On-site wireless communications for quicker response

How quicker response to disturbances creates a more agile organisation, prevents production losses and reduces risk.

ascom

Contents

Executive summary

Who needs on-site wireless communications?

On-site wireless communications increases the productivity in your operations if:

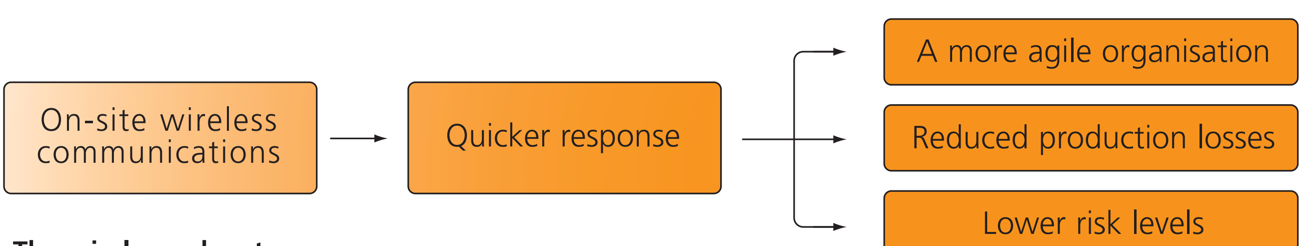
- It is physically dispersed (a large building or complex of buildings).
- Key people need to be mobile within the workplace.

Wireless communications enables quicker response to disturbances – such as technical problems or material shortages – and enables faster adjustment of scheduling, and improves the synchronisation of activities.

Key staff members receive time-critical information directly to their pocket – as speech, text, alarms or data – from colleagues, machines and computer systems. Information reaches them wherever they are.

Key people can also retrieve the information they want, or receive it automatically. They can control the process and track important equipment.

This document explains how wireless communications creates business benefits.



The wireless advantage

What are the business benefits of quicker response?

1. **A more agile organisation:**
   - More production from existing capacity
   - Higher delivery precision

2. **Reduced production losses:**
   - Fewer unscheduled stops
   - Shorter scheduled stops
   - Higher average line speed
   - Better yield from raw materials
   - Fewer defective products to customers

3. **Lower risk levels:**
   - Improved personnel safety
   - Improved property security
   - Improved environmental protection

Where does quicker response create business benefits?

1. **Continuous processes:** Highly automated manufacturing. A stop in one sector quickly leads to a total stop. It takes time to recover full quality and line speed after each halt. Technical failures are a common cause of stops and reduced line speed. Ascom wireless solutions shorten the time between failure and action.

2. **Batch processes:** Many different products in each plant, many components in each product. Common causes of stops and reduced line speed are: wandering bottlenecks, materials shortage and technical failure. Ascom wireless solutions enable quicker adjustment of scheduling, and shorten the time from materials shortage or technical failure to action.

3. **Project processes:** Each delivery is unique. Automation only of sub-processes. Waiting for information and decisions are common causes of delays and quality losses. Ascom wireless solutions shorten waiting times for information and decisions, and improve the synchronisation of simultaneous projects.

How to make more of the resources you already have

Most production systems could be more agile and produce more with better quality and delivery precision – without investing in new equipment and advanced support systems.

If only…

Yes, there are many "ifs" and "buts". Wireless communications cannot answer them all. But surprisingly many.

Quicker response

On-site wireless communications ensures quicker response in critical situations. It creates a more agile organisation, prevents production losses and reduces risk to people and the environment.

Key staff receive time-critical information directly to their pocket (as voice, text, alarm or data) from colleagues, machines and computer systems. Information reaches them wherever they are. They can stop and start processes and track important equipment. And they can retrieve or automatically receive information on deliveries, throughput, OEE or other key figures – while on the move.

Smart integration

We are not promoting a particular wireless network technology. Different technologies are suitable for different needs and applications. Nor do we want you to rip out your old communications systems. Many of today's systems will deliver value for years.

But you get more out of the resources you already have by adding wireless links between your key people, production controls (MES), enterprise resource planning (ERP), IT and telephony, and premises alarms (BMS).

Customised solutions

Ascom wireless communications systems support all departments and processes. They transfer time-critical information between personnel and processes in order processing, materials supply, scheduling, production and quality control, processing, maintenance, security and building services.

You get a customised solution based on the needs of each department or process. Commissioning, training, maintenance and service are part of our offering. We can continuously adapt your solution so that it changes with your needs.

Step by step

Wireless systems should only be phased in where they have a clear potential to create value. The investment must be affordable and deliver benefits upfront. The solution must be modular so it can be implemented step by step.

Ascom's offering to manufacturing operations comprises concepts for the following areas: production, materials supply, personal security, corporate security and technical installations. You can start with any concept, and add more concepts over time. You can begin with 10 to 20 users and add more later.

We can also help specify the requirements necessary for achieving long-term, enterprise-wide integration.

Small investment yields big return

Installing wireless solutions and integrating them with existing systems is relatively inexpensive. Typically, the investment is only a fraction of the factory's total investments in systems for monitoring, control

and production planning. The investment is often fully paid back in less than one year, for instance because:

- You gain a potent tool for everyday cost cutting, and can postpone investing in new capacity.

- You can more effectively synchronise the numerous people involved in scheduled stops – thus reducing downtime. Sometimes, the uptime gained in only one scheduled stop justifies investing in wireless solutions.

- You more quickly achieve full efficiency when investing in new capacity. This may even translate into lower-than-expected staffing requirements.

Enabling agile manufacturing

Today's customers change their demands faster and more unpredictably than ever before. They expect made-to-measure products. They want to place orders around the clock via the internet and other channels. They think nothing of altering – or indeed cancelling – orders at the last minute. Yet they insist on high quality, swift delivery and a low price.

Today's production systems must therefore master uncertainty and change to a degree previously unheard of. They have to produce goods in numerous variations for different countries, regions and market segments. At the same time, they must maintain low inventory levels and high effectiveness.

The ability to master the unexpected while still turning a profit is today decisive for competitiveness in many industries. And it is fast becoming so in many more.

The potential is there

Agility is the ability of a production system to quickly respond to unplanned changes in customers' preferences, and to other surprises. Most production systems have considerable latent agility. This is the structurally inherent potential for agility in existing equipment, manpower and space.

But to turn its latent agility into real agility, the organisation must be able to quickly respond to changes that the production system has not foreseen or cannot control.

The path to real agility

Capacity planning is typically done in a time frame of about one year.

Scheduling allocates capacity and resources to different tasks, activities or customers in a time frame of months, days and hours. Dispatching rules then specify which job should be selected for processing next from a queue of jobs.

In reality, it is difficult to follow the schedule because of disturbances originating outside the organisation (rush orders, delayed materials) or within it (a machine breaks down, a key operator calls in sick).

To be really agile, the organisation must be able to adjust scheduling in real time. For example, by splitting jobs at bottlenecks and exploiting unforeseen free capacity. An hour added at the bottleneck will add an hour of capacity to the entire factory.

The agile organisation

A quick response to disturbances is a defining characteristic of the agile organisation. Responsiveness is supported by:

1. More local responsibility. Take advantage of the fact that shop-floor staff want and can accept responsibility.

2. More effective communications. Interactive, multidirectional information flows. Your key people must be reachable at all times – wherever they are within the plant.

More capacity, higher delivery precision

Wireless communications speeds up response and liberates the latent agility in your organisation

Key staff in order processing, materials supply, production, quality control and maintenance can communicate instantly – between management layers, across departments, regardless of location. They can communicate with one another, with processes and with support systems – within systems, across systems, and while on the move.

You squeeze more capacity out of your existing structure. Sometimes, you gain enough to postpone investing in new capacity. You can cut lead times for critical orders without negatively affecting lead times for other orders. You improve your average delivery precision.

Examples of unpredictable disturbances

Disturbances originating outside the manufacturing organisation:

Downstream disturbances
- Rush orders
- Changes to orders (quantity, due date)
- Quantity and mix variations
- Customer production problems
- Finished goods delivery delays
- Lost stock, poor stock monitoring
- Demand variations
- Forecasting errors

Upstream disturbances
- Materials quality problems
- Supplier production problems
- Materials delivery delays
- Materials property variations
- Incorrect deliveries

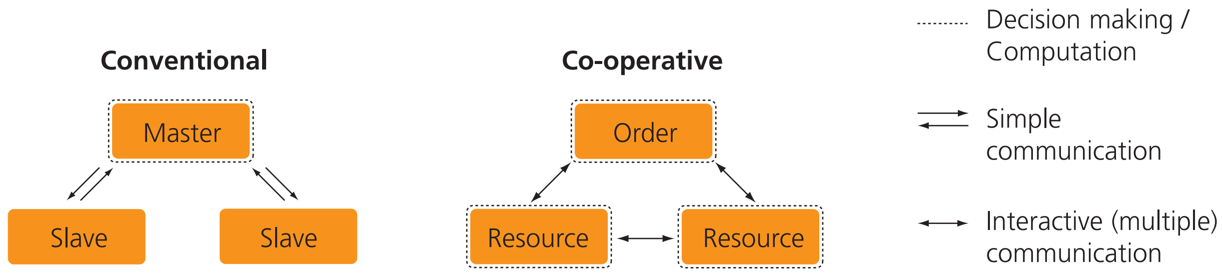
Disturbances originating inside the manufacturing organisation:

Processing
- No parts
- No operator
- Human error
- Machine breakdown
- Software error
- Lack of utilities (air, heating, cooling)
- False alarms (fire, gas, burglar)

Planning and control
- Sub-optimal scheduling
- Unsuitable dispatch rules

Wireless communications enables quicker response to disturbances. It enables quicker adjustment of scheduling. It boosts capacity in the existing structure and sharpens delivery precision.

Conventional flow of directives (left) compared to interaction between human/human or human/machine



Preventing production losses

A common measure of the total effectiveness of a machine or factory is OEE, Overall Equipment Effectiveness. OEE quantifies all the losses in a process and groups them into availability losses, performance losses and quality losses.

The combined effect of losses in the three categories is often alarming. In continuous processes, an OEE of about 75 per cent is common. In batch processes about 50 per cent.

	Availability x	Performance x	Quality	= OEE
Continuous processes:	98%	85%	90%	= 75%
Batch processes:	70%	80%	90%	= 50%

On one hand, it can be disheartening to realise that effectiveness is only half of what it could be. On the other hand, it highlights the potential for improving OEE.

How to improve OEE

You can tap some of the potential by quicker adjustment of scheduling so that existing capacity is better utilised (see pages 6–7). You can tap even more potential by responding quicker to disturbances that have a potential to reduce the capacity of critical resources or impair raw material yield.

Such disturbances can be technical failures (mechanical problems in bearings, pumps, motors). They can be random errors (material is incorrectly fed into an automatic processing machine). Or they can be the result of human error (quality problems from a prior operation).

Other disturbances are sub-standard raw materials and components. The further these travel through the process, the more losses they cause.

Time bandits

Some people think a few seconds to download a webpage is a long time. But a few seconds to react to a materials or process problem can result in defective products and production stoppage.

There are many reasons why valuable seconds tick away. Time can elapse between the emergence and the discovery of a disturbance, for instance because the alarm goes to an operator terminal that is momentarily unmanned.

Time also passes between alert and action. It may be unclear who is responsible for an alarm, for instance blinking lamps or sound signals. In the case of alarms to operator terminals, operators must often scroll through the system to understand what is happening.

When an alarm goes to the control room, seconds tick away while the control room locates an individual who can take action. Even when contact has been made, the control room may not be able to answer follow-up questions. When a staff member finally reaches the source of a problem, he or she may not have the right tools or competence for the job.

Quicker response

You can banish time bandits with on-site wireless communications and quicker response:

- Identify the disturbances with the greatest potential to impair OEE. That is, disturbances that risk reducing the capacity of critical resources or lowering raw material yield.

- Prioritise the most time-critical alarms, and assign a key person on the floor with the responsibility for each alarm signal. Link alarms to both functions and individuals, thus ensuring that signals get through without a hitch even at shift and duty changeovers, and in the case of a worker's absence.

- Provide your key people with wireless communications so they can receive alarms anywhere in the plant (and with escalation to colleague after a certain time without acknowledgement), and communicate with colleagues and supervisors either one on one or in groups.

Fewer production losses

On-site wireless communications speeds up the response to disturbances that can halt production, reduce speed or cause defective products.

Key production staff receive alerts right into their pocket, regardless of their location; with correct priority, and in unambiguous language that explains what has happened, and where. Your staff can communicate with processes. They can request further information. They can start or stop critical pumps and open or close valves (if authorised). They can speak with one another one on one or in conference calls – throughout the entire plant, through concrete walls, in noisy environments.

Wireless communications strengthens your staff's sense of responsibility. It helps build a team spirit around every task. Motivation increases. Losses go down.

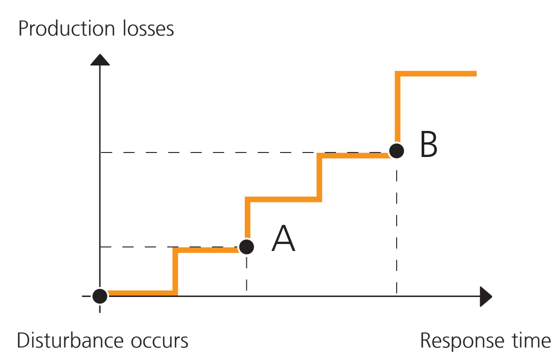
Shorter scheduled stops

During a scheduled stop a lot of work has to be done in a short time. Many different trades and work teams have to co-operate. Often, your staff works alongside workers brought in from outside.

Wireless communications contributes to a more effective synchronisation of the tasks at hand. The duration of scheduled stops is reduced. In fact, the time gained in a single scheduled stop is sometimes enough to justify the investment in a wireless communications system.

A tool for everyday cost cutting

Most companies can substantially improve their bottom line by achieving only very small improvements in OEE. Lower quality losses are profitable in any economic climate. Even minor improvements have a great impact on the bottom line.



Wireless communications helps your organisation respond at A rather than B.

But it also makes business sense to improve availability and performance in an economic downturn. The improvements you achieve then take you further within your existing capacity when the economy improves.

Use on-site wireless communications as a tool in your everyday cost cutting, and you may be able to postpone investing in new capacity.

Have you taken the one per cent test?

The only figures you need to calculate how much you stand to gain by improving OEE by one percentage point are 1) sales, 2) the cost for direct material.

The tables on page 13 give examples of what a one percentage point better availability, performance and quality can mean in different industries. The figures are based on our experience from production plants in Europe and the USA.

Of course, the ratio of direct material to sales varies considerably from industry to industry, from company to company, and from product to product. Nevertheless, the tables illustrate the financial benefits available.

- One percentage point higher availability or speed equals one percent higher contribution (if you can sell the extra production).

- One percentage point less quality loss has a dramatic impact on the bottom line. If you cannot sell the extra volume, profits increase by an amount equal to the reduction in direct material costs. If you can sell the extra volume, profits increase by 1 per cent of total sales.

OEE = A x P x Q

A = Availability
P = Performance
Q = Quality

Availability (A) is the difference between actual and planned production time. Set-up time and adjustments are examples of availability losses.
A = (planned production time – downtime)/ planned production time.

Performance (P) is the ratio between actual and planned production speed. Short stops, idling and reduced speed are examples of speed losses.
P = (Number of products x ideal cycle time)/available production time.

Quality (Q) is the ratio between the number of good products to the number of manufactured products. Rework and rejects are examples of quality losses.
Q = (Number of products – number of defective product)/ Number of products.

Hidden costs

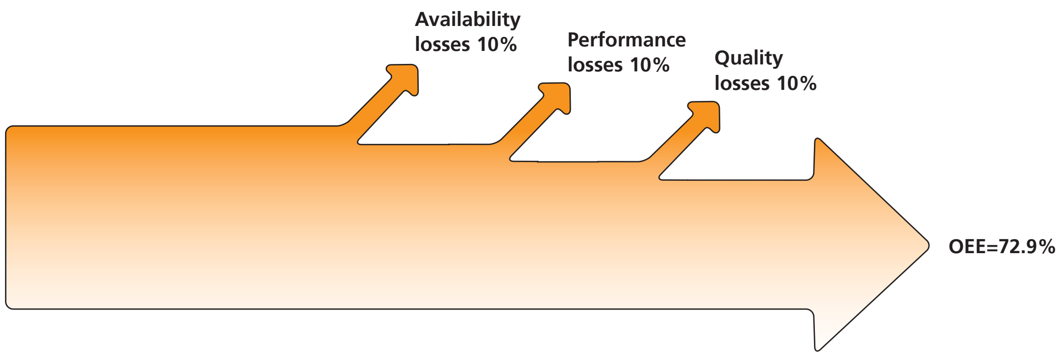
By far the most expensive quality losses arise when defective products are delivered to the customer. Sometimes the customer is satisfied if you deliver new products. Hidden costs 'only' manifest themselves when the same delivery must be manufactured again (this time without payment) and when this unplanned production suddenly gets top priority and disrupts planned production.

But the true scope of hidden costs is often much greater. For instance, in the form of costly damage to corporate reputation, penalties and even legal action.

Countermeasures

The best countermeasure is to design the value-adding process so that failures never happen. Many companies have gone a long way towards achieving this.

But random glitches and human errors in production will occur as long as the laws of quantum physics apply, and as long as there are human beings in factories. On-site wireless communications for quicker response helps your organisation master the unpredictable.



The OEE quantifies all losses to good quality output that can occur in a process.

The seven wastes of production

Losses in availability, performance and quality often have their root causes in the 'seven wastes of production'. Wireless communications and quicker response can help reduce them:

1. Overproduction ahead of demand
2. Waiting for the next processing stop
3. Unnecessary transportation of materials
4. Overprocessing of parts
5. Inventories more than the absolute minimum
6. Unnecessary movement by employees during the course of their work (looking for parts, tools, prints, help, etc.)
7. Production of defective parts

What you can earn for each 100 million euros in sales

A = Availability up by one percentage point

Plant	Sales (Million €)	Direct material	Value [1]
Pharma	100	25%	750,000
Power	100	40%	600,000
Cars	100	60%	400,000
Paper	100	70%	300,000
Food	100	75%	250,000

[1] Additional contribution (if the additional production can be sold).

P = Performance up by one percentage point

Plant	Sales (Million €)	Direct material	Value [2]
Pharma	100	25%	750,000
Power	100	40%	600,000
Cars	100	60%	400,000
Paper	100	70%	300,000
Food	100	75%	250,000

[2] Additional contribution (if the additional production can be sold).

Q = Quality losses down by one percentage point

Plant	Sales (Million €)	Direct material	Value [3a]	Value [3b] (€)
Pharma	100	25%	250,000	1,000,000
Power	100	40%	400,000	1,000,000
Cars	100	60%	600,000	1,000,000
Paper	100	70%	700,000	1,000,000
Food	100	75%	750,000	1,000,000

[3a] Additional profit equal to the reduction in direct material costs (if more volume cannot be sold).
[3b] Additional profit equal to one per cent of sales (if more volume can be sold).

Reducing the risk of accidents

Some disturbances cause more than just production losses. They can damage facilities. They can harm the environment. They can kill people. An explosion at a fireworks factory in Enschede, the Netherlands, in 2000 claimed 20 lives. One year earlier, a blast at a chemical plant in Toulouse, France, killed 29.

Effective risk management has long been a top priority for processing industries. And it is increasingly assuming the same status in manufacturing.

A risk-analysis model

An important task of any risk analysis is to identify the error sources and to attempt to predict how an error propagates and causes an accident. For instance according to this model:

1. Deviation: A deviation occurs (drifting process parameters, leakage of toxic or explosive substances). The deviation goes unnoticed (broken sensor). The deviation grows (alarm fails to reach right person quickly enough).

2. Hazardous event: The deviation grows into a hazardous event (pressure in a tank reaches a critical level, explosive substance reaches a dangerous concentration). The hazardous event goes unnoticed (broken sensor). The hazardous event grows (alarm fails to reach right person quickly enough).

3. Accident: The hazardous event escalates (someone begins welding … ignites leaking gas). Hazardous event grows into an accident.

A good risk analysis clarifies how to prevent the consequences of unintentional disturbances (human error, technical failure), and intentional disturbances (theft, sabotage).

One challenge is that risk analyses are seldom comprehensive. It is difficult to correctly identify all the errors capable of causing serious accidents. It is even more difficult to accurately predict all the possible patterns of error propagation.

It is therefore crucial that the organisation can take action quickly in response to problems. Also, the organisation must have the capability to react to unforeseen error propagation.

In addition, all alarms should be logged. This increases the chances that the organisation quickly finds the primary error when many alarms come almost simultaneously. Logging makes it simpler to eliminate systematic errors and minimise risk levels long term.

Quicker response reduces risk

On-site wireless communications enable quicker response to disturbances that can harm people, property and the environment.

Key staff in safety, production and management get alarms right into the pocket. Wherever they are, designated personnel get clear, unambiguous information on what has happened and where. Staff can communicate with safety systems and processes. They can talk one on one or in conference calls – throughout the plant, through concrete walls and in noisy environments. They can nip many problems in the bud, and reduce the risk of accidents.

More effective damage control

Even when an accident has occurred, quicker response helps minimise the consequences. For example, in the event of an accidental discharge of

On-site wireless communications enables quicker response to disturbances that can harm people, property or the environment.

cleaning agent, the company can alert the sewage treatment plant, so they can take action and minimise the damage.

In the event of a serious accident, safety personnel can get information about the number and location of people in the risk zone. They can quickly set up conference calls with management, outside specialists and emergency services.

Wireless communications speeds up the dissemination of information to the press and public. Company spokesmen can sooner replace "We still don't have any information" with: "At 8.16 a.m. a small amount of ethylene oxide leaked from tank 12. The situation is now under control. No injuries have been reported."

On-site wireless communications helps you comply with regulations for security, worker-safety and environmental protection, such as the EU Seveso II Directive.

Accelerate decision-making – strengthen motivation

The real power of wireless communications is its ability to accelerate processes and decision-making. The effects are not merely practical. They are psychological as well. The most important practical effect is, of course, the time saved. But the many psychological effects are at least as important.

People, not terminals

1. A first principle of our solutions is that time-critical information should reach the right person at the right time, not just an operator's terminal. This enhances the individual's sense of personal responsibility. There is no doubt who is responsible for taking action.

2. A second principle is that information must reach people in plain language, not in obscure code, and that the person must acknowledge receipt. This minimises misunderstanding and mistakes. (Alarms that are not acknowledged within a fixed amount of seconds are automatically passed on to the next person in a predetermined chain.)

3. A third principle is that events, alarms and actions should be logged. This further strengthens the sense of personal responsibility among users. And it provides valuable information for continuous improvement of processes and routines.

Own initiative

4. A fourth principle is that operators should be able to access process values, inventory levels and other critical information on their own initiative – without having to walk to the control room or field instruments. This encourages operators to use their ability to predict, think and draw conclusions. It increases their sense of being important and trusted.

Both speech and text

5. A fifth principle is to enable people to communicate both with speech and text. It is easier to keep a clear head in critical situations if you know you can talk to colleagues or superiors. And it is useful to be able to download repair instructions from the system to the wireless phone.

6. A sixth principle is to enable communicatons with several people simultaneously, with both speech and text. Setting up a quick phone conference often makes synchronisation of efforts easier. Quick feedback of production results via a text message strengthens motivation and team spirit.

Gain more from people power

Extensive automation of planning, control and processing is an obvious condition for high productivity.

But equally important is making better use of your staff's ability to predict, think, take initiative and co-operate. Wireless communications can contribute. You will see the results in the form of a more agile organisation, reduced production losses and a lower risk level.

Wireless communications encourages people to use their abilities to predict, think, take initiative and co-operate. It simplifies delegation, accelerates decision-making and enables quick feedback. It creates a sense of security and strengthens team spirit.

Twenty-five value-creating services

Here are just a few examples of wireless communications for manufacturing plants. Most of the functions are already in use. The rest we can quickly create for you.

1. When the production manager arrives at work in the morning, the communications network recognises his wireless communications device. Production figures from the nightshift pop up: volume three per cent above target, quality spot on. (Everyone on the nightshift received the results in their handsets before handing over to the day staff.)

2. The sales manager learns a rush order cannot be delivered within a week as promised. He calls the head of planning who is out making her morning tour of the plant. She has just learned that line A will be free for two hours because raw materials have been delayed. However, according to the stock figures on her handset, materials for the rush order are available. Line A immediately starts work on the rush order.

3. An operator receives an alarm that the temperature in the paint oven is too low; almost at the point where the car bodies cannot go to the assembly line. He cannot solve the problem alone, so he forwards the alarm. Within seconds he is in phone contact with the process expert who is in a meeting in the press shop.

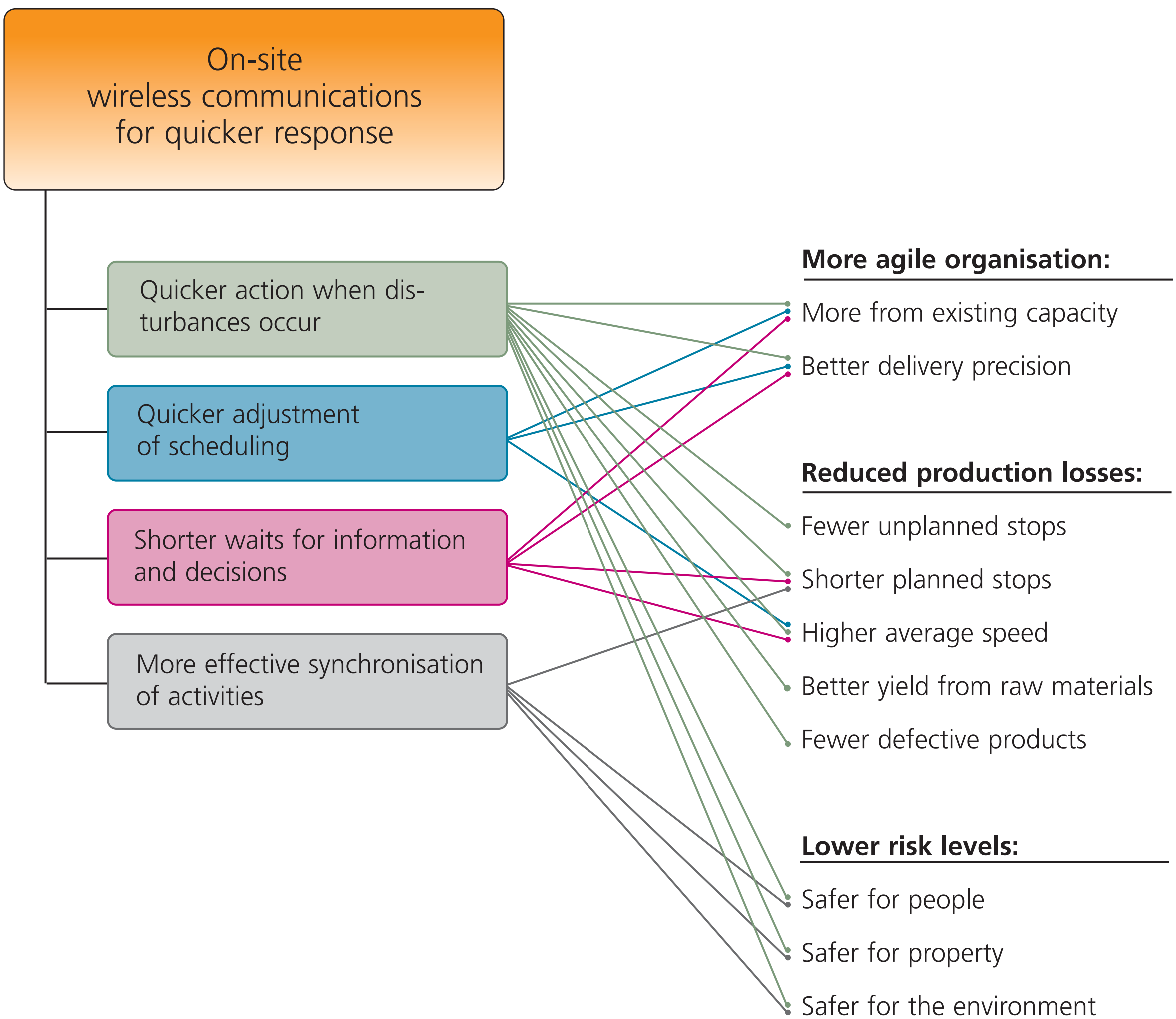
4. A customer who has just taken delivery of a new-model car reports problems with the brakes. The Service Area Manager calls the containment team. Within one minute a conference call is set up that includes everyone on the team – one in his office, two moving between floors, four out on the factory floor, one out travelling.

5. The assembly foreman gets an alarm to his phone alerting him to quality flaws in a batch of plastic components. Attached to the alarm are the Batch Manufacturing Records. The foreman quickly identifies all the vehicles that have already been fitted with components from that batch.

6. A batch of valves is almost assembled. All that's missing are the handwheels, which are not in stock. When the goods reception department registers the arrival of the handwheels 20 minutes later, the assembly staff are automatically notified.

7. A process technician is supervising the cleaning of a batch reactor when she receives an alarm from another reactor to her handset, including a process chart. The temperature in the reactor is correct. But the glycol in the heat exchanger circuit for refrigeration is –16°C instead of –18°C. With the push of a button she makes speech contact with the head of utilities supply. They solve the problem before the temperature in the reactor rises markedly.

8. A process engineer is in a meeting on the fourth floor. At the same time he monitors a pump that failed earlier in the day. He also monitors the new bio-reactor that is being run in. Pump flow and process data stream across the screen of his wireless handset while the meeting continues.



9. Simon and Tim are responsible for the automatic high bay storage. Both receive an alarm that an automatic truck has stalled. Simon knows he is closest to the truck, and acknowledges the job. The alarm disappears from Tim's handset. Once Simon has fixed the truck he confirms completion of the assignment and reports the cause of the problem.

10. The process operator, thinking the water in a pool looks suspiciously cloudy, wants to read off one of the plant's 1,200 field instruments. But no operator display is nearby. He uses his wireless handset to request data. As he suspected, the humus content is too high, so he adjusts the freshwater flow. The event is logged for a follow-up investigation, and for adjustment of the regulating parameters for freshwater flow.

11. A process operator calls to report an electrical failure just when Kurt, the electrician on duty, has to nip out on an errand. Kurt calls his colleague John who is in another building and asks him to take over. John confirms the changeover by using his handset to log on for duty. He takes over without any time gaps or confusion about who is responsible. Machine alarms, phone calls and other duty functions automatically transfer from Kurt's to John's wireless phone. The event is logged. John proceeds directly to investigate the electrical failure.

12. A process technician is taking a coffee break when the gas alarm goes off. He is a member of the plant's catastrophe management team, and receives a text message: "Ammonia leak tank 3, outflow 1 tonne/min". The alarm initiates a conference call. He is already in contact with the rest of the team as he dashes from the canteen. The speedy connection helps the team effectively co-ordinate their response, thus limiting the leak's effects.

13. Lenny is responsible for fire safety. He receives an alarm in his wireless handset: "Fire alarm, detector 24, assembly". He acknowledges receipt of the alarm, knowing he has 120 seconds before the general factory alarm goes off, and sprints towards the detector. Upon arrival in assembly, Lenny sees it is a false alarm (somebody is welding near the detector). Lenny re-sets the alarm, preventing an evacuation of the plant.

14. A maintenance technician works alone late Saturday night when the process line is down. He slips from a ladder and the fall leaves him unconscious on the floor. The 'man down' alarm in his wireless terminal alerts the external alarm centre. The wireless alarm device gives the alarm centre the precise location of the injured man.

15. A technician is making his daily inspection tour. Key information automatically appears in his wireless handset whenever he approaches an inspection point. After each inspection he signs off his approval by pushing a button. All events are logged.

16. An IT engineer is repairing a PC in the bookkeeping department when he gets a virus alarm in his handset: "Virus, Bob Gilbert's PC, order process dept". The engineer pushes a button and gets Bob on the line. He asks Bob to immediately disconnect his computer from the network in order to prevent the virus from spreading.

17. As he stands by the coffee machine, a paper machine operator receives an alarm – complete with vibration signature – from a bearing on the free side of a drying cylinder. He decides to stop the machine to prevent serious damage. Each minute of downtime costs 225 euros in lost contribution. Within 30 seconds he is in a conference call with the head mechanic, the spare parts depot and the mill manager.

18. An operations technician is alerted to an electrical problem. Two pumps have stopped. He calls the duty electrician (who has already received the alarm and is on his way). Together they manage to solve the problem and restart the pumps before having to stop the machine.

19. A paper machine operator happens to be standing beside the size press at the very moment a web break occurs. 170 m^2 of printing paper is going to waste every second (one hectare a minute). He needs help fast, so he uses his wireless handset to summon two colleagues from the head box 100 metres away. The three get straight to work, clean up the mess, and soon the machine is running again at 1,000 metres per minute.

20. A low level in the size tank causes an alarm to start blinking at an operator's console … but nobody is there to see it. The alarm also goes to the operator's wireless handset. He immediately sees that three chemical containers are showing red and need to be refilled.

21. A glance at the phone tells Burt levels in the size tank are approaching red. To avoid getting an alarm in the middle of a shift change, he refills right away.

22. The mill manager is walking across the yard to the lab when he receives real-time quality parameters in his handset: caliper, grammage, whiteness, opacity, bulk – together with trends and deviations from goals. He also sees that following that morning's web break, the operator team got back to the right quality quicker than ever before. Everyone on the team receives the message "Nice work, well done!" in his phone.

23. A company accidentally spills a cubic metre of cleaning agent. It pours down the drain. A technician is in the warehouse where the accident occurs. He immediately calls the local wastewater treatment plant. The early warning gives them enough time to divert the highly polluted water to a separate tank, and prevent it from reaching the biobeds.

24. A tanker is loading crude oil. The officer in charge follows tank levels with his wireless phone (he is standing at the refinery's pump station). For each tank, the officer knows exactly when to stop filling. He can therefore fill each tank to its maximum capacity, but still avoid spillage.

25. The free stock picker accepts the customer order from his phone. An automatic voice in an earpiece guides him through the pick list item by item. His hands and eyes are free at all times. He confirms each picked item with a voice command, and the item is moved from the logistics system to the customer's order. Upon picking the next-to-last item on the list, the nearest available truck driver is automatically alerted to go and collect the customer's package.

No doubt you see several possibilities to accelerate processes, decisions and action in your organisation. And you probably already have a good idea which bottlenecks hinder information flow. Then hand them over to us. We'd like nothing better than to remove them.

Smart integration

Quick response requires that time-critical information flows smoothly between machines and people, from computer system to computer system, and between people. It requires that all key people can always get hold of each other for information, discussion and decision-making.

Simply put, quick response requires smart integration with the systems you already use.

The secret behind the business benefits

A wireless communications system comprises infrastructure, application software and pocket devices.

The infrastructure includes wireless technology that lets key people reach each other while on the move, and enables people to communicate with machines.

The infrastructure also includes interfaces with production control systems; with business and accounting systems; with IT and telephony; with security and building management systems; and with wireless phones, PDAs, pagers and alarm devices.

The role of the application software is to retrieve information, add value to it, and make it available in a user-friendly way in a handset.

Smart integration with existing systems is the secret behind the business benefits of wireless communications. And smart integration is our real strength – acquired during 50 years integrating more than 20,000 systems for industrial companies in Europe and the USA.

Forward and backward compatible

The infrastructure we build for you is open to the future. You can upgrade and introduce new system, without excessive costs for adapting the wireless system.

You get a solution without hard-to-penetrate boundaries between different generations systems for alarm, voice, text and data. (We are still extending systems that we installed twenty years ago.)

Ascom can help you specify the requirements for wireless technology so you can achieve long-term and enterprise-wide integration. The technologies you choose may vary from department to department. But everything should be compatible and operate under common systems monitoring.

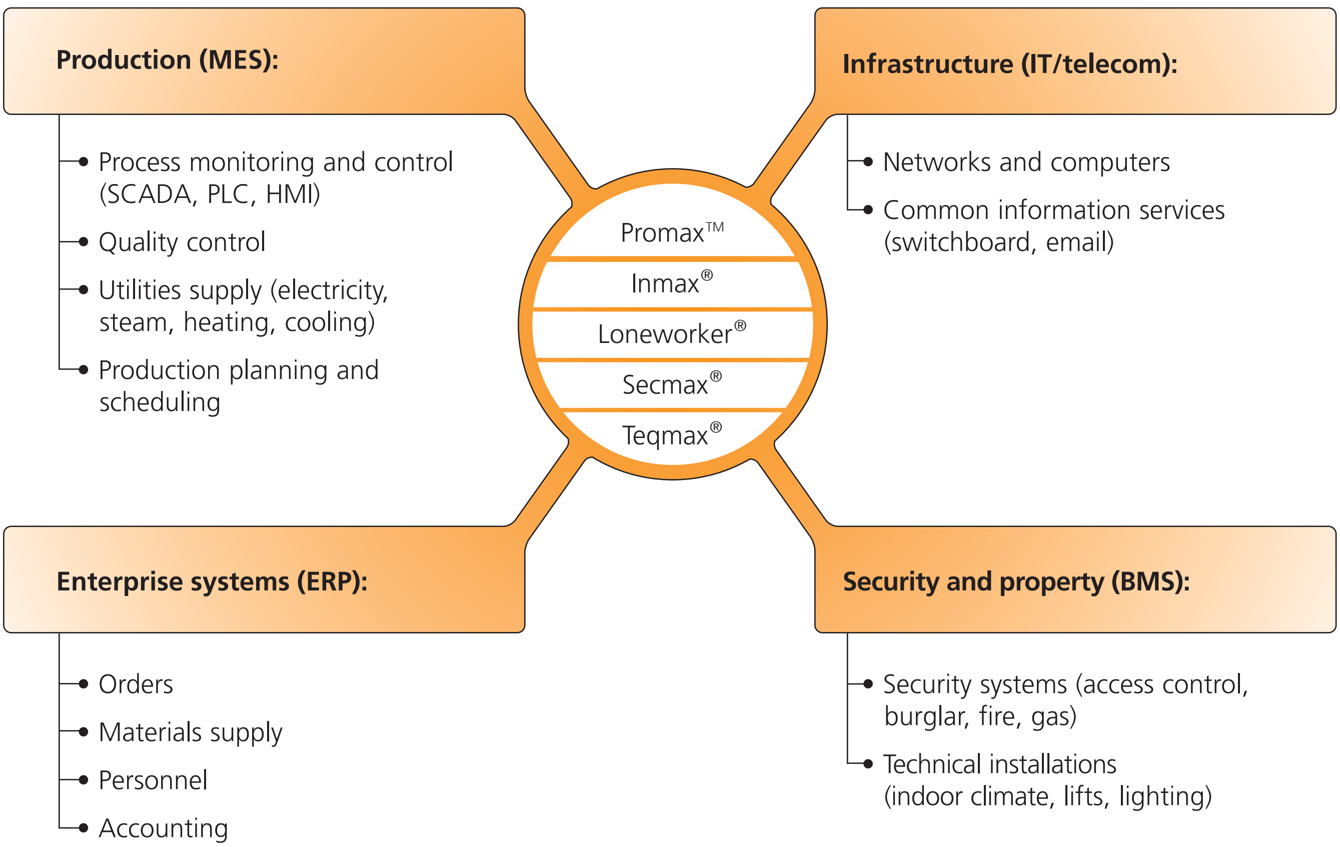
One step at a time

Ascom's offering to process and manufacturing industry comprises five concepts:

- Promax™ (production)
- Inmax® (materials supply)
- Loneworker® (personal safety)
- Secmax® (corporate security)
- Teqmax® (technical installations)

You can start with any concept and get a made-to-measure solution complete with training, maintenance and service. You can add more concepts over time. You can start with 10 to 20 users and add more later.

Technical integration with existing systems



Promax™

Quicker response to disturbances in process and utilities supply

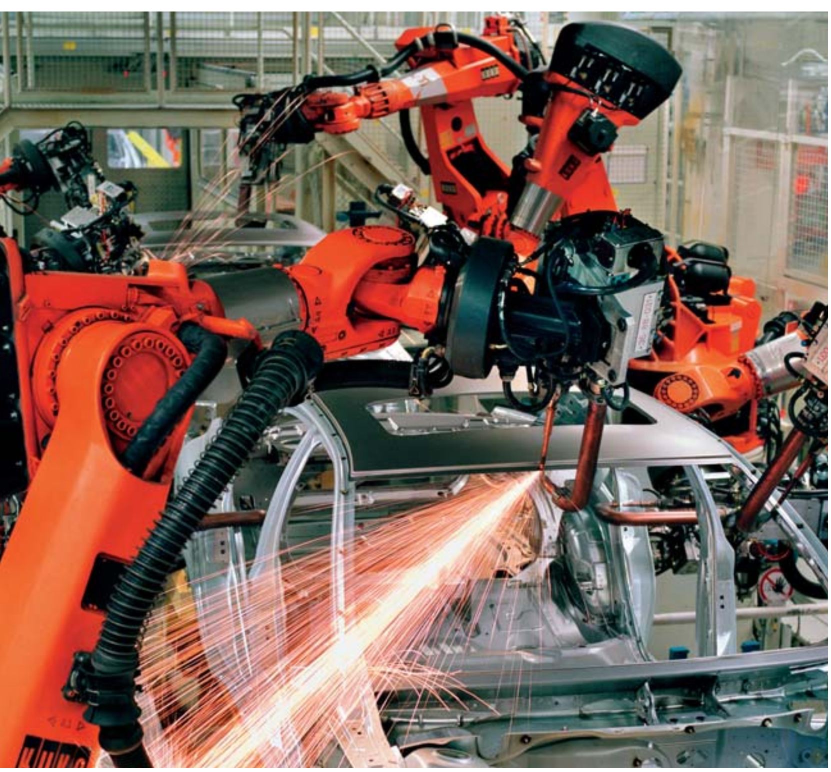
Promax is a concept for wireless communications for key people within production and utilities supply. Typical users are: process operators, team leaders, process managers, machine operators, resource planners, utilities managers, production managers and corporate management.

Promax gives quicker response to external disturbances, such as rush orders or changes to orders, and to internal disturbances, such as technical failures in process and utilities supply (electricity, steam, process gases, heating, cooling).

Key people get time-critical information directly in their pocket – as alarms, text, voice or data. From colleagues, machines, or computer systems. Key people can request or get information automatically about throughput, OEE or other key figures. They can send control signals (stop a pump, open a valve), and track equipment.

You get a more agile organisation that can adjust scheduling quicker and prevent production losses more effectively. Because Promax logs events and action taken, you also get a basis for eliminating systematic errors and continuously improving processes and routines.

A complete solution includes infrastructure, software, handsets and integration with process monitoring, utilities supply, business and accounting systems, and common information services such as the switchboard and email. The solution also includes installation, commissioning, training, maintenance and service.



Examples of functionalities:

- Get alarms and critical process values directly in your phone
- Check the status of process values from your phone
- Control the process – stop/start, increase/reduce
- Receive and send text messages
- Talk to colleagues – one on one or in conference
- Log data for continuous improvement
- Track important equipment

Randolf Reitan,
Senior Engineer at the Norsk Hydro aluminium plant in Sunndalsøra, Norway.

Maintaining quality and uptime at Europe's largest aluminium plant.

The Norsk Hydro aluminium plant in Sunndalsøra, 200 km south of Trondheim, Norway, employs almost 800 people.

When expansion work is completed in 2004, the plant will be the largest in Europe, producing 350,000 tonnes of primary aluminium annually. Ascom is on-site to help ensure production never stops.

This is how aluminium is produced:

1. Alumina, a powdery compound of aluminium and oxygen, is extracted from bauxite, a red-coloured ore.
2. The alumina is continuously fed into an electrolytic cell.
3. In the cell, the alumina is dissolved in a bath of electrolyte: cryolite (sodium aluminium fluoride) at 960°C.
4. Carbon anodes are dipped into the bath of molten cryolite containing the alumina. High-current electricity (250,000 A) is passed through the cryolite, breaking down the alumina into oxygen and aluminium.
5. The released oxygen combines with carbon to form carbon dioxide (CO_2). The molten aluminium collects at the bottom of the cell, where it is siphoned off.

It sounds easy. But according to Randolf Reitan, Senior Engineer at the plant, "Reality is slightly more complex. The electrolytic reduction process [step 4] must be continuously monitored. And deviations in key values such as current and voltage must be immediately acted upon by the right people. If not, yield goes down, costs go up."

Continuous monitoring is essential for several reasons. Normally, the voltage at each cell should be a stable 4V-5V. A sudden increase in this voltage could mean that insufficient alumina is being dissolved in the electrolyte. Should this happen, the cell will produce the polyfluorinated carbons (greenhouse gases) CF_4 and C_2F_6, instead of CO_2.

Sudden voltage increases could also indicate that the temperature of the electrolyte is below the 960°C necessary for electrolysis to take place.

Which is where Ascom enters the picture. "Correct," says Reitan. "We have an Ascom process monitoring solution. Suspect deviations are instantly sent to operators as text messages, wherever they are. This, of course, means the operators can respond more quickly to any potential problems."

A quick response to current increases is crucial for Reitan and his colleagues, as an increase could indicate the presence of dirt or other impurities. "Unwanted bodies can reduce yield. So we need to know about any voltage rises as soon as they occur, so we can respond in time."

The Ascom solution also means staff on the floor can act independently. Process alarms no longer have to go to a control room, only to be sent again to an employee. The messages go directly to the people best able to handle the situation.

"That's right. We save money by not having somebody sitting all day – and all night – in a control room gazing at screens. Workers can attend to other tasks, but remain reachable in case they need to respond. Put simply, the Ascom solution helps us focus on what we want to do – make the best possible aluminium as quickly and effectively as possible."

Inmax®

Quicker response to disturbances in material flow

Inmax is a concept for wireless communications for key people within materials supply. Typical users are production managers, machine operators, logistics managers, purchasers, warehouse managers, warehouse staff and external suppliers.

Inmax gives quicker response to disturbances in materials supply through early alert of low stock levels and delayed deliveries, and automatic notification when delayed material is registered on arrival.

Key people get alarms and notification directly in their pockets, from computer systems, colleagues or suppliers. They can retrieve or get information automatically about stock levels, delivery times or other key figures. Wherever, whenever.

You get an organisation that discovers and remedies shortages faster, that has better control of material flow and that prevents production losses. Because Inmax logs events and action taken, you get a good basis for identifying systematic errors and continuously improving processes and routines.

A complete solution includes infrastructure, software, handsets and integration with the ERP system (orders, materials supply) and common information systems such as the switchboard and email. The solution also includes installation, commissioning, training, maintenance and service.

Examples of functionalities:

- Get alerts on critical stock levels directly in your pocket
- Request information on future deliveries
- Get update on the materials situation
- Order material externally and internally
- Talk to colleagues – one on one or in conference
- Log data for continuous improvement

Ingemar Klaesson,
Production Manager at the Malmbäck plant, Sweden.

Keeping things moving at Sweden's leading supplier of refined biofuels.

SBE's (Svenska BrikettEnergi) plant in Malmbäck, Southern Sweden has an annual production capacity of 48,000 tonnes of wood briquettes, 30,000 tonnes of powder and 12,000 tonnes of pellets. An Ascom solution helps ensure optimal raw material stock levels – and a trouble-free production process.

Producing refined biofuel is a complex, multistep process. The first step involves receiving and storing the raw material (sawdust and wood shavings) in silos. Next comes separation, where metal, stones, gravel and other foreign bodies are removed. The cleaned material is then broken down in a mill and sorted according to size; larger fragments being used for briquettes, smaller ones for pellets and powder.

"But a lot remains to be done," says Ingemar Klaesson, production manager at the Malmbäck plant. "The next step in the phase, drying, is critical. We have to get the raw material as dry as possible. This we do with a drum dryer that increases the dryness of, say, sawdust, from 47% to 92%. This boosts the energy content from 2.12 kWh/kg to 4.8 kWh/kg."

The dried material is then conveyed to presses where briquettes and pellets are formed, or to a mill where the wood is reduced to powder. Briquettes and pellets are formed by heat. As the wood is pressed together (in the case of briquettes, at a pressure of 1,000 kp/cm^2) the temperature increases and the lignin in the wood is released. As the temperature drops, the lignin stiffens and binds the wood together as pellets or briquettes.

Comments Klaesson: "Obviously, all these processes demand a smooth material flow. Just as important, they demand an accurate flow. For example, a conveyor belt overloaded with raw material will automatically shut down. And that's bad news, especially since we produce around the clock, seven days a week."

The Ascom solution in use at Malmbäck helps ensure a smooth, accurate material flow in several ways. "That's right," says Klaesson, "our operators can, for instance, be automatically alerted to problems in our raw material storage silos. Should the stock level in the silo approach our pre-set critical point, a clear text message can go out to the people on duty – wherever they are in the facility."

Apart from monitoring raw material levels, the Ascom solution also gives early warning of possible production problems. "We have hundreds of process alarms, and any potential problems – deviant pressure or temperature readings, for example, – go directly as text message alerts to the responsible operators."

And the benefits of the system? "Well, we know how much material is in stock, and we can respond faster to any problems," says Klaesson. "But less stress on our workers is another major benefit. Previously we had a system where alarms went out in code. Once alerted, an operator would have to drop whatever he was doing and dash to a terminal to decipher the code. And all too often it was a very minor alert that didn't warrant disturbing the worker in the first place. Valuable time was wasted. Now, with the Ascom solution's clear text alerts, the operator knows the severity of each alarm, and can react accordingly."

Loneworker®

Quicker response for better personal safety

Loneworker is a concept for wireless communications for higher personal safety. It is a valuable companion for people working in potentially hazardous circumstances. Typical users are maintenance and service technicians, warehouse staff and security personnel.

Loneworker gives quicker response to alarms that are either triggered automatically through "man down" or "no movement", or manually via a special alarm button on the handset. Loneworker locates the person in need of help.

You get a more efficient maintenance organisation with staff who feel greater personal security, and a tool that enables quick help when necessary. Because Loneworker logs events and action taken, you get a good basis for continuously improving processes, routines and personal safety.

A complete solution includes infrastructure, software, handsets and integration with safety systems, maintenance systems and common information services such as the switchboard and email. The solution also includes installation, commissioning, training, maintenance and service.

Examples of functionalities:

- Alert when "man down" and "no movement"
- Easy to locate colleagues in need of help
- Talk to colleagues – one on one or in conference
- Receive and send text messages
- Logging of events

Tue Christensen,
IT Manager at
the Sønderborg plant, Denmark.

On-site wireless communications for 24-7 lone-worker safety.

The Sønderborg power plant in Jutland, southern Denmark, uses municipal waste and natural gas to deliver heat to more than 12,000 households. Thanks to its Ascom on-site wireless communications solution, it also delivers exceptional safety to its 25 employees.

For Tue Christensen, IT Manager at the Sønderborg plant, two main reasons lie behind the decision to install an Ascom wireless solution: "One, the solution expanded our communication possibilities. Two, it was easily integrated into our existing safety systems."

The solution at Sønderborg includes robust 9d23 'Protector' wireless handsets. A member of staff need only press one key for the handset to send a text message with alarm to workmates. But as Christensen points out, "Safety goes the other way, too. Should a failure occur in the plant, an alarm can automatically be sent to all handsets, wherever they are."
The Sønderborg plant came online in 1996, and each year incinerates 55,000 tonnes of municipal waste. Its annual heat output is 838,000 GJ, which is used as district heating for 12,000 households. Its annual electricity output is 193,000 MWh. It's a major facility, a crucial part of Denmark's modern infrastructure.

The plant's size, plus its non-stop operation, means workers are often alone on-site. "That's correct," says Christensen. "We have numerous processes gathered under one roof: waste incineration, natural gas consumption, heat production, power generation, ash treatment, etc. Plus, we operate around the clock. Staff have to be mobile to oversee all this. And our communications have to be mobile so we can oversee the staff's safety."

To provide maximum lone-worker safety, each wireless handset is connected to an outside alarm centre. A 'no-motion' function in the handset automatically sends a distress alarm to this centre if the handset user is stationary for more than one minute. The user can also send a distress alarm manually. In addition, distress alarms go to the plant's central control room where a computerised map in the control room shows the location of the worker who sent the alarm.

Says Christensen in conclusion: "Staff safety has a top priority at Sønderborg. The Ascom solution has satisfied our own tough safety standards, and has contributed to the smooth operation of our facility."

Secmax®

Quicker response for higher security

Secmax is a concept for wireless communications for key people within security. Typical users are security managers, security staff, the local fire brigade and medically trained personnel.

Secmax gives quicker response to disturbances that can harm people, property or the environment. Key people within production, security, fire fighting and medical care get time-critical information directly in their pocket – for example, gas alarms and fire alarms. Wherever they are. In the event of an accident, they can directly begin to coordinate resources and alert areas that could be affected.

You get an organisation that reacts quickly, prevents error propagation and reduces the risk of accidents. Should an accident still occur, you get more effective damage control and communication with those involved, both inside and outside your plant. Because Secmax logs events and action taken, you also get a good basis for continuously improving security.

A complete solution includes infrastructure, software, handsets and integration with gas and fire alarms, protection against trespassing and common information services such as the switchboard and email. The solution also includes installation, commissioning, training, maintenance and service.

Examples of functionalities:

- Fire and gas alarms directly to individuals or groups
- Check arrivals and departures
- Burglar alarm (fence, gates, building)
- Talk to colleagues – one on one or in conference
- Log events for future analysis
- Track people for safe evacuation
- Track important equipment

Marcus Schönwälder,
Head of the Technical Department at Bewag's Berlin West power station.

"Our staff are safer, and telecommunication costs have gone down 50%."

When Bewag AG, supplier of electricity to 80 per cent of Berliners, placed three power stations under central control, they also wanted to cut costs, make their workforce mobile, streamline workflows and protect staff. They asked Ascom for help.

Centralising the control of their Reuter (coal), Reuter West (coal) and Moabit (coal/oil) power plants presented Bewag AG with lots of challenges. But it also presented an opportunity to reduce costs.

"Cost reduction was crucial," says Marcus Schönwälder, Head of the Technical Department at Bewag's Berlin West power station. "Deregulation has made the German energy market extremely competitive. Costs simply have to be kept down."

Prior to the new solution, Bewag faced four main telecommunication problems. Problem number one was the unacceptable cost. Schönwälder explains: "We had 1,100 fixed phones, several different pagers, handsets and other devices and systems in use. In addition, we were using a large number of mobile phones."

Problem number two was the restricted flow of information. "Direct information exchange between the different systems and power plants was not possible," comments Schönwälder.

The third problem was lack of mobility. "Our existing communications platform just couldn't deliver the mobility and flexibility we needed."

The fourth problem was the need to improve staff protection due to ZH1-accreditation, a German standard on safety measures for lone workers.

Things have certainly changed since the arrival of the Ascom solution. The number of fixed phones and other devices in use has dropped to only 140. And according to Schönwälder, telecommunication costs are "down 50 per cent."

The Ascom solution has helped boost the bottom line in other ways. Response times to disturbances have been speeded up. Time-critical information automatically reaches the right people as easy-to-read texts. And the messages get through whether the person is at a workstation or on the move.

But lower costs were not Bewag's only demand when they asked Ascom to devise an on-site wireless communications solution. Another 'must have' was increased staff safety.

"Absolutely," says Schönwälder. "One problem we used to have was lack of coverage. Our previous systems could neither penetrate our reinforced concrete walls, nor cover all the areas in our large sites. This would have made it difficult to quickly locate injured staff. The Ascom solution satisfies both these demands."

The full coverage provided by the Ascom solution means all staff can transmit alarms. It also means any injured person can be quickly located, thereby saving precious time in case of a medical emergency. A 'no-movement' function automatically sends an alarm should a staff member's handset not move for a pre-determined length of time. A 'man-down' function also automatically transmits alarms in case a worker loses consciousness. An injured, yet still conscious, user can also manually activate the alarm.

The Ascom wireless solution was installed in only four weeks (another reason cited by Schönwälder why Bewag opted for Ascom). Since its installation, telecommunication costs have been halved, workflows have been made more efficient, and staff safety has improved. In fact, when summarising the impact of the Ascom solution, Schönwälder says: "Anything else is just not imaginable."

Teqmax®

Quicker response to technical and utilities alarms

Teqmax is a concept for wireless communications for key people involved in facilities management – property managers and technicians.

Teqmax enables quicker response to alarms from indoor climate systems, lifts, doors, windows, lighting and other technical installations. The technician gets the alarm directly in his pocket, can check the status from anywhere in the plant and reach colleagues with voice and text messages while on the move. He can also control devices from a wireless phone – for example, stop a fan or restart a pump.

Teqmax can provide information wirelessly, automatically or on request about the situation – energy consumption in the building, air flow in the ventilation system, water flow in heating and cooling circuits.

You get a quicker response to failures in technical installations and a better grasp of functional safety. Because Teqmax logs events and action taken, you get a good basis for continuous improvement.

A complete solution includes infrastructure, software, handsets and integration with the BMS (Building Management System), security system and common information services such as the switchboard and email. The solution also includes installation, commissioning, training, maintenance and service.

Examples of functionalities:

- Alarms directly in your pocket
- Status checks (temperature, doors, fans)
- Control lifts, doors, fans, pumps
- Talk to colleagues – one on one or in conference
- Log events for future analysis
- Faster action when failures occur

M. Jean Villain,
Engineering and Safety Manager at the Voiron mill.

How Ascom helps a major paper mill minimise fire risk and prevent machine stops.

With 260 employees, an annual output of 140,000 tonnes, and a 13-hectare (32-acre) site, Papeterie Voiron a subsidiary of Matussière et Forest's paper mill at Voreppe in France, doesn't take any chances with fire. Which is why they asked Ascom to devise an on-site wireless solution.

"There is an inherent fire risk in what we do. We have 24-hour production – including weekends and holidays – and a large workforce. So fire safety is an absolute top priority for us," says M. Jean Villain, Engineering and Safety Manager at the Voiron mill.

The mill must also satisfy the tough fire safety demands placed by insurance companies and the workforce. Fire alarms must reach all employees regardless of their location in the plant.

"In short," adds M. Villain, "we needed one general system that combined technical alarms and telephony. A system that covered the entire plant, protected the staff and goods and was future-proof."

Ascom's solution for the Voiron mill means a fire alarm can be raised from any fixed phone in the facility. The alarm reaches mobile workers through their wireless handsets. The handsets indicate the type of alarm, and which zone the suspected fire is in.

The whole site has been divided into 19 zones clearly identified by plans posted throughout the plant. Ascom's solution for the Voiron paper mill means a fire alarm can be raised from any fixed or mobile phone in the facility. The alarm is received on large illuminated displays installed in the various buildings of the site, indicating the zone where the suspected fire is in. This alarm is also transferred to the wireless telephones, the handsets displaying the type of alarm and indicating the zone.

Thus, the on-site firefighters are immediately and precisely alerted and can be at the scene of a fire anywhere in the plant within three minutes. The local fire brigade, alerted by the guard station, will arrive within 8–10 minutes.

The Ascom solution also lets time-critical information reach the maintenance staff directly on their mobile telephones.

"This feature has already delivered benefits," says M. Villain. "It assures a short response time. In fact, several machine stops have already been avoided, resulting in saved time and money."

Solutions for demanding industrial environments

Ascom provides you with on-site wireless solutions in which every component has been developed for demanding industrial environments. Each solution meets the most stringent demands.

Formal requirements

The formal requirements placed on equipment for use in industrial environments vary from segment to segment, and from country to country. Our solutions meet these demands.

You can get watertight and robust hand-held units (certified, for example, to IP 64 and IEC 68-2-32). If you need wireless communications in potentially explosive atmospheres, we can provide an ATEX-certified solution. You can get a solution that meets the most rigorous safety requirements, such as the GS standard (Geprüfte Sicherheit).

Practical requirements

Practical requirements vary from company to company. A common stipulation is secure and complete coverage of specified areas. Another is that people can speak to each other in noisy conditions.

We can design your solution to deliver guaranteed coverage of every nook and cranny of a defined area. Whether it is underground or perched in a crane.

You get telephones that suppress ambient noise. Users can hear – and make themselves heard – even when standing beside an operating paper machine. Hands-free devices and hearing protection are also available.

Should a phone malfunction, simply transfer the SIM card to another device. All personal information, alarms and personal functions move with the card into the new phone.

Whatever the demands posed by your manufacturing environment, we can devise a wireless solution that satisfies the toughest formal and practical requirements.

Challenge us. We look forward to showing you what we're capable of.

Primary system functions

User interface for pocket devices:

- Role/responsibility-specific function push-buttons
- Menu structures adapted to specific user requirements
- Text and graphs
- Sound and/or vibrating signals

Process alarm:

- Alarm to personnel or central systems
- Preference for prioritised alarm
- Alarm receipt notification

Personal alarm:

- Automatic alarm (man down, no movement)
- Manual alarm (push button, pull cord)

Interactive messaging:

- Traditional paging with message receipt function
- Send or receive text messages
- Request status (vital signs)
- Send control signal (start/stop, open/close)

Voice:

- Person-to-person calls
- Conference calls
- Hands-free
- Loudspeaker

Positioning:

- Precise locating (x-, y- and z-axes)
- Movement
- Tracking of people and equipment

Logging:

- Alarm (what, where, when, who)
- Action (who did what)
- Task confirmation (repair, inspection)

System security:

- Logging of system alarms
- Escalation of important messages and alarms
- ATEX certification

System monitoring:

- Monitor the wireless system
- Monitor to ensure handsets work correctly
- Monitor modules and interface

Total customisation to your needs

Many suppliers of wireless communications try to sell standardised systems that are intended to satisfy all needs. But being all things to all people usually means being very little to very few. No two companies function the same way. Each company has its distinctive organisation and infrastructure. People too have differing values, preferences and priorities. They simply do not work the same way.

Our way of doing things takes all these differences into consideration. You get a solution made to measure with smart, often unique functions. Commissioning, training, maintenance and service are part of our offering. We go to greater lengths to adapt to your needs than any of our competitors do.

Identify and prioritise

Where can effective communications create value in your operation? Usually, there are several areas where quicker response leads to benefits upfront.

Together with key people from your organisation, we identify promising areas of improvement, quantify the benefits in each area, and prioritise according to value for you. The result is a 'to-do list' for greater productivity.

Mapping your organisation

We map the workflow in each of the prioritised areas. We involve members of your staff so we can take advantage of their experience and ensure they understand what is going on.

What information is needed by whom and when? Which staff members have to be able to communicate? Under what conditions? How do your people move around the worksite? Do they wander outside it? How is responsibility transferred during shift and duty changeovers?

The result is an overview of your organisation, processes and information flows.

Find the bottlenecks – and remove them

Wherever decision-making and processes have to be accelerated, we define the wireless functions and integration needed to remove information bottlenecks.

You stipulate the requirements you want from your solution (time from event to contact or action, information content, security demands, etc.).

We transform those requirements into a solution comprising infrastructure, software and communication devices. We integrate with your existing process-monitoring, quality-control and production planning systems. We integrate with your ERP system. With your switchboard and messaging systems. With your security and building management systems.

A complete solution

You get a robust system with high functionality and security. You can count on a complete solution, including installation, commissioning, training, maintenance and service.

During installation and commissioning, we train the system managers and users. System managers get effective tools for discovering, identifying and solving problems. During the system's entire service life, we offer training for users to ensure usability and maximise the business benefits for you.

Starting with your needs and requirements, we design customer-specific services for preventive maintenance and remedial service.

You can get maintenance contracts based on preventive maintenance that ensures the availability of the system. You can get service contracts with guaranteed service response times, or telephone support from our local organisation. And at a fixed price so that you have complete control over all costs.

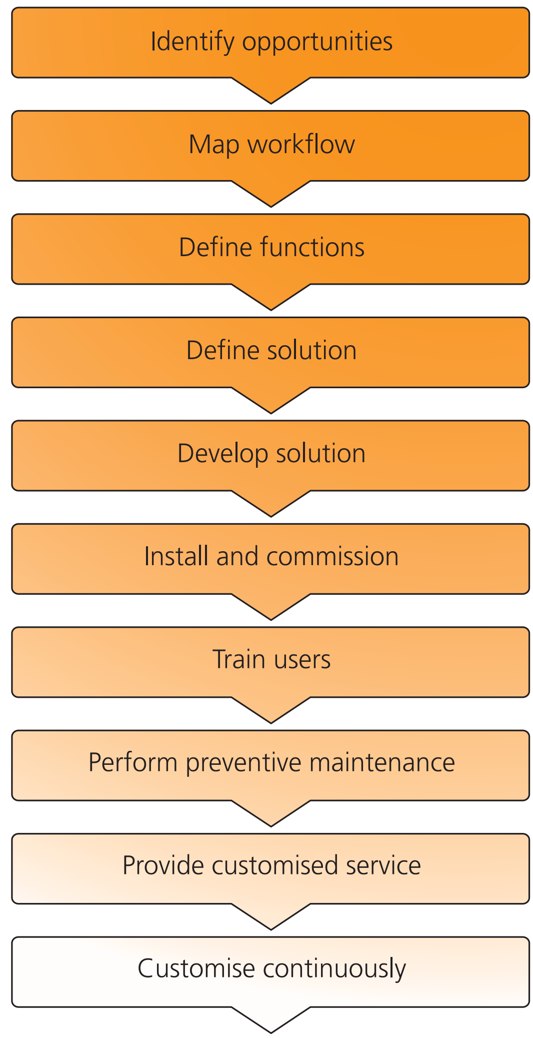
Continuous customisation

Your demands will change over time as you develop your processes. That is why we offer not only a solution made to measure for today's needs. We offer a future-proof solution. We can continuously enhance it to meet your organisation's changing requirements. We transfer expertise over to your organisation so you can develop your own applications.

Most of our systems are in use for ten years or more. And more than 20,000 of them are currently in operation in processing and manufacturing facilities around the world. That has given us solid experience of continuous customisation.

A growing number of manufacturing plants are using on-site wireless communications for quicker response. No other supplier can match Ascom's experience in this area.

Ten steps to quicker response and improved productivity



Which on-site wireless technology is best?

The answer depends on the functions you want. Different functions impose different demands. No single technology can deliver everything. Each one has its own advantages and drawbacks. The technologies you end up choosing can therefore vary from department to department. But they should all be compatible and operate under a common management structure.

Examples of wireless technologies are DECT, PWT, GSM, Bluetooth, on-site paging and Wi-Fi (this is only a sample of the technologies Ascom can handle). The following checklist can help you make wise choices.

Ten things to think about

1. Coverage – Only the office or the entire plant? In basements? In culverts? In buildings with thick concrete walls? Voice, messaging and alarm in the same wireless device? Do you want guaranteed coverage?

2. Sensitive equipment – Is any of your equipment sensitive to radio waves? Which power levels on communications devices are acceptable?

3. Alarm lead times – Can you accept SLA5 (Service Level Agreement Five = maximum five seconds response time)? Do you insist on GS certification (Geprüfte Sicherheit, a German standard that specifies a maximum two-second response time to alarms from lone workers)?

4. Transmission capacity – How ‘big’ is the information you want to flow through your system? How many Mbit/sec do you need? Graphs and diagrams? How many simultaneous calls? How many messages per second, minute, hour?

5. Usage – Will handsets have to work in dark, humid or noisy conditions? In potentially explosive environments? How long should a handset work between battery recharges? How long should recharging take? Should individual users have individual chargers, or should all users share one?

6. Remote control – Do you want to remotely control process objects – start/stop, open/close, increase/ reduce?

7. Positioning – Do you need to locate mobile lone workers such as guards and service technicians?

8. Tracking – Do you want to track electronically tagged equipment as it moves around your

plant? Want to know, for example, the location of a measuring instrument or a forklift truck?

9. Safety – The choice of technologies has a big impact on the ease – or difficulty – with which a solution can be designed for reliability and availability. The same choice also increases or reduces the requirements for redundancy and preventive maintenance to achieve prescribed safety levels.

10. Security – Your requirements for security against bugging as well as requirements to shield against hackers and viruses will influence your choice of wireless technologies.

And two more to bear in mind
Most wireless functions require smart integration with existing systems and with different communications devices (usually hand-held or pocket devices). Function requirement therefore influence the choice of wireless technologies:

1. With existing systems: With which systems will your wireless system communicate? SCADA, PLC, HMI? Orders, inventory? Switchboard, messaging, gas, fire, burglar alarm? BMS? Your wishes determine which protocols your wireless system must be capable of handling (OPC, IP, TDMA, for example).

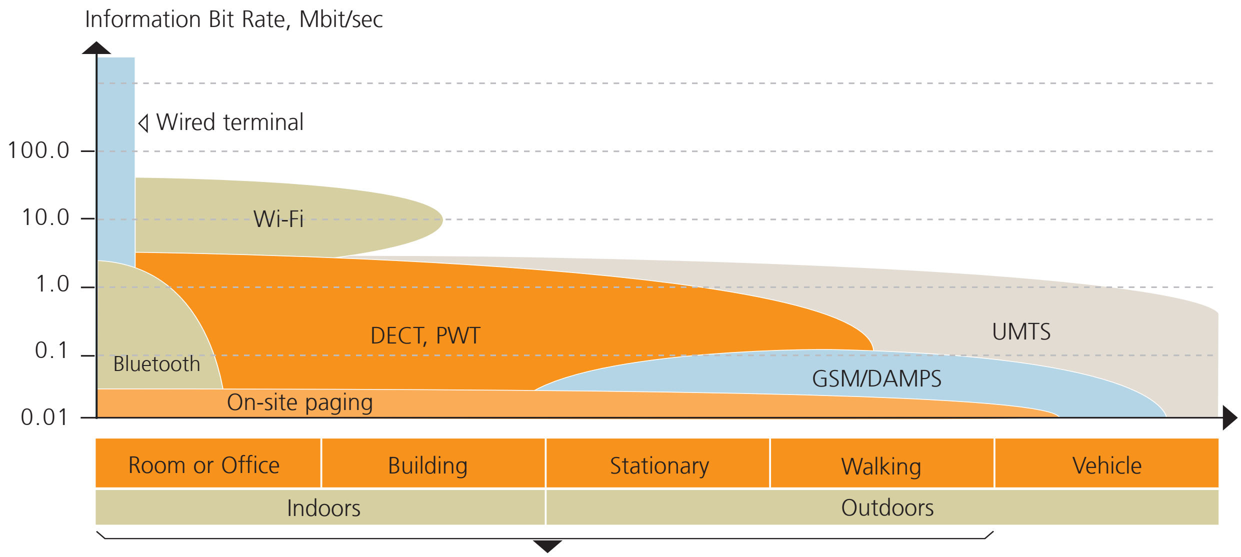
2. With communications devices: Which devices will your wireless system be able to handle? Wireless phones, regular mobile phones, PDAs, pagers?

Ascom can help you specify the requirements for your wireless technology so you can achieve a cost-effective solution, as well as long-term and enterprise-wide integration.

"Beam me up, Scotty!"
We can realise most wireless functions … and at a cost that is reasonable when compared to the business benefits they deliver. But we are still a bit away from achieving what Dr Spock was able to do in Star Trek in the 60s.

So the easiest way to get hold of one of our crew of experts is to give us a call (we promise to be over at warp speed).

Our contact details are on the back cover.



Source: DECT Forum

Acronyms and terms

Added value. Or value added. The amount by which the income of a business exceeds the cost of its inputs. The difference between what a company spends buying material, components, services, etc., from outside and what it receives from selling its products. Out of this added value, the company has to pay wages, interest, etc.

Adjustment time. Production time lost when changing the settings of equipment during a production run.

Agile manufacturing. The ability to react quickly to customer needs and to technical or environmental surprises. Includes tools, techniques and initiatives that enable a plant to thrive under unpredictable change.

AP (Access Point). Wirelessly networked devices usually connect to a wired network through a hardware device called an access point. Multiple access points, set up in various locations around an office, let users roam freely while staying connected.

ATEX. "ATmosphères EXplosibles", French for potentially explosive atmospheres. A directive that applies to equipment and protective systems intended for use in potentially explosive atmospheres. The Directive covers a large range of equipment, potentially including equipment used on fixed offshore platforms, in petrochemical plants, mines, flour mills and other areas where a potentially explosive atmosphere may be present. The Directive has been mandatory from 1st July 2003.

Availability. The proportion of total time that an item of equipment is capable of performing its specified functions, normally expressed as a percentage.

Bandwidth. The capacity of a communications link, measured in bits per second (bit/s).

Batch (Lot). A defined quantity of raw materials, intermediate product, work in progress or finished devices. The batch is defined by the facts that all items are essentially identical and have been processed either together or in unbroken succession.

Batch Manufacturing Records (BMR). Written and where necessary, authorised records relating to individual batches comprising quality control and production records including details of raw materials and/or components, intermediate products, labels and any production conditions. All documents should relate to the batch number.

Bluetooth. A low-bandwidth, short-range wireless networking technology for communication between small personal computing and communication devices, such as desktop computers, laptops, PDAs, and cell phones. Data can be exchanged at a rate of 1 Mbit/s, and up to 2 Mbit/s in the second generation of the technology. Bluetooth transmits both voice and data on the 2.4 GHz ISM band. It uses FHSS (1600 hops per second) to increase the reliability of the communication channel. Built-in encryption and verification is provided. As with 802.11 devices, Bluetooth devices have sleep modes and only transmit when there is a need, so most of the time the transmitter is inactive. Bluetooth and IEEE 802.11-based wireless LANs are complementary, rather than competing, technologies.

BMS (Building Management System). An integrated computer system that helps control technical installations in a building. Includes online monitoring of technical installations, online measurement of equipment availability, coordination of preventive maintenance activities and follow-up of technical problems.

Bottleneck. Any point at which movement is slowed because demand placed on a resource is greater than capacity. A temporary bottleneck is a work centre with insufficient capacity to meet a schedule. Wandering bottlenecks occur when either (1) a large lot size of production causes a temporary bottleneck first at one plant, and then, when output has at last been achieved, at the next step along the way, or (2) when two or more large lots by coincidence require processing at the same time at the same plant. A permanent bottleneck is a work centre with insufficient capacity to meet the demand over a long period. See also constraint.

Capacity planning. The process of determining how many people, machines, and physical resources are required to accomplish the tasks of production. It defines, measures, and schedules the levels of capacity so they are consistent with the needs of production.

Cell production. A plant layout in which machines and other equipment are arranged to create small flow lines, each one dedicated to the production of a few families of parts. See also line production.

Changeover time. Time lost during changeover from the current product to the next product through swapping of equipment, dies, connections or materials.

Channel. A communication path capable of transmitting data. Several channels can be multiplexed into a single link, wired or wireless.

CMMS (Computerised Maintenance Management System). A software-based system that analyses operating conditions and failure data of production equipment and applies these data to the scheduling of maintenance and repair, inventory orders and routine maintenance functions. A CMMS prevents unscheduled machine downtime and optimises a plant's ability to process product at optimum volumes and quality levels.

Concurrent engineering. A cross-functional, team-based approach in which the product and the manufacturing process are designed and configured simultaneously, rather than sequentially. Ease and cost of manufacturability, as well as customer needs, quality issues and product-life-cycle costs are taken into account. Teams include representation from marketing, design engineering, manufacturing engineering and purchasing, as well as suppliers and customers.

Condition monitoring. All work performed to find failures early. Often involves the use of specialist equipment to measure the condition of production equipment.

Constraint. Anything that prevents a system from achieving higher performance versus it goal. Every system has at least one constraint that limits output. Constraints will determine the output of the system whether they are acknowledged and managed or not; either you manage the constraints or they manage you. See also bottleneck.

CRP (Capacity Requirements Planning). Process for determining amount of machine and labour resources required to meet production.

DECT (Digital Enhanced Cordless Telecommunications). An interface specification for European digital mobile telephony. DECT employs 10 carrier frequencies between 1.88 gigahertz (GHz) and 1.9 GHz with 24 time slots each leading to a capacity of 120 simultaneous calls, and has a transmission speed of 144 kilobits per second. It is typically used for short-range communications and wireless-local-loop applications. Advanced radio technology ensures effective use of the radio spectrum, low risk of radio interference, low power consumption and excellent security.

Defects loss. Time lost to making scrap, doing rework, or managing defective parts.

DMAIC (Define, Measure, Analyse, Improve, Control). The essential method in Six Sigma. The individual letters stand for: Define the goals and scope of a project; Measure the performance of the current process; Analyse the differences between the current performance and the required performance; Improve ways and means of reaching the required state; and Control to make the changes permanent.

Downstream production disturbances. These include rush orders, changes to orders (quantity, due date), quantity and mix variations (e.g., due to demand variations in customer’s business), customer production problems. Demand variations (e.g., due to seasonality, marketing activity, competitor activity), forecasting errors, finished goods delivery delays, lost stock, poor stock monitoring.

Downtime. The time that an item of equipment is out of service because of equipment failure. The time that an item of equipment is available, but not used is generally not included in the calculation of downtime.

Efficiency. A productivity measure that focuses on actual performance against a standard. Expressed in a percentage figure, it is calculated by dividing actual resource time charged to a task by the standard resource requirements for the same task.

Emergency. A set of events that warrant immediate action.

ERP (Enterprise Resource Planning). Integrating manufacturing, financial and distribution functions to optimise the enterprise's resources, using integrated software. ERP is the technological evolution of manufacturing requirements planning (MRP) II.

ERP II (Enterprise Resource Planning II). An extension of traditional enterprise resource planning functionality to integrate key internal and external collaborative, operational and financial processes.

ESPA 4.4.4. A standard protocol for exchanging messages with paging equipment. Adopted by the European Selective Paging Manufacturers Association.

ETSI (European Telecommunications Standards Institute). A non-profit organisation that establishes telecommunications standards for Europe. ETSI guidelines are voluntary and usually comply with standards produced by international bodies.

Ethernet. The most widely installed local area network (LAN) technology, specified in the IEEE 802.3 standard. Ethernet is also used in wireless LANs (WLANs). The most common Ethernet systems are called 10BASE-T and provide transmission speeds up to 10 Mbit/s. Devices compete for access using the CSMA/CD protocol. Fast Ethernet, or 100BASE-T, provides transmission speeds up to 100 megabits per second. Gigabit Ethernet provides an even higher speed at 1000 megabits per second (1 gigabit or 1 billion bits per second). 10-Gigabit Ethernet provides up to 10 billion bits per second.

Failure rate. The number of failing units of a particular type of component in which failures have occurred by a certain time as a fraction of the number of surviving units.

FHSS (Frequency-Hopping Spread-Spectrum). One of two types of spread-spectrum radio technology used in WLAN transmissions. FHSS modulates the data signal with a narrowband carrier signal that "hops" in a predictable sequence from frequency to frequency as a function of time over a wide band of frequencies. Interference is reduced, because a narrowband interferer affects the spread-spectrum signal only if both are transmitting at the same frequency, at the same time. The transmission frequencies are determined by a spreading (hopping) code. The receiver must be set to the same hopping code and must listen to the incoming signal at the proper time and frequency to receive the signal.

FM (Flow Manufacturing). Techniques and processes that make possible continuous throughput in manufacturing to reduce production costs, work in progress (WIP) and time to market. Production lines and schedules instead of work orders drive production. FM is synonymous with flexible, lean and synchronous manufacturing.

FMS (Flexible Manufacturing System). A facility capable of producing small numbers of a great variety of items at low unit cost. An FMS is characterised by low changeover time and rapid response time.

Frequency hopping. A type of spread-spectrum technology commonly used in the ISM band. Originally designed for the military, frequency-hopping radios change frequency at regular intervals to resist jamming.

GPRS (General Packet Radio Service). A packet-oriented overlay to GSM networks supporting connection- and connectionless-oriented services and diverse quality-of-service mechanisms. The theoretical maximum speed can be as high as 171.2 kbit/s using all eight time slots and CS 4 channel speeds. Real-life user throughput is expected to be much lower – less than or equal to 56 kbit/s.

GSM (Global System for Mobile Communications). Digital mobile telephone networks that operate at 900 MHz, 1,800 MHz and 1,900 MHz frequencies. In Europe, GSM uses the 905-915 MHz and 950-960 MHz spectrum. GSM 1900 is the North American version.

Hazard. A source of potential harm or a situation with a potential to cause adverse effects. Hazard identification looks at the source of the risk or the characteristics of the site that might lead to risk.

HMI (Human-Machine Interface). Any device able to present information to the operator about the state of a process, and to accept and implement the operator's control instructions. This includes all systems from which a user can receive information (e.g., software displays) and to which a user can transmit information (e.g., remote controls, control panels, computer keyboards).

IEC 68-2-32. A procedure where a product is dropped twelve times from one metre.

Internal production disturbances. These include control and communication system failures, operator errors and omissions, recording and communication errors, materials ordering errors, materials stock control problems. Machine breakdowns, variability in machine performance (quality, cost, production rate), and unavailability of labour. Material handling and flow blockages, handling-equipment failure.

IP-classification. Enclosure testing of electric or electronic equipment intended to operate in difficult environments (dust, corrosive substances, moisture, water). Testing is normally carried out in accordance with the global IEC 60529 standard or its European equivalent, EN 60529.

ISO 9001:2000. An internationally recognised quality-management standard developed by the International Organisation of Standardisation. It strongly emphasises the incorporation of quality standards in systems, procedures, documentation and total employee involvement.

IVD (In Vitro Diagnostic). In vitro tests are a unique source of objective information about the state of health or disease in a human body. Blood, tissues or urine samples are taken from the body to measure the concentrations of various chemical and biochemical components, counting cells or measuring physical properties of the sample.

JIT (Just In Time). A philosophy of manufacturing based on planned elimination of all waste and continuous improvement of productivity. It encompasses the successful execution of all manufacturing activities required to produce a final product, from design engineering to delivery and including all stages of conversion from raw material onwards. The primary elements include having only the required inventory when needed; improving quality to zero defects; reducing lead times by reducing set-up times, queue lengths and lot sizes; incrementally revising the operations themselves; and accomplishing these things at minimum cost.

Kaizen. A business philosophy of continuous cost reduction, improved quality, and shorter delivery time through rapid, team-based improvement activity. The Japanese word means change for the better or improvement.

Kanban. A re-order card or other method of triggering the pull system based on actual use of material. Typically, kanbans are cards attached to boxes of parts and carrying information about the parts (name, part number, quantity, source, destination, etc.). The Japanese word means sign.

Lead time. The time from the point of entry of a job into production to its completion. Usually considered as consisting of five elements: (1) queue time (time spent waiting to begin); (2) set-up (time to set the machine up for the job); (3) run (the time occupied by actual manufacture); (4) wait (the time waiting after manufacture has been completed); and (5) move (the time spent moving the job to its next destination). Usually, 90 per cent of lead time comprises queue time.

Lean manufacturing. A business practice characterised by the endless pursuit of waste elimination. Lean manufacturing encompasses concepts such as just-in-time, kaizen, kanban, empowered teams, cycle time reduction, small lot manufacturing and flexible manufacturing.

LCC (Life Cycle Cost). The total cost incurred through all stages of equipment existence, from concept to decommissioning. Life cycle costing, estimating the total costs of ownership, operation and maintenance of an item of equipment during its projected life, is typically used in comparing alternative design or purchase options to select the most appropriate option.

Line efficiency. A measure of the efficiency of a production line. Describes the relation between the maximum output at a given capacity utilisation and the real output. Often expressed as OEE (Overall Equipment Effectiveness).

Line production. A plant layout in which the machines and other equipment required, regardless of the operations they perform, are arranged in the order in which they are used in the process. See also cell production.

Machine availability rate. The percentage of time that production equipment is available for use, divided by the maximum time it would be available if there were no downtime for repair or unplanned maintenance.

Maintenance. The organised activity, both administrative and technical, of keeping structures, systems and components in good operating condition, including both preventive and corrective (or repair) aspects.

Maintenance management. The planning and execution of tasks performed to maintain the operation of equipment, vehicles and facilities. It spans many diverse functions and responsibilities, ranging from designing maintenance jobs to providing and managing the resources needed to complete the work.

MAP (Manufacturing Automation Protocol). A protocol, based on Open Systems Interconnection (OSI) standards, that allows communication among competing suppliers' digital products in the factory.

MES (Manufacturing Execution System). A factory floor information and communication system with several functional capabilities. It includes functions such as resource allocation and status, operation/detailed scheduling, dispatching production units, document control, data collection and acquisition, labour man-agement, quality management, process management, maintenance management, product tracking and genealogy, and performance analysis. It canprovide feedback from the factory floor on a real-time basis. It interfaces with and complements accounting-oriented, resource planning systems.

MRP (Manufacturing Resource Planning). Methods and software for planning of all the resources of a manufacturing company, including business planning, production planning and scheduling, material requirements and capacity requirements planning. Output can be integrated with business reports (e.g., business plans, purchase commitment reports. MRP II is migrating towards enterprise resource planning (ERP).

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MTBF (Mean Time Before Failure). An indicator of expected system reliability calculated on a statistical basis from the known failure rates of various components of the system. MTBF is usually expressed in hours. Over a long performance measurement period, the measurement period divided by the number of failures that have occurred during the measurement period.

MTTR (Mean Time To Repair). The average time to correct a failure and return the equipment to a condition where it can perform its intended function; the sum of all repair time (elapsed time, not necessarily total man hours) incurred during a specified period (including equipment and process test time, but not including maintenance delay), divided by the number of failures during that period.

OEE (Overall Equipment Effectiveness). The overall performance of a single piece of equipment, or even of an entire factory. A measure that embraces and quantifies all losses to good-quality output that can occur in a process. Losses are grouped into three categories: (1) Availability losses (downtime), (2) Performance losses (speed losses), and (3) Quality losses (rejects, rework). To establish overall performance, these three measurements are multiplied.

OPC (OLE for Process Control). A specialised implementation of Microsoft's OLE (Object Linking and Embedding), created to serve the needs of the manufacturing automation and process control industry. It is a specification or set of written rules and procedures to enable multiple software programs to talk to each other. The specification is managed by volunteer effort and administered by the independent OPC Foundation.

Outage. A term equivalent to shutdown, used in some industries, notably power generation. Often a shutdown that affects the whole plant for more than 16 hours.

PBX (Private Branch Exchange). An automatic telephone exchange that provides for the transmission of calls internally and to and from the public telephone network. Also called private automatic branch exchange (PABX).

PDA (Personal Digital Assistant). A handheld computer that serves as an organiser, electronic book or note taker. It typically uses a stylus or pen-shaped device for data entry and navigation.

Performance. The rate at which equipment converts available time into useful product. See also OEE.

Planned maintenance. Preventive maintenance consisting of refurbishment or replacement that is scheduled and performed before unacceptable degradation of a structure, system or component.

Planned production time. Total time that equipment is expected to produce product.

Planned shutdown. Deliberate unproductive time.

PLC (Programmable Logic Controller). The fundamental building block of factory and process automation. A speciality purpose computer, including input/ output processing and serial communications, used for executing control programs, especially control logic and complex interlock sequences. PLCs can be embedded in machines or process equipment, used stand-alone in local control environments or networked in system configurations.

Predictive maintenance. Avoiding unscheduled machinery downtime by collecting and analysing data on equipment conditions. The analysis is used to predict time-to-failure, plan maintenance, and restore machinery to good operating condition at times that do not interfere with production schedules. Predictive maintenance systems typically measure vibration, heat, pressure, noise, and lubricant condition. Computerised maintenance management systems (CMMS), enable predictive maintenance work orders to be released automatically, repair-parts inventories checked, or routine maintenance scheduled.

Process. (1) A planned series of actions or operations (e.g., mechanical, electrical, chemical, inspection, test) that advances a material or procedure from one stage of completion to another. (2) A planned and controlled treatment that subjects materials or procedures to the influence of one or more types of energy (e.g., human, mechanical, electrical, chemical, thermal) for the time required to bring about the desired reactions or results.

Process manufacturing. The manufacture of products such as chemicals, petrol, beverages and food products, in batch or continuous production modes rather than discrete units. Many process operations require input such as heat, pressure, and time for thermal or chemical conversion. Process manufacturing adds value by performing chemical reactions or physical actions to transform materials, or by extracting, mixing, separating or forming materials. See also discrete manufacturing.

Process monitoring and control. The function of maintaining a process within a given range of capability by observing performance against known parameters and introducing appropriate feedback and correction.

Production disturbance. An unpredictable disruption to production. Though it may not stop production, it reduces production efficiency and calls for action. Production disturbances can be internal to the process or external to the process. External disturbances can be either upstream disturbances or downstream disturbances. See also internal production disturbances, upstream production disturbances and downstream production disturbances.

Production efficiency. A general term to describe the relation between the maximum output at a given capacity utilisation and the real output. Often expressed as OEE (Overall Equipment Effectiveness).

Production loss. The difference between maximum output at a given capacity utilisation and the real output. The three major losses are availability loss, speed loss and quality loss. See also OEE.

Productivity. The ratio of input to output. A production process has three main types of input: (1) labour, (2) capital (equipment and buildings, and (3) purchased input (goods and services). The numerator of the productivity equation is value added (output minus purchased input). The denominator is costs (capital costs plus labor costs). A more productive company can either produce the same output with less input and thus enjoy cost advantage or produce more or better output with the same input and command a price premium.

PWT (Personal Wireless Telecommunications). U.S. wireless technology, a variant of DECT.

QA (Quality Assurance). The formal and systematic exercise of identifying problems in medical care delivery, designing activities to overcome the problems, and carrying out follow-up steps to ensure that no new problems have been introduced and that corrective actions have been effective. Quality assurance issues are contained in the ISO 9000 series of standards.

Quality. The definitions include: (1) The totality of features and characteristics of a product or service that bear on its ability to satisfy stated or implied needs; (2) Conformance to requirements (Philip Crosby); (3) A predictable degree of uniformity and dependability, at low cost and suited to the market (W. Edwards Deming); (4) Fitness for purpose or use (Joseph M. Juran); (5) A system of production methods that economically produce quality goods or services meeting the requirements of customers (Japanese Industrial Standard); (6) Percentage of produced items that meet design specifications.

Quality control. The continuous improvement of a stable process.

Reliability. Freedom from operational failure in service or use on a comparative scale. The probability that machinery or equipment can perform its intended function continuously, without failure, for a specified interval of time when operating under stated or specified conditions. Normally measured by MTBF.

Rework. Works orders or components that must be corrected by further machining and manufacture.

Risk. The potential for, or probability of, an adverse effect. It may be due to an event, action, or lack of action. Risk can be subjective and expressed qualitatively, but the potential for the realisation of the unwanted, negative consequences of an event can also be assessed quantitatively – the probability that specific deleterious consequences may arise and the magnitude and character of such consequences. Pure risk involves uncertainty only as to loss without affording any possibility of gain. See also perceived risk.

Risk management. The culture, processes and structures that are directed towards the effective management of potential adverse effects to people, to the environment and to business performance. Risk management involves well-defined steps that support better decision-making by contributing to a greater insight into risks and their impacts. It is as much about identifying opportunities as it is about avoiding losses.

Roaming. The ability of a user to maintain network access when moving between access points.

SCADA (Supervisory Control And Data Acquisition). A software package that displays information, logs data and shows alarms – in graphical and tabular formats, words or pictures. SCADA is used in manufacturing, process industries and utilities.

Scrap factor. The percentage of ruined components created in a process. The term implies that the process failed, either due to machine malfunction or operator error, rather than that the process is inherently incapable of producing 100 per cent conforming output.

Set-up time. The time it takes to set up a machine or work centre to perform a specific operation, e.g., calibrate a machine.

Seveso (Seveso I, Seveso II). The Seveso directive (96/82/EG) was issued by the European Council and the European Parliament for the purpose of preventing and limiting the effects of major industrial accidents. (1982: Sevesco I, 1996: Sevesco II). The name originates from an accident that occurred on July 10, 1976, when a chemicals factory in Seveso, Northern Italy, exploded. Since February 1999, companies and authorities within the EU are obliged to meet the requirements of the directive. A distinctive feature of the directive is that it not only makes demands on safety measures but also on issuing information to the general public about the inherent risks and how one should act in the event of an accident (principle of "need to know").

Shop floor monitoring and control. Processes and systems for using data from the shop floor to communicate status information on manufacturing orders and work centres, and to assign priorities to each in order to keep production flowing in accordance with requirements, conditions and events.

Six Sigma. A management philosophy and a set of procedures that strive to reduce out-of-specification product or service delivery to less than one-in-a-million level. The word sigma is a statistical term that measures how far a process deviates from perfection. All business practices, not just the shop floor, are examined and steps are taken to reduce or eliminate variation. The term Six Sigma was coined by Motorola in the 1980s. See also DMAIC.

SMS (Short Message Service). A bidirectional paging function that is built into Global System for Telecommunications (GSM) systems. Each message can be up to 160 ASCII characters long. The network stores messages for up to several days (typically a maximum of 72 hours) and attempts to deliver the messages whenever the portable phone is switched on. Confirmation of receipt is available as an option in some networks.

Supply Chain Management. The integration and optimisation of business processes from definition of customer requirements, manufacture of raw materials and components, and intermediate production through completion, distribution, and support of products to satisfy customer needs.

Tagging. Methods for uniquely identifying, tracking and tracing a person or an item.

TCO (Total Cost of Ownership). Quantifying every aspect of cost, starting with the cost of buying infrastructure, devices and software, then adding the cost of service support and breakdowns, then subtracting the gains from faster response, more work performed, shorter service cycles and demonstrated ability to extend equipment life.

Throughput. In Theory Of Constraints (TOC), throughput is the rate at which the production system generates money, calculated as sales minus cost of raw materials and purchased parts. Direct labour is not deducted in calculating throughput. Sales are recognised only when money is available to the firm. Production for inventory is not a part of throughput.

TOC (Theory of Constraints). The basis of TOC (developed by Eliyahu Goldratt) is that in every production process there are bottlenecks or constraints that determine the throughput of a factory. Relieving the most important constraint will greatly improve throughput.

The theory argues that the only goal of operations is to make money. If the plant does not make money for the company, it will cease to exist. Making money can be broken down into three quantities: Throughput, inventory and operating expenses. Throughput is the sales of the plant minus the cost of raw materials. Inventory is the raw material value of any goods held in inventory. Operating expenses are the costs of turning raw materials into throughput (labour and overhead costs).

If excess capacity exists, the task of operations is to do whatever it can to help increase sales, and thus throughput. If the plant is operating at capacity, it must push orders through the plant faster to increase throughput. This is done by identifying the bottlenecks in the plant and increasing their capacity, often without buying more equipment but by more creative scheduling. The most important constraint, either sales or the production bottleneck, should be relieved to increase throughput. This way, the operation will progress towards its goal of making money.

TQM (Total quality management). A multifaceted, company-wide approach to improving all aspects of quality and customer satisfaction – including fast response and service, as well as product quality. TQM begins with top management and diffuses responsibility to all employees and managers who can have an impact on quality and customer satisfaction.

UMTS (Universal Mobile Telecommunications System). The first of the third-generation (3G) cellular networks, UMTS is being designed to offer speeds of at least 144 kbit/s to fast-moving (e.g., vehicle-based) mobile devices, and offer an initial 2 Mbit/s to campus sites. Designers expect to increase this to 10 Mbit/s by 2005.

Upstream production disturbances. These include materials quality problems, supplier production problems, materials delivery delays, material property variations and incorrect deliveries.

Uptime. The time that an item of equipment is in service and operating.

Utilisation. A measure to describe how intense a resource is being used. Utilisation compares the actual time used to the total available time. Utilisation = actual time used/total available time. Actual time used is the total processing time and set-up time in a given period. Total available time is the total available hours in a given period minus the total time the resource is down for repair or maintenance.

Utilities and HVAC. The body of activities and systems associated with designing and maintaining power, water, process gases, heating, ventilation and air conditioning systems for the facility.

Value added. The value of something is its inherent worth to a customer – what the customer is prepared to pay for it. Thus, value added is sometimes used as a measure of a company's productivity and is defined as "sales revenue less the cost of purchased materials and services".

VoIP (Voice over IP). The ability of an IP network to carry telephone voice signals as IP packets in compliance with International Telecommunications Union Telecommunication Standardisation Sector (ITU-T) specification H.323. VoIP enables a router to transmit telephone calls and faxes over the Internet with no loss in functionality, reliability or voice quality.

Wi-Fi (Wireless Fidelity). The Wireless Ethernet Compatibility Alliance's (WECA's) name for the IEEE's 802.11b standard for wireless LANs operating at 2.4 gigahertz (GHz). WECA promotes the standard's use for wireless products, and performs interoperability certification on products submitted by member companies for testing. More than 40 wireless technology vendors support the Wi-Fi standard.

WIP (Work-In-Process). The amount or value of all materials, components and subassemblies representing partially completed production; anything between the raw material and purchased component stage and finished goods stage.

WLAN (wireless LAN). A LAN technology in which radio, microwave or infrared links take the place of physical cables. Three physical media types of WLAN are available. The first two – direct-sequence spread spectrum (DSSS) and frequency-hopping spread spectrum (FHSS) – are based on radio technologies that are not interoperable. The third is infrared, a non-radio technology based on light waves. Infrared can coexist with radio-based systems in one enterprise network. WLAN standards include IEEE 802.11 and HIPERLAN. Although WLANs can be found in a corporate environment, service providers are offering commercial services in "hot spots", such as airline lounges and coffee bars.

Workflow. The sequencing (and often, automation) of business processes into structured movement of tasks, documents and data among people performing different functions or responsibilities. Workflow software tools generally cover the following capabilities:

- Planning, sequencing, tracking of tasks
- Electronic distribution of task-related information objects
- Electronic routing (sequenced distribution)
- Electronic approval (ranging from email to full digital signature)

Yield. The percentage of satisfactory output of a batch of material in process industry manufacturing (food, chemicals etc.).

Wrapping it all up

A more agile organisation. Fewer production losses. Lower risk. These are the benefits you get if your organisation can respond quicker to unexpected events – rush orders, materials shortages, technical failures.

Wireless communications gives quicker response. Key people receive time-critical information directly to their pocket (as speech, text, alarms or data) from colleagues, machines and systems, and while they are on the move. They can retrieve or get information automatically about process values, OEE or other key figures. The right person gets the right information, at the right time, in the right way.

Ascom wireless communications integrates with production controls, business and accounting, building management and security, with telephone systems; and with wireless and wired devices such as pagers, telephones and PDAs.

Integration with existing systems is our true strength – acquired during fifty years of supplying integrated communications to more than 20,000 production plants in Europe and the U.S.

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