

Design to Distribution

WINNER

Management Today Factory of the Year 1994; Electronics Industry Best Factory 1994; Best Factory in the Midlands 1994

ACTIVITY

Printed circuit board design, manufacture and assembly

ASK

Just-in-time supply of high volume printed circuit boards and products for a range of blue-chip companies – including Dell, Madge Networks, Hewlett-Packard and Pace Micro Technology

COMPLEXITY

Product: medium
Process: high

SIZE

600 employees

EXCELS AT

Quality systems, purchasing and material supply, process capability and design, technology absorption and people management

OVERVIEW

You have to be nimble in the volume electronic sub-contracting business – as well as excellent at exploiting a wide range of technologies and manufacturing competences. Fast-growing Design to Distribution shows how it's done

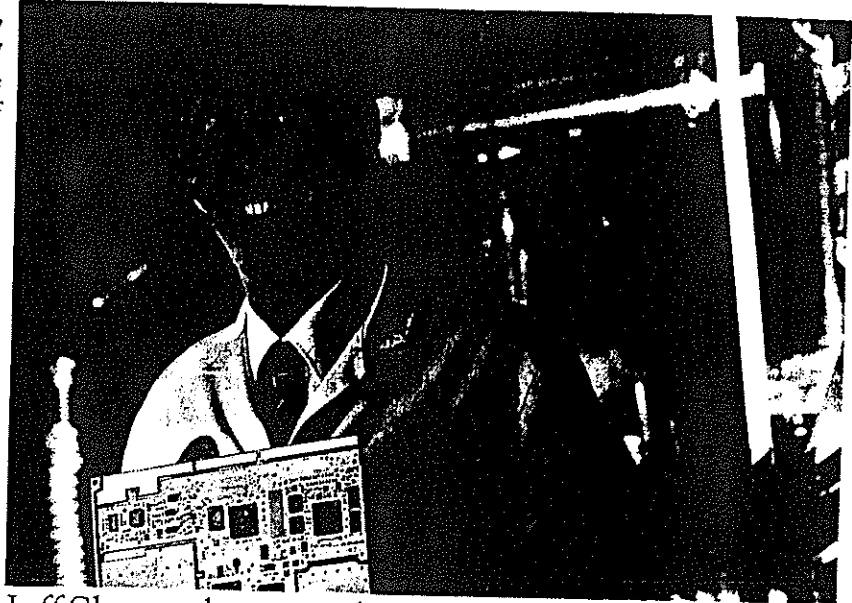
'Within the ICL business, manufacturing certainly wasn't seen as a core competence,' says Jeff Sharrock, recalling the late 1980s. 'In fact,' he continues, 'it was increasingly regarded as a drain on resources.' Somehow, this is not the sort of observation one expects to hear from a senior manager of Management Today's 1994 Factory of the Year, the Kidsgrove printed circuit-board plant of Design to Distribution, the contract manufacturing arm of computer company ICL.

What a difference a few years can make. Sharrock – general manager of the factory at the time of the

award – is now part of a corporate effort which aims to replicate its demonstrated and award-winning manufacturing excellence elsewhere. But Kidsgrove's success goes beyond the transformation of a factory into an example of world-class manufacturing leadership. The nature of the business that the factory is in has changed, too: Kidsgrove now supplies totally new customers with levels of volume that it could only dream of before.

Design to Distribution is now the fifth-largest contract circuit board manufacturer in the world – a business that it entered for the first time in 1990. Circuit boards produced in Kidsgrove are shipped to prestigious – and demanding – customers, such as Sun Microsystems, Dell Computer Corporation, Madge Networks and Hewlett-Packard. The buildings, the people and some of the equipment are the same, but virtually everything else has had to be rebuilt, or re-learned, from scratch. 'We needed to get leaner, meaner and hungrier for orders,' says Robert Brown, former operations manager and the factory's director since Sharrock's departure.

Excellence is observable everywhere – and not just in the range of technologies and capabilities on offer. The plant not only assembles boards using the latest high-speed 'chip shooting' equipment, capable of placing 40,000 components an hour, but also produces the bare boards themselves, in multi-layer 'sandwiches' up to 32 layers thick. Depending on the



Jeff Sharrock, general manager at the time of the award, is now reproducing D2D's manufacturing excellence elsewhere at ICL. His role was crucial, too, in winning Kidsgrove's first outside customers

customer's requirement, the plant will even modify the design of the board to achieve greater manufacturability and service life, as well as source components from around the world at keen prices – keener than many of its customers can achieve, thanks to high volumes and the purchasing power of parent companies ICL and Fujitsu.

'Time to volume' is increasingly important in this business,' says Sharrock, pointing to specific contracts that the plant has won on its ability to take a product on, and then quickly increase the output levels as demand grows. The plant's engineers are now past masters at bringing in new equipment and processes and getting them on stream smoothly and effectively: the layout of the factory floor is rarely the same from one month to the next. To maximise flexibility, cells are constructed to facilitate the removal and substitution of equipment. Conveyor-driven 'tower bridges' – 7 feet wide by 12 feet high – are inserted into the lines at regular intervals to provide access routes for people and equipment.

Another key requirement is cost reduction. 'All our customers want to see continuous cost reduction,' explains Sharrock. 'They want to see a forward plan, and they want to know in advance what's going to come out of the costs – and when.' Partly, the solution lies in technology: Kidsgrove invests heavily in equipment designed to enhance yield – reject boards being a prime source of waste. A laser-

driven solder reflow machine to 'nudge' minutely misaligned components back into place, for instance, paid for itself in under three months.

But perhaps more importantly, no part of the operation is immune from an intensity of cost improvement programmes rarely found in what Sharrock and his colleagues now refer to, half-disparagingly, as 'captive houses': plants that are still tied to a single customer, and removed from the cold competitive winds that now blow through the Kidsgrove plant. 'We used to compare ourselves with DEC or IBM,' says Steve Whigham, purchasing and supply manager. 'Now it's with a fellow sub-contractor that I probably hadn't heard of a few years ago.'

Painful nettles to grasp

Innovative buying arrangements, slick planning systems, flexible working practices and a focus on empowerment – all these have played their part, as they have in many other leading-edge plants. But Kidsgrove has had to grasp some painful nettles and put in place improvements that are more difficult to disguise with language and good intentions. As part of a package christened Competitive Working Practices, for instance, it has reduced overtime and shift premiums, and now has over two-thirds of its direct operatives contracted to cover a seven-day, 19-shift roster, instead of the traditional Monday to Friday working week.

And its people have had to learn to be more than

often involve a conference call through to the Dell assembly plant in Ireland, talking through the detail of production and delivery schedules with the Dell personnel who will receive the boards that she ships. From such close links spring opportunities. Apparently, when a US supplier to the Dell plant in Texas let its customer down, Kidsgrove stepped into the breach, picking up an order for an extra 30,000 boards to be shipped at short notice.

Although the Kidsgrove plant dates from the early 1960s, the story of its transformation starts in the mid-to-late 1980s. The situation, explains Sharrock, was simple: the investment needed to support and develop a viable printed circuit-board manufacturing capability was rising faster than the revenues earned to pay for it from the company's mainframe and minicomputer business. Although ICL was good at designing and selling its computers and their associated software, the viability of the manufacturing part of the business tasked with turning sales into delivered products was becoming increasingly questionable. Each successive generation of circuit-board technology demanded new and expensive equipment – and seemed to be barely in place before the next technological advance heralded its replacement.

It's a classic squeeze – and one that, in industries ranging from automobiles to aeroplanes, has seen manufacturing capability concentrated within fewer and fewer companies as the battle to acquire

KIDSGROVE'S PEDIGREE OF QUALITY IMPROVEMENT

1985	1986	1987	1988	1989	1990
60 quality circles in place	Quality improvement process starts	Flow charting of processes	All staff trained in quality	Statistical Process Control	Zero Defects Day at Kidsgrove
Single-status restaurant and car park	All managers trained in Crosby methodologies	Corrective Action, Recognition, Cost of Quality in place	BSI ISO 9002 registration achieved	Sister plant at Ashton wins <i>Management Today</i> Best Factory award	Failure Mode Effect Analysis at Ashton
Use of first names	Measurement starts		Harmonisation of working conditions	Customer surveys start	Self inspection on all processes
Open-plan offices	Investing in People appraisals start		Delivered Quality audits start		British Quality Award
	Team briefings start				Accredited Vendor Scheme starts

Changes to the plant's established working practices were achieved in an apparently cost-free overtime and shift premiums were cut, and most of the workforce are now contracted to work within a seven-day, 19-shift system

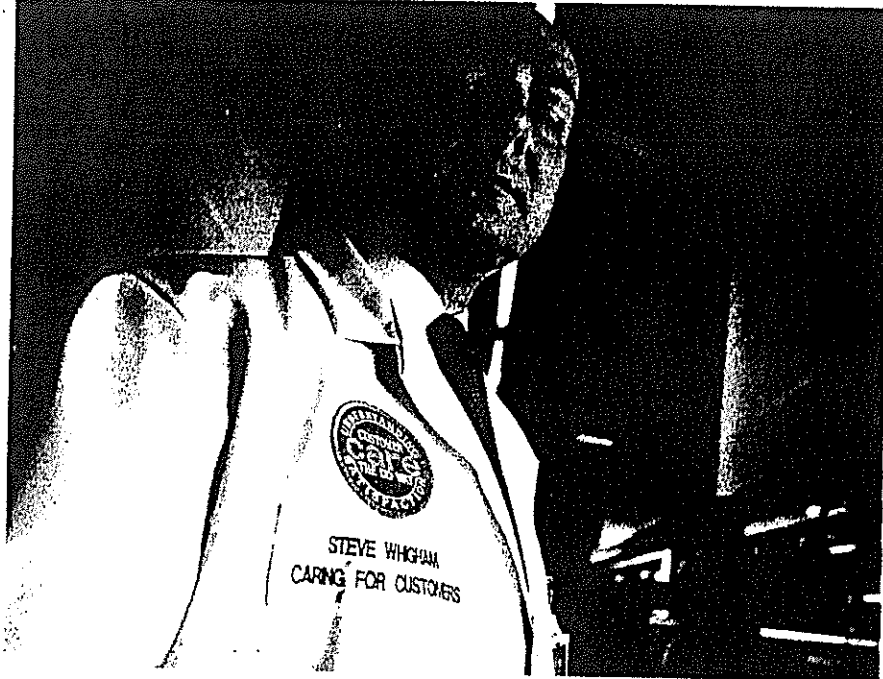
just a simple source of assembly labour. 'An operator working on a line knows the customer, the volume target, the board cost, the profit margin – and therefore the number that we need to make in order to break even again if we scrap a board,' adds quality and business planning manager Barry Wootton. Hilary Brammell, a shift leader on the Dell line, has been at the factory for over 20 years, and can see the changes of the last few years very clearly. 'It takes us around an hour and a half of elapsed time to make a board: in the old days, it might have taken three weeks,' she says.

She points to other changes, too: operators are more proactive, supervisors more actively involved, and the links that the plant has with its customers are far closer than she would once have believed possible. The daily production meetings, for instance,

sufficient market share to absorb spiralling fixed costs takes hold. For a time in the late 1980s, concedes Sharrock, one option was to withdraw from manufacturing; as some companies have successfully shown, design and selling skills are more critical competences to possess than manufacturing ability.

Manufacturing's low profile

Withdrawal didn't remain an option for very long. As the company looked at its manufacturing plants – another factory at Ashton-under-Lyne assembles computers, incorporating Kidsgrove's circuit boards – it realised that despite manufacturing's relatively low profile within the company, the plants 'really were rather good'. A lot of hard work had gone into them, particularly with respect to establishing a quality-conscious culture, and successive improve-



Purchasing and supply manager Steve Whigham: We used to compare ourselves with DEC or IBM. Now it's with a fellow sub-contractor I probably hadn't heard of a few years ago.

ment programmes—including total quality management, team briefings, flexible manufacturing systems, single-status employment and statistical process control (SPC) — had gradually transformed them into virtual showcases.

Growing a core competence

Indeed, they had long been employed in this showcase role by the company's marketing and sales teams—demonstrating some of the company's computer and software applications in a real industrial environment. The Ashton plant, for instance, had been an early convert to computer-controlled automatic guided vehicles, which shuttled between factory floor and raw materials store, bringing components to the assembly stations 'just in time'.

Management's analysis concluded that the fault lay not with the plants themselves—nor with their ability to change and improve—but with the volume levels of the business. Merely supplying ICL's own demands generated insufficient manufacturing activity to sustain the factory's pace of development. Instead, says Sharrock, 'we took the decision to stay in manufacturing, turn it into a core competence—and then grow it.' Growing it, of course, meant finding new customers—and so moving into the tough world of contract manufacturing.

Almost coincidentally, an article appeared in an electronics trade magazine about a new Sun Microsystems factory opening in Scotland, to assemble Sun's range of high-end computer workstations. Sharrock was immediately given the task of trying to win the contract to supply the new plant with circuit boards. It took 18 months, and taught Kidsgrove's managers some of their very first lessons about the electronic sub-contracting business.

'One of the things that we've learned is that we do need a sales and marketing arm,' he acknowledges. 'Manufacturing people can talk about manufacturing issues, but other skills are required: these are large, long-term contracts, and the dialogue can be very wide-ranging.' Although D2D now sends along manufacturing people 'very early on' in discussions with potential customers ('something which sends a

very powerful and positive message'), they are longer the first and only contact.

Other lessons were more painful. Winning the business was one thing—making a success of it was quite another. Echoing a theme that surfaced in many of *ManagementToday's* Best Factories, Sharrock recalls the disciplines that started to emerge from working for such a demanding customer. 'Su were a baptism of fire,' he says. 'They "micro-managed" us for a long time.' Rob Brown, specifically recruited as operations manager from another contract manufacturer, can still recall his reaction on first seeing the Kidsgrove plant. 'The biggest impression was the slower pace. Even today, it's still an issue, even though the pace is so much faster.'

It wasn't just the pace of work that needed ratcheting up: everything needed to move up a gear. An instance was the plant's approach to quality—something on which it had previously prided itself, and a feature that had definitely been a deciding factor in winning the Sun contract in the first place. 'But what we hadn't got right was the time criticality, Sharrock admits. 'Our culture had been to collect data on quality, analyse it at the end of the week, and do something about it the week after.'

Sun, it seemed, wanted things to happen rather more quickly—such as within a shift, for instance. 'Involving operators in the process—rather than quality analysts—was the only way of achieving this,' says Sharrock. But for this to happen, several procedural changes were necessary. The approach to SPC—in place since 1989—needed dramatically simplifying and making more operator-accessible. 'We don't measure as many things as we did when we first started SPC,' acknowledges Wootton, 'but we certainly measure them more intelligently.' Commitment needed improving, too. Training and techniques are one thing, but the will to apply them quite another. The various changes made to the corporate culture since the mid-1980s had certainly helped, but something was still lacking.

Zero Defects Day

Sharrock and his team regard the 1990 Zero Defects Day as an important contribution to generating the required commitment. A whole day was devoted to emphasising the quality ethos: suppliers and customers came on site to talk about the importance of quality, technicians employed devices such as Faraday cages to provide practical demonstrations of how quality problems such as static electricity occurred, and employees publicly signed a large perspex board declaring their commitment to the goal of zero defects. The day was rounded off by a social evening for all 2,000 employees on site, with a hired marquee and a jazz band. 'It was a real milestone,' says Sharrock.

But one of the biggest contributions to raising quality levels came—oddly enough—from the plant's ICL heritage, rather than through the commercial imperatives of its new sub-contract role. The volume of boards shipped to Sun was growing rapidly—external sales in 1990 were £2 million, increasing to £26 million in 1991—and new customers were being sought. Thanks to its insistence on involving manu-

GOODS INWARDS

Before	Goal
Book in	Ship to stock
Inspect	
Test	
Burn in	
Test	
Inspect	
Test	
Inspect	
Store	
Kit	

finding that potential customers were attracted by a design-for-manufacture and design-for-test capability that stemmed from ICL's background in mainframe manufacture.

Increasingly, it seemed to Kidsgrove's managers that this seemed to differentiate them from other competitors in the marketplace, whose association with the boards that they manufactured ended when they left the factory. Customers, too, lacked the plant's in-depth exposure to the detail of circuit board manufacturing: personal computer companies' strengths might lie in mail-order marketing techniques, for example, rather than electronics.

But thanks to work undertaken in the mid-1980s in connection with the company's mainframe products, the Kidsgrove plant had this expertise 'on tap' in the form of a computer-based quality modelling system (QMS). 'Quality and price seemed to be the "entry tickets" to the sub-contracting business,' recalls Sharrock. 'The ability to design for manufacture and design for test seemed to be a real differentiator.' Recognising the potential in this, they began to develop the model in earnest.

At its heart lay some very detailed data on failure characteristics of both components and manufacturing processes. A board is described to the model in terms of the components that are on it; whether they are mounted double-sided or single-sided; how many components – and which – are inserted manually; and details of any particularly delicate components or programmable logic chips. The probabilities of test and service failure can then be calculated – both for the individual board and the end device within which it is incorporated. Boards with a 98.5% probability of passing the final systems test, for instance, would result in an overall probability of system failure of 86% if (say) 10 of them were used in a particular system.

The power of the approach lies in its ability to make several sorts of predictions – such as 'a system will fail four times a year and require four customer visits', or 'only such-and-such a proportion of those devices going through final assembly test will pass first time' – and then stimulate a board re-design to improve the figures. Because the model identifies those points of leverage where the greatest influence on the total reliability can be exerted, engineers can achieve the largest possible improvement in reliability with the fewest possible number of changes.

In addition to offering this service to potential customers, the plant found the data of vital importance in bidding for new work, as it was possible to predict very precisely the levels of end-of-line rectification work that would be required on a particular

board – and to state fairly precisely what levels of throughput could be achieved. Today, with a Windows interface and a built-in database containing a history of 120,000 faults, the program allows the plant to accomplish the results of around 50 man-years of engineering effort in a few minutes' processing on a fast computer. 'This is particularly useful,' observes Wootton drily, 'when you have neither the 50 men nor the year.'

In parallel, explains purchasing and supply manager Steve Whigham, a lot of effort was going into radically restructuring the nature of the plant's trading relationship with its suppliers – not only to improve quality, but also to achieve a host of other much-needed benefits. In 1988, purchased component reliability stood at an appalling 35,000 parts-per-million failures, necessitating an investment of £8.5 million in component test equipment, as well as £2.8 million a year in operational expenditure for space and engineering skills. Safety stocks were also high to buffer against both suppliers' poor reliability and delivery problems, with long lead times occurring through a 'play safe' mentality.

Although a vendor accreditation programme was making headway against this, the move to sub-contract manufacturing accelerated the effort, and also broadened the commercial focus: within the subcontracting industry, 90% of costs relate to materials, with only 10% accounted for by other manufacturing costs. Clearly, anything that could be done to reduce materials-related costs was going to have an important effect on the overall costs of the operation.

Get it right first time

The goal, says Whigham, was to achieve mutually-beneficial partnerships operated to achieve lowest delivered cost at highest achievable quality. The programme would be paid for, in simple terms, by taking the engineers devoted to checking incoming materials on the goods receiving bay, and relocating them instead in suppliers' factories, working with them to 'get it right first time.' Yet partnerships clearly demanded a high level of resource input if they were to be successful. It was impossible to form partnerships with the large number of vendors with whom the plant then had trading relationships; contraction was imperative.

But not contraction for the sake of contraction. 'Setting numeric targets for the number of vendors isn't the right way to go about it,' argues Whigham, who opts instead to focus on minimising the cost of procurement through automating purchase order placement. 'A single new board can bring 800 new and unique part numbers onto the bill-of-materials,' he points out. 'Straightforward vendor reduction simply wasn't appropriate.' The approach adopted thus saw numbers of new vendors taken on – because they offered lower costs of procurement, perhaps through better quality or more reliable deliveries – whilst other suppliers were eliminated by making them, in effect, suppliers to other suppliers, who in turn supplied the plant.

One example of this effectively saw 33 different vendors elided into one. The packaging used for the >

NATURE OF PURCHASING RELATIONSHIPS

Pre-1987	Price-based; wide vendor base
1987-88	Price-based, but delivery performance, too
Post-1988	Quality, cost of ownership, level of service
1991-94	Mutually beneficial partnerships
1994 onwards	Integrated partnerships

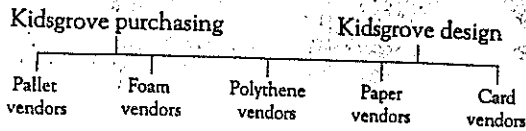
OVERALL REDUCTION IN VENDORS

Year	Number of vendors	New vendors	Net change
1988	726	0	0
1989	522	25	-229
1990	402	22	-142
1991	386	35	-51
1992	306	12	-92
1993	267	60	-99
1994	307	145	-105

Managing supplier relationships has brought many benefits: reduced inventory, lead times and obsolescence have all improved radically.

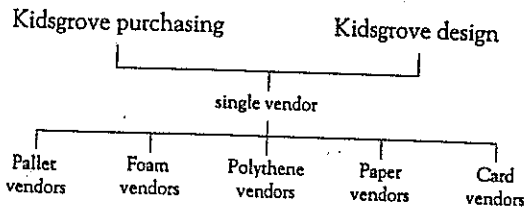
AN EXAMPLE OF VENDOR REDUCTION

BEFORE: 33 VENDORS



- Kidsgrove design and purchasing groups dealt with 33 different vendors to supply packaging for one product
- large project teams to support product introduction
- extensive communication chains
- non-core business, not adding value

AFTER: ONE VENDOR



- single accredited vendor
- co-ordinated project design
- satellite premises
- JIT deliveries three times a day
- 10% year-on-year reduction in price (not cost)
- recycling service
- MRP ownership
- electronic trading

Buyers now adding value on core business

Purchasing staff used to spend 80% of their time placing orders manually and chasing goods in. Now their role is 90% inventory management and customer enquiries and just 10% order placing

says Whigham, but also facilitated initiatives such as recycling and the use of more environmentally friendly materials.

Another initiative saw the procurement arrangements substantially simplified for programmable devices known as PALs and EPROMs. Up to 800 unique components were purchased from a factory in Penang in moderately high quantities – at around £2 million per year – but on five-week lead times and in quantities that resulted in considerable amounts of inventory and a not inconsiderable obsolescence provision – £500,000 and £70,000 a year respectively. Although emergency and 'top-up' requirements could be met through a UK-based distributor, this was at the cost of a 20% price increase compared to ex-Penang devices, and further on-site programming costs equating to 40 pence per component.

After talking to both the supplier and the distributor, Whigham managed to secure an arrangement that resulted in the distributor moving into device programming – with the Kidsgrove's plant's initial technical support, equipment loan and assistance. The five-week lead time was replaced by one of six hours, with components programmed to order daily. Industry-standard unprogrammed devices were still sourced from Penang, in order to achieve the lowest possible programming cost, but they were held by the distributor, programmed, and delivered to order. Obsolescence fell to zero, and inventory holdings averaged around three days of supply – essentially the contents of the production line.

Early successes like these did much to stimulate the drive towards effective vendor management, as opposed to price negotiation. Overall, says Whigham, pre-production inventory holdings now total

despatch of boards and finished computers calls for a great deal of design thought, and incorporates a wide range of different packaging materials, often simultaneously. Packing boxes might contain card, foam and polythene – each of which needed to be designed and procured in conjunction with the others. Coordination of this was costly in terms of time as well as inventory holdings – and was in no sense a core activity.

The decision was taken to out-source the whole task to one of the 33 vendors, who would then handle the total design and purchasing interface with the other 32 suppliers. The chosen vendor then set up satellite premises close to the plant, from which material was despatched direct to the point of use three times a day. As well as freeing up design and purchasing resources, the approach not only resulted in year-on-year price reductions,

just four days of supply, against 30 days in 1988, metrics such as inward quality and delivery reliability have also been transformed. Ship-to-st deliveries have increased from 13% of components to 97% (and are now standard on all materials: new products), parts-per-million (ppm) failures have dropped from 35,000ppm to under 25ppm, the six-week cycle time for goods receiving and has dropped to about two hours.

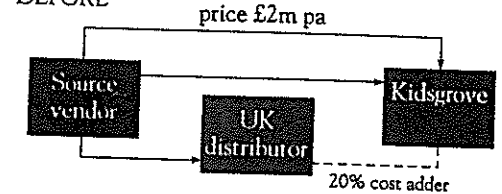
A rounded business role

Meanwhile, the deployment of purchasing personnel was also transformed. In the past, Whigham guesses, only around 20% of his people's time was spent developing the business, either through seeking to improve vendor performance or doing 'what-if' analyses on received orders. Over 80% of the time was spent just placing orders manually and chasing goods in. With better vendor management and 90% automated ordering, roles became more rounded: 'business professionals', rather than narrower 'purchasing professionals'. Today, just 10% time is spent placing orders, says Whigham, with the balance spread across inventory management and customer enquiries in roughly equal proportions.

But it wasn't just the purchasing people who were working themselves into new roles. Along with two new customers – disk drive manufacturer Connex and workstation company Meiko – 1992 brought to the plant an ICL-spearheaded programme called

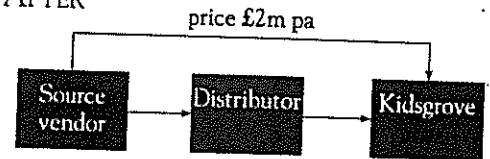
PROCUREMENT MADE SIMPLE

BEFORE



- spend £2 million
- lead time five weeks
- based Penang
- 800 unique lines
- high support costs
- Kidsgrove holding £500,000 inventory
- minimum batch 250 pieces
- internal charges >£0.40p

AFTER



- spend £2 million
- lead time six work hours
- zero obsolescence
- based Crewe (six miles)
- no distribution cost adder
- 100 common parts, not 800 unique
- zero support costs
- inventory three days of supply
- minimum batch of one
- significant savings

Customer Care. The timing, confesses Sharrock, was fortuitous: for the first time, the plant actually had some external customers. In truth, the proportion of activity devoted to ICL work was shrinking fast, and the moment was right for the plant to spend some time thinking through the consequences of this. (Already comprising a third of the activity in 1992, external work grew the following year to around half the plant's output – and then became the larger proportion.)

The customer care programme employed external consultants to help prepare the training materials,

but it was actually delivered by management and supervisors in cascade fashion – an important contributor to the programme's success, according to Sharrock. Just as important, possibly, was the way that the programme went about gaining commitment to the concept, and so sharing the factory's responsibility for customer care.

As with people's individual signature on the commitment to the principle of zero defects (a tradition begun in 1990 on Zero Defects Day, and since continued with new recruits), part of the programme's strength lay in the way that it harnessed people to the overall goal. A very visible feature of the Kidsgrove plant is the way that name badges (and photographs of personnel, too) are deployed. Stuff, overly formal name tags are eschewed in favour of the names that people actually use: Whigham's badge doesn't proclaim him to be 'Mr S. Whigham', or some such, but simply says 'Steve Whigham' – and, underneath, in similarly sized letters, the words 'Caring for Customers'.

But how best to achieve this? Part of the answer, says Sharrock, lay in focusing on 'core competences' – 'figuring out what we were here to do, and then organising ourselves accordingly'. In terms of the bare boards operation, the answer seemed to be technology. In the assembled boards business, the evidence pointed more to service, responsiveness and the plant's abilities in the design-for-test, design-for-manufacture and procurement areas.



Employees are no longer seen as an 'amorphous mass': operators are more proactive, supervisors more involved and people are increasingly identified with a specific customer

As a result, the organisation chart began to have more of a customer-focused feel to it, aimed at harnessing some of these identified critical competences more closely. The effects were felt from top to bottom: operatives were no longer regarded as 'an amorphous mass', to be switched from task to task as demand dictated, but began to be identified more with particular customers.

This process is continuing to the present day, stresses Sharrock: the plant is still experimenting with different ways of managing and motivating people, and probably always will. The people working on the boards for Sun are now effectively a business within a business: 'a team that owns its own manufacturing capability – operators, machines,

quality reporting, planning and engineering'. As with QMS and the early involvement of manufacturing people in the sales process, management believes this marks the plant out from other sub-contractors, who either won't or can't do it.

Beginning in the middle of 1993 came a period of major investment in people and equipment that was to last for almost 18 months. The spur was the arrival of new customers – starting with Dell, then with Compaq and subsequently Madge Networks. It was a period, concludes Sharrock, of 'inevitable stresses and strains', during which some of the lessons that the plant had learned about equipment layout and flexibility were cruelly driven home. Trying to swallow four new surface-mount lines at once stretched resources almost to breaking point: 'We just hadn't appreciated the level of skills infrastructure that would be required.'

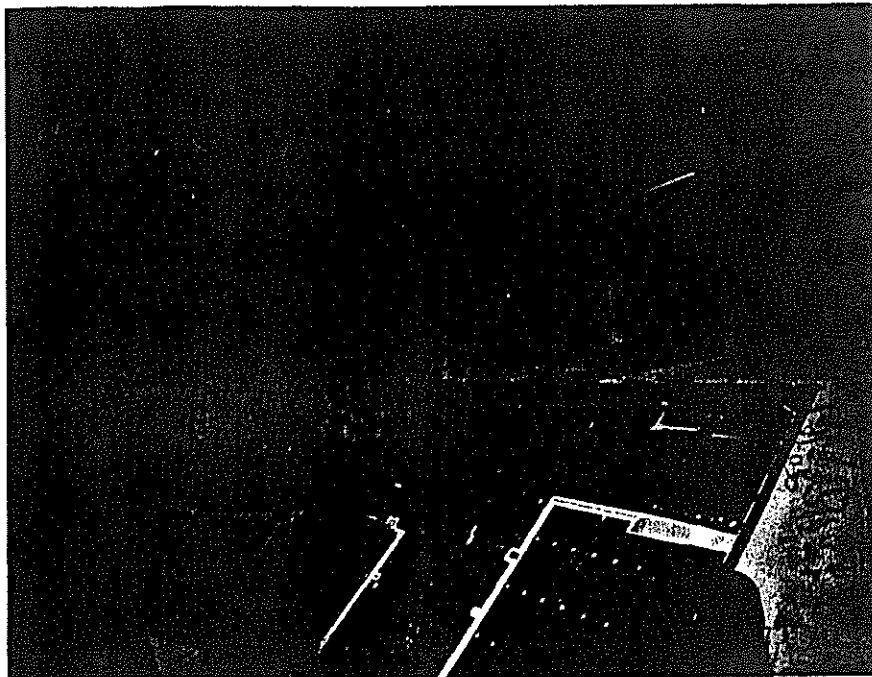
But if technology had always arrived in easily digestible lumps in the past, people had tended to arrive even more slowly: ICL's days of heady expansion were by now long gone. With a rapidly growing business came the need to take on substantial numbers of people – a potential disaster that instead appears to have gone remarkably smoothly. 'We doubled the size of the organisation in a year, mostly within a six-month period,' says Sharrock.

Several elements seem to have played a part. The first was a strict reliance on aptitude testing – for dexterity, verbal and numerical reasoning and basic literacy. The testing programme soon threw up a surprise: it had originally targeted younger people as potential recruits, but they were failing to make the grade. Older, more experienced people did better. Faced with a choice between meeting target recruitment numbers and hitting an ideal age profile, the intended age range was soon sacrificed – a decision that has so far stood the test of time. Once on board, the new recruits spent at least two weeks in the training school undergoing a familiarisation and education programme. 'We had to resist the temptation to put people on the factory floor before they were ready,' recalls Sharrock.

A pool of useful talent

Another element was perhaps more fortuitous than anything else. The plant undoubtedly benefited from the high number of apparently over-qualified people who applied for jobs – the result of a combination of economic recession and a downturn in the local pottery industry. Even though many were recruited as straightforward machine operators, they represent a pool of talent for the future. It is a resource that is already being exploited, says Sharrock, pointing to instances of redundant graduate engineers from the pottery industry making the transition to the technology of the microchip era.

With the expansion in numbers, the plant's management also took the opportunity to adopt more flexible employment practices, including a move to seven-day, 19-shift working. The switch could well have sparked unrest and resentment among a workforce established since the mid-1970s, but the transition seems to have been smooth. One reason may have been the commitment to move towards



Zero Defects Day in 1990 stressed the quality ethos: customers and suppliers came on site and employees publicly put their signatures on a wall-mounted declaration of their commitment to zero defects

greater empowerment, and a rather more focused approach towards investing in people. What is clear is that the appraisal process is remarkably open, with all the measures and criteria published in a glossy 37-page brochure distributed to all staff – one of the most thorough such publications seen by the *Management Today* judges.

In part, the openness reflects early experiences with the concept of appraisals for all. 'When we first launched appraisals, without the glossy brochures, they acquired the reputation of being something that was done to someone,' explains personnel manager Steve Rowe. 'We probably frightened a lot of people.' The message needed toning down and clarifying. Attempts to put into practice some of the identified training programmes also threw up lessons. 'It's fine to talk about multi-skilling and flexibility, but teams learn best when they are kept together,' reflects Rowe. 'It's obvious when you think about it, but it's a lesson that it took us some time to learn.'

Today, each member of staff has both personal and team objectives. 1994 also ushered in a final change. ICL's Manufacturing and Supply Division was re-christened Design to Distribution. The new name is intended to reflect the company's capabilities and its ambitions. D2D – the company's shorthand abbreviation – is a totally autonomous ICL subsidiary, one of 28 federated ICL businesses. The two largest factories – Kidsgrove and Ashton-under-Lyne – jointly offer customers their skills in designing hardware as well as in building it. This can extend to distributing it and even, if required, selling it through a telesales operation.

However, the market has been slow to take up capabilities such as distribution and sales, concedes Rob Brown, Sharrocks' successor at Kidsgrove, 'although there's still plenty of time.' It took a little over four years for the proportion of ICL work going through Kidsgrove to drop to 25% – and that against a commercial background of selling to customers who had previously been competitors. In the broadest sense, of course, some of them still are, and the change of name 'helps soften the ICL connection'.

Even today, some 350 different types of board go through the Kidsgrove factory destined for ICL's own computers, but the ICL proportion continues to shrink as existing customers place more orders, and new customers sign up. For a company that just a few years ago was acknowledging that manufacturing was not one of its core competences – and was consequently busy wondering about its future – it's a remarkable turnaround.

And one that, in the process, has taught the plant something about the nature of manufacturing itself. 'Even though the lines are machine-driven, it's still people who take corrective action when it matters, and who make the process work,' muses Sharrock. 'I think the most important thing that we've done is to define ownership, and then work out what it is that we've had to do to achieve it.' □

D2D IN PROFILE

Data file	People	Valid at June 1994
Numbers	Direct	410
	Indirect	163
	Total production	573
	Others	32
	Total	605
Age profile	Under 30 years	37%
	30-40 years	28%
Average length of service		9 years
Average absenteeism rate		3.3%
Average annual turnover rate		<2%
Data file	Product	Valid at June 1994
Live items	Finished product	400
	Manufactured components	3,443
	Raw material/bought out	1,179
Average components per finished product		150-200
Innovation	Lead time to market	2 months
	Major new products in past five years	310
	Major new products in next five years	400
Data file	Process	Valid at June 1994
Area of plant		15,000 sq.m.
Product availability	Ex-stock	0%
	On quoted lead time	100%
	Inventory (weeks of usage)	Bought out
	WIP	<1.5
	Finished	0
Cost structure	Bought out	<85%
	Direct labour	<9%
Quality	Scrap	<1%
	Capacity used for reprocessing	<2%

N.B. Data refers to the printed circuit board plant only

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