Summary
Shell tested wireless connections at their global test lab. Two different connections were tested:

- Connections between mobile workplaces and System 800xA servers
- Connections between HSE subnets and linking devices LD 800HSE.

The setup of the wireless system took 1.5 days. It was running immediately without any problems.

Shell Global Solutions International BV evaluates wireless technologies for process control applications from a users point of view at the Shell Research and Technology Centre in Amsterdam (The Netherlands). Systems, devices and networks from various vendors are under test. In this context ABB extended the 800xA system at Shell with a wireless Foundation Fieldbus and control network connection.

The wireless network has recently been successfully commissioned and is in operation. It is used to bridge the distance between the control room (test lab) and two pilot plants, that are located in different buildings.
Use Cases for Wireless Technology

Shell defines three areas of use for wireless technology:

1. Wireless Bridging

Wireless bridging is defined as the extension of system networks or fieldbus networks through a radio connection. The radio connection is typically used to reduce installation costs

- For bridging large distances
- To get access to areas that are difficult to reach via cable, if for example a road, a river, or a mountain divides two locations

2. Mobile Workplaces

Mobile operator or engineering workplaces (clients) can be used at any location in a plant through a wireless connection to servers. This can save costs during commissioning, calibration or maintenance work. Through mobile clients, the impact on the process of for example a parameter change or a manual interaction can be monitored and verified immediately.

All features and functions like trend displays, diagnostic information, or process variables up to a complete plant overview are available and accessible without restrictions. Access rights of operators or engineers are managed by the control system. Wireless access allows working directly on the system’s data from any location within the plant. Data consistency is always guaranteed, data base reconciliation is not required.

3. Wireless Sensors and Actuators

In some cases it can be beneficial to have radio communication directly to the actuator or sensor, such as

- Distant locations
- For temporary installed devices
- Devices difficult to access

The devices are typically battery powered.

Technical Solution

The wireless networks, ABB has installed at Shell Test Labs cover two of the three mentioned use cases:

- The FF HSE network is extended through wireless bridging
- Engineering and operator/asset management workplaces are wirelessly integrated into System 800xA.
To achieve this, two protocols are running at the wireless network:

- FF HSE for accessing FF field devices
- RDP (Microsoft’s Remote Desktop Protocol) to login to a Windows PC. This is used to connect to a System 800xA connectivity server remotely.

**Installation at Shell Test Lab, Amsterdam**

The test set-up at Shell Test Labs in Amsterdam consists of an 800xA distributed control system (figure 1) located in a central control room with

- AC 800M controller
- wired FF HSE network with redundant LD 800HSE linking devices
- Engineering workplace
- Operator/Asset Management workplace

The system is connected to four FF H1 fieldbus segments, with instruments from various vendors located in a pilot plant.

Foundation Fieldbus functionality and features of System 800xA had been extensively tested by Shell recently and were approved by Shell.

Shell desired to set up a new FF H1 bus in an operating plant that had up to now no connection to the test system in the central control room. This was easily possible by extending the FF HSE network with a radio link (figure 1). Hirschmann wireless access points were used to set up the communication:

- BAT 54 rail, wired Ethernet to wireless according IEEE 802.11 a, b, g, allowing transmission rates up to 54 MBit/s.

Shell limited the maximum transmission rate to 6 Mbit/s, to reduce the error rate and increase availability.

A satellite box with an LD 800HSE linking device allowing to run up to 4 FF H1 buses was placed in the remote building. Two FF devices, a temperature transmitter and a machinery health monitor were connected to one of the H1 segments.

Another wish was the ability to have mobile engineering and operator workplaces in the remote pilot plants. Again the Hirschmann access point BAT54Rail was used to ensure wireless connectivity in the different buildings and floors (figure 2).
Results

Due to the ABB solution it was possible to utilize FF devices in a plant, that had no wired connection to the FF network. This new setup enables Shell

- To install FF devices in a very cost efficient way
  - no extra cabling
  - no installation cost for cabling
- To have mobile workplaces in the lab and pilot plants
- To have new H1 segments in the pilot plant
Figure 2: Wireless link between buildings

Setting up the wireless extension of the network took 1.5 days. Berry Mulder, Shell program leader, commented: “I’m very pleased with the new wireless solution. The installation was performed in very short time and it provides high flexibility for future modifications.”

ABB and Shell will continue their collaboration in wired and wireless fieldbus technology.

Next steps are: Analysis of security needs and installation of security measures e.g. firewalls to be set up. Currently the strongest available state-of-the-art encryption is used (WPA2-AES).