisticated mobile phones and personal digital assistants (PDAs), with ever-increasing functionality, and e-mail make it possible for many people to access documents at any time in almost any place. Many will agree that such quick access to information has resulted in increased efficiency in many aspects of business life. In other words, we live in a world where being mobile and always connected is now seen as a necessity rather than a luxury.

ABB is now taking this technology and it benefits, and applying it in an industrial environment. The company has developed a solution that gives mobile access to a factory's process control system, thereby enhancing overall productivity and efficiency. To fully test this solution, it has been installed at Boliden Mineral AB in Sweden where the benefits can already be seen.

In most industrial plants, control systems are used to monitor and control many device parameters, for example, the level of a tank, the temperature of a fluid in the process or the opening of a valve. Most plants have one or more centralized control rooms and in each room, the user typically has access to several operator stations with large 20-inch monitors. Using the graphical user interface of each station, the operator can supervise a process by means of graphical representations of real world devices. The system returns alarms and events from these devices as well as giving the operator device control, eg, motor stop and start.

It is often necessary for operators, process engineers and service personnel to visit the production area during, for example, trouble-shooting, commissioning of new system parts or during scheduled inspections. Problem solving most probably means that the person in the production area has to be assisted by a person who must be situated in the control room. Communications are carried out by means of a walkie-talkie,

telephone or, not unusually, by miming or simply shouting. Naturally, the risk of misunderstandings is quite high.

Such a level of dependency can be significantly reduced, or simply eliminated, if staff could move around within the factory and still have access to the tools and information they need. Think of the time saved trying to explain complicated instructions not the mention the reduction in downtime when a problem occurs.

This potential has now been realized by ABB with the development of a solution that allows factory employees mobile access to the plant's process control system. The solution has already been installed in Boliden, a major mining company and early adopters of industrial mobile applications. For Boliden the introduction of what is now termed 'the mobile control room' is perceived as *a new and future way of working.*

Challenges faced
Mobility can be achieved in a number of ways, ranging from a laptop via

Tablet PCs and Pocket PCs to a mobile telephone. The system installed in Boliden uses smaller type devices like Pocket PCs (and even smaller devices, eg, mobile phones that easily fit in a pocket) mainly because users do not want to carry a bulky laptop around a potentially large production area.

From a human-computer interaction perspective, mobility in general, and the use of small devices in particular, has some special requirements. Because of their size, pocket PCs and telephones cannot display the level of detail seen on 20-inch monitors in the control room **1**. For an operator working in the production area, such detail is not really necessary. ABB engineers were therefore faced with the challenge of filtering out the most important and relevant information available in the control room to a normal operator and structuring it for use on a mobile device.
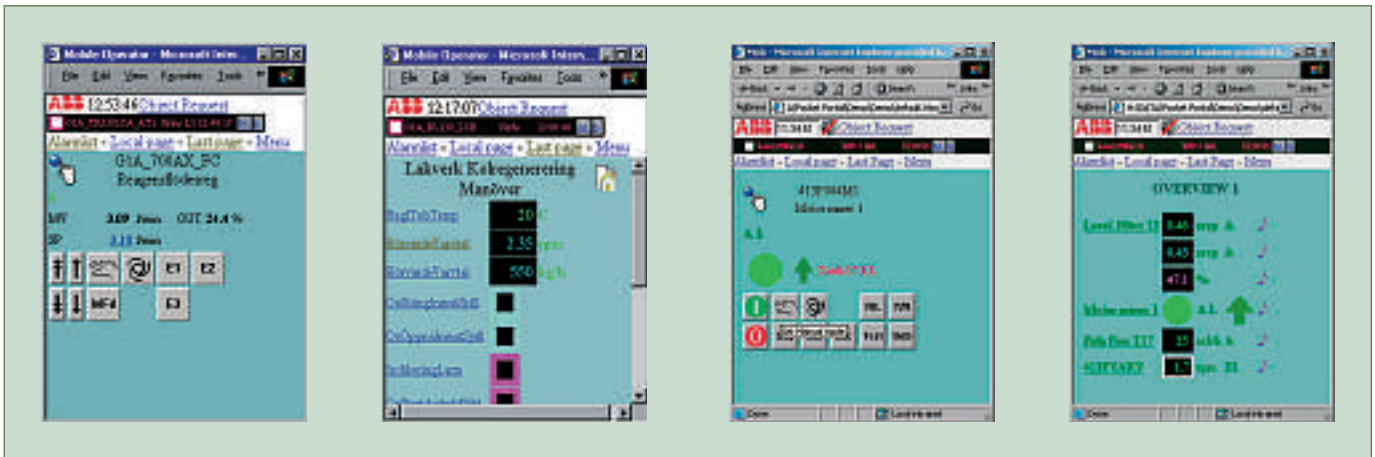
With this in mind, the designers decided to focus on the display of dynamic information such as the state of a device, measured values and set points, **2**,

1	Typical displays from a control system (20 inch monitor)
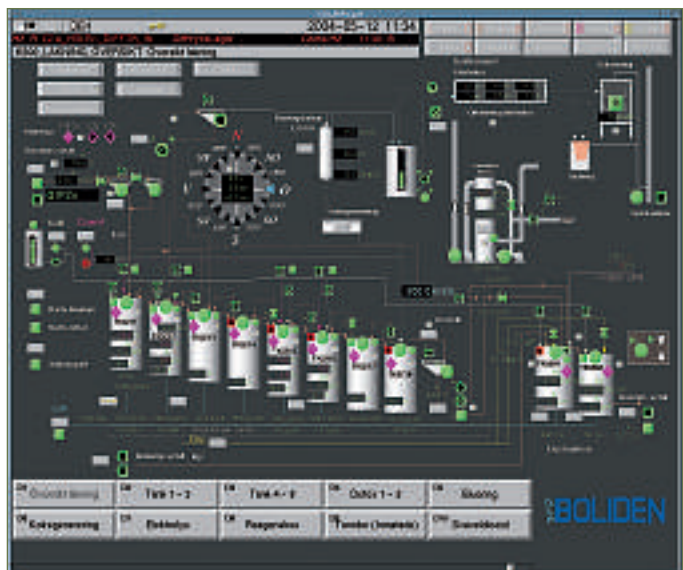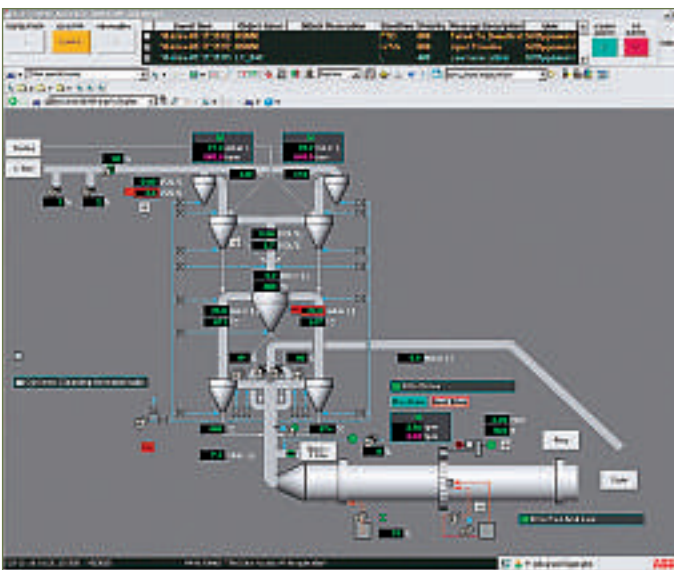
2	Typical screen shots from a mobile interface.

Pocket PC size terminal showing an overview and a detailed faceplate for a motor device.

while using only graphical symbols for all devices.

The solution

The ABB solution gives a mobile user (eg, an operator or service technician) real time access and control to all devices in the control system by means of handheld computers and wireless communication.

The solution is implemented on top of Process Portal A[1] server which acts as:

- A connectivity server to access data from the process controllers (through OPC).
- An access server for mobile clients (by means of the Microsoft Internet Information Server IIS).

With ABB's solution, the following functions are available to users:

- *Process overview:* This allows the user to monitor the state of his process.
- *Process control:* Using faceplates, the operator can interact with the process.

- *Alarm list:* The user is always notified and can evaluate and acknowledge whenever there is an alarm.
- *Device search:* The operator can do this using an object request function.

Technical overview

- When the device is turned on, the mobile user is automatically connected to the local area network (LAN) using, for example, wireless LAN (WLAN), Bluetooth or GSM/GPRS/3G.
- The client software requests information using an http-type request. In fact, the graphical user interface is in the form of a web page.
- The server (ie, Process Portal A) in turn queries the process controller(s) for dynamic information using OPC.
- The user is then presented with continuously updated real-time information.

One of the key objectives when designing the solution was to ensure that it

was 'terminal independent'. Having said that, it was obvious that XML and XSL style sheets would be used. The system is very flexible and supports different terminals, ranging from WAP telephones to different handheld computers like Pocket PCs or Tablet PCs.
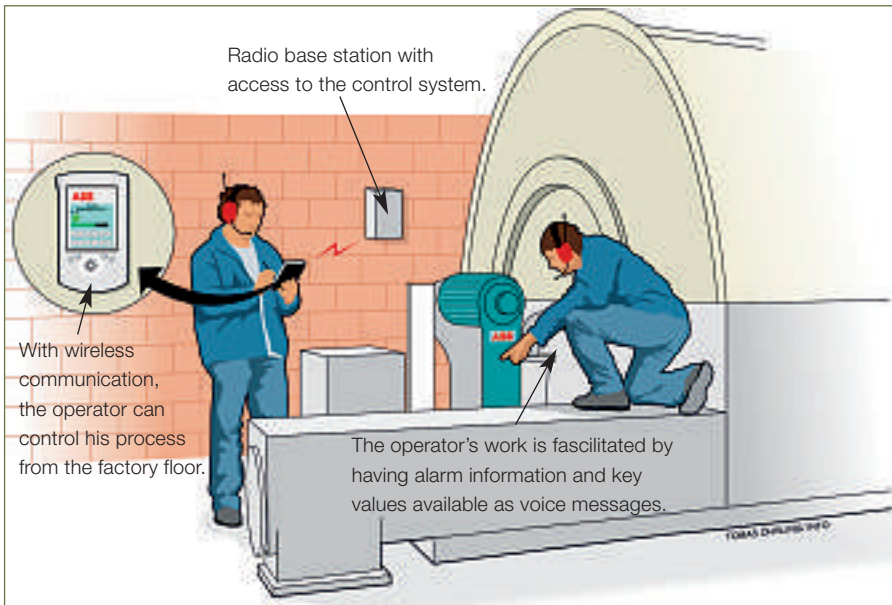
The Boliden experience

In a highly automated environment, operators very often become so dependent on operator stations that it becomes nearly impossible for them to move outside the control room. Yet, highly automated processes require inspection and control by a person on the move. When a problem has been detected in this way, quick and effective action means equipping the operator with tools that enable the execution of various tests that give immediate visual feedback.

Boliden is a company that believes operators and service engineers should have the proper tools available to enable them to carry out their jobs effec-

[1] Process Portal is an operator interface for process control which is also a very efficient tool for the daily work for engineers and maintenance personnel. With its standard technology design basis, Process Portal provides a unified window interface to monitor, control and manage plant-wide information from one location.

3	Giving the user online access to the control system

Radio base station with access to the control system.

With wireless communication, the operator can control his process from the factory floor.

The operator's work is fascilitated by having alarm information and key values available as voice messages.

use of local panels, buttons and indications could save costs in a number of different aspects including electrical design, installation and commissioning, actual material, programming and maintenance. In fact, when it comes to the design of a new process section, the concept of having 'the mobile control room' can reduce costs over the complete life cycle.

Functionality in the future

ABB and Boliden have tried to identify what additional functionality could help improve efficiency even more. In the not too distant future, it is anticipated that the following functions will become part of ABB's mobile control room:
- Video transmission to enable communication with a remote expert when problem solving.
- The use of video sequences to demonstrate work procedures, for example for certain maintenance tasks.
- Access to maintenance systems in order to create, receive and finalize work orders.

Boliden strongly believes that superior use of this type of technology will help keep it very competitive. The company is always very interested in new technology but does not hold the view of introducing 'technology for technology's sake'. Rather, new technology is a means of improving work processes and therefore productivity and efficiency. And Boliden is convinced that mobility really does increase efficiency.

tively. In addition, as a company with a reputation for adopting new technologies, it has already utilized WLAN (802.11b) and off-the-shelf type Pocket PCs (like HP Ipaq) with relatively few teething problems. The technology was initially introduced on a small scale, with wireless access in only one process section and limited use of Pocket PCs. Boliden evaluated the system over a few months after which it was decided to extend implementation.

Since installing the system, Boliden has observed that:
- It is very important to realize that mobility means a new way of working. Work processes and thus the tasks the user performs, must be changed.
- From a design and implementation point-of-view, it is important to focus on what functionality is really needed and what can actually be accomplished on a small device. In addition, it is critical to maintain the same look-and-feel as a normal control system. The mobile device is after all a complement to operator stations.

Benefits

The benefits Boliden has experienced include the following:
- Problem solving is somewhat easier and quicker when operators are next to the machine and are able to run the equipment manually.
- Access to the alarm list has been of vital importance.
- Production is quickly back to normal after certain disturbances.
- Problems are spotted earlier, thus improving preventive maintenance.
- The commissioning and testing of new process equipment is easier.
- There has been a very noticeable reduction in communications traffic between the factory floor and the control room.
- Operators found the use of the standard voice record function, available on most Pocket PCs, to record memos very useful.

In the long-term, Boliden believes this technology will minimize or even eliminate the need for special purpose panels (for maneuvering). Minimizing the

Pierre Öberg
ABB Corporate Research
Västerås, Sweden
pierre.oberg@se.abb.com

Christoffer Apneseth
ABB Corporate Research
Oslo, Norway
christoffer.apneseth@no.abb.com