Remembering Istel

SWINDON PRESS SHOP MONITORING

Rogan Meadows

The Site

The Site Today

The office block has disappeared and, in its place at the bottom left, is a dark area of car park in front of what was known as A Building, then B Building with C Building being mid right hand side of photo.

The Press Shop

In 1976 I joined a systems team being formed to implement a computer system to monitor activity in Swindon's press shops. At that time there were three major press shops: A Building, B Building and C Building. Each press shop comprised a number of major press lines. Each line comprised up to eight major presses, each press having a "bed" (the area into which dies were fitted) of around six feet.

A typical major press line.

As far as I can remember, A & B Building each had 12-14 press lines whilst C Building had 18. Within each press shop there was also a "Blanking" area where coils of metal/steel were cut up into "blanks" of flat metal. The finished parts were subsequently joined/welded together to form vehicle bodies incorporating smaller parts produced in the light pressings area at Swindon.

Customers were Austin/Morris, MG, Rolls Royce, Rover/Triumph and other vehicle manufacturers.

Each of the press shops worked a day shift (0800 – 1630) and a night shift (1800 – 0630) back then.

The Press Process

Pressed parts were produced in batches and stored at Swindon before shipment, or shipped directly to customers sites. Customer requirements were based upon sales forecasts for the relevant vehicles. Coils of metal had to be ordered well in advance of any planned press/production run, often over 26 weeks in advance. Each building had its own “planners” who scheduled jobs into the relevant press shop/line. The production of a part comprised two jobs or press runs: a blanking run followed by a press run. A finished part usually involved a number of sequential presses, with a blank being fed into the first. Each press would be fitted with a set of dies – a top and a bottom die. A metal blank would usually be fed into the first press manually and then extracted and fed into the next via a combination of manual and automated handling.

All the production information was recorded manually. By the time consolidated information became available to management it was, on average, 12 hours old. This led to many problems for “management” when faced with questions such as:

- how many panels can you ship to us as we need them now.
- how come so much downtime has been booked to electrical faults and the Electrician Foreman knew nothing about them.
- why has BOK taken so long.

The Proposition

The aim of the proposed computer system was to capture information in real time and make it available in understandable form to management. Each press would be connected to the computer, using strain gauges, so that press strokes could be counted and the strain reading would enable the presence of a metal part to be detected. The time each stroke occurred was recorded so that stoppage times would be accurate. This would mean that an existing job – Checker/Recorder - would no longer be needed. The unions, who were still very powerful in those days, were placated by the promise, from the Plant Director, that no-one would be made redundant. They would be re-deployed.

In the event of problems (e.g. press stoppages) the necessary personnel could be alerted.

As C Building was the largest press shop, it was chosen as the first to have the proposed system, named Press Line Monitoring (PLM). From the start considerable effort was made to explain to everyone in the plant who would be affected what the system was intended to do and how it would do it. The first form of this was to use an on-site conference room and mount a series of displays illustrating how information would be collected, processed and presented. By walking groups of people through this, explaining and answering questions (and noting any that couldn’t be answered there and then!), everyone had the chance to learn what was being proposed.

Choice Of Hardware

In 1976 there was a “buy British” sentiment about. However, as what was being proposed was something of a first (we knew of nowhere else in the world who had done this) it was felt that a wider view of what was available should be taken in order to select what was best for the job. A comprehensive set of criteria for the proposed system (hardware and software capabilities) was drawn up by the project team. These were weighted in importance such that each option looked at could be scored for each criteria, then multiplied by the weighting.

If my memory is correct, four computer manufacturers were looked at/invited to tender: ICL & Ferranti from GB, IBM & DEC from USA. Having scored each criteria for all options, the scores were normalised: best scoring option for each criteria was 100%, the other percentages for that option were relevant to the top score. Eventually, and this was not a short process (!!) we could rationalise all of this data/scoring and come up with a “winner”. The recommendation was to use DEC hardware. This was accepted by senior management and orders placed with DEC.

Systems Development

The proposed system would become an essential part of press shop operations. Thus, any system failure would have a severe impact upon the ability to manufacture there. For this reason a duplex system was proposed. Two identical computer systems, linked together, with one being the “master”, the other the “slave”. Only the master would hold two way conversations, the slave would simply listen, but also update its own files/database as if it were the master.

As we had no experience of developing software on DEC hardware, and no experience of duplex systems, it was agreed that DEC would write the special software to capture the press strokes and enable the master/slave environment to work. They would also manage the production of the Fortran based programs that would communicate, via VDUs,with those operating the press shops. We would specify the Fortran programs and provide the programmers who would write them under DEC management. It has to be remembered that, at that time factory personnel did not know what a VDU was! We had to explain to them that each had a typewriter type keyboard and a TV like screen. The chosen hardware were 2 X DEC PDP11/70 machines with (I think) 32K of memory in each. DEC would carry out their development on one of the PDPs, the other would be put into a new computer room at Swindon for our programmers to use under DEC supervision. The initial project team (a manager, 2 x analysts and a technical expert) was to be increased to include programmers and a couple of people recruited from Swindon’s planning department who would be trained as programmers/analysts providing local detail knowledge of the processes in their areas in order to correctly specify the relevant software.

Shortly after orders had been placed and development plans/timescales had been outlined, DEC came to Swindon to present to our management their detailed development plan. Their project management produced a detailed plan using overheads, which illustrated the various stages of development that they proposed, including Fortran program development by our programmers under their supervision. Our Project Manager listened politely until the end of their presentation, then asked what had happened to August? Yes, their beautiful time-charts had missed out the month

of August completely! Oooops, much embarrassment. It was decided that we would manage all of the Fortran programming with DEC producing the specialist technical software over a time period that included the month of August.

Thus, our next step was to learn as much as we could about how things worked in the press shop, their processes, working practices etc. in order to be able to specify the relevant computer programs. To do this the two analysts on the team (one a business analyst, the other a systems analyst) spent several weeks shadowing all of the relevant roles on the shop floor observing the processes and procedures on both day and night shift

Business Analysis

Each Press Shop had a Senior Foreman who oversaw a number of Press Line Foremen. In addition there were trades foremen, one for each trade, along with Planners who planned and scheduled the press work/jobs, and a substantial number of press operators who formed gangs to run each job. At the start of each shift the planners would indicate the “high” priority jobs. The press operators would congregate at the gangway running along the end of the press lines. From there they would be “herded” up the gap between lines to where the Senior Foreman would allocate operators to the jobs/lines. Any unallocated would find somewhere to wait until they were required.

Each parts press run would entail the presses having dies from previous job removed and dies fitted along with the relevant automation (safety barriers, mechanical hands, conveyors etc.) for the next job. This work, carried out by a combination of tradesmen (die fitters, automation fitters, electricians, plumbers etc.) could take hours/shifts culminating in a panel that passed quality inspection, or “OK”. This was known as BOK – Before OK. Once complete a gang of men (press operators) would be allocated to produce the required number (‘000s) of finished pressed parts – AOK – After OK. Each part had a target time in hours for BOK, and a target of “x” panels produced per hour in AOK. Plant Industrial Engineers set the targets. Each press had a stroke counter that would be set to zero at the start of AOK.

A blank being manually fed into a press

A Foreman was responsible for each of the main bay press lines. Each Foreman would cover 2 or 3 lines, but would not need to be involved on a detailed (minute by minute basis) during BOK. However, during AOK he was responsible for ensuring that the required target was met by the gang of allocated press operators. The Foreman had to ensure any problems were addressed efficiently in order that production was maximised – e.g. obtaining necessary tradesmen (electricians, pipe fitters etc.) in the case of breakdowns/production problems.

Production information (time taken/press strokes performed and breakdown times/reasons) was manually recorded. Each “breakdown” (a stoppage during AOK in excess of 2.5 minutes) was recorded with the reason (electrical fault, oil dripping, mechanical failure etc.). All of this recording was performed by a Checker/Recorder who would cover 2-3 press lines taking the stroke counts off the press and getting breakdown reasons from the Line Foreman.

During our time shadowing the various roles we liaised with the Plant HR Department to check on the various rules, regulations and union agreements that we came across.

A lot was learned by observing production. For example, a press stroke count did not reflect panels produced as presses could be turned over without metal, albeit too much of this could damage a die. Some presses stroke counts could be increased simply by leaning hard on the guard rails. And Checker/Recorders did not accurately record press strokes in AOK. As mentioned earlier, each job had a target of strokes per hour. At the start of AOK the gang of men/press operators were keen to ensure that everything was to their liking enabling the job/press run to go smoothly and efficiently with teething problems being ironed out. In most cases smoothly and efficiently meant they could

exceed the target rate. However, the Checkers never recorded above target. So, if the rate was (say) 600 strokes per hour and the gang achieved 900 in the hour, the Checker would record 600. If this actual rate was achieved consistently in the shift, the gang could stop work as soon as they had achieved their shift target: 8 hours at 600 strokes = 4800 press strokes on the lead press. The actual rate achieved of 900 per hour meant that they could stop work after 5 hours 20 minutes. But if you looked at the paperwork from the Checker the gang worked for 8 hours at 600 per hour. Having achieved their target for the shift the gang just stopped work and made themselves comfortable on the line. This above target time was called “earned relief”. Agreements were such that another gang could not be put on the job until earned relief had expired or the shift ended. This included earned relief time when the job had completed - .the number of panels required for this run had been pressed and presses went into BOK. No official records existed showing anything above target was achieved!

If a stoppage occurred during AOK (a stoppage being a break of over 2.5 minutes without a press stroke) the stoppage time was rounded to the nearest 2.5 minutes. Thus, a stoppage of 6 minutes should be recorded as 5 mins., whilst one of 6.5 should be recorded as 7.5. This agreement allowed for the Checker and the Foreman not necessarily being present at the point of stoppage. However, rounding down of the stoppage times was rare. If the Foreman or Checker was not present at the point of stoppage, they would have to ask the operators when did it start. Stoppage times were taken out of production time during which targets had to be met. So, if a gang could “invent” say, an hours worth of stoppages during their 8 hour shift, they only had to do 7 hours of production at target rate. The Line Foreman would tell the Checker the reason for the stoppage and would also have to go and find any required tradesmen to carry out a repair. These tradesmen each had their own residence/cubby hole/self-made seating area. If they were not where the Foreman expected to find them, he would have to go looking for them or their /Foreman, elongating the stoppage time.

Usually, well before a shift ended the press shop was almost at a standstill as all jobs had reached their shift target. Given the noise made when half/2/3rds of the presses were operating in AOK (the normal percentage) the silence towards shift end was remarkable. But those were the agreements and that was the way they were operated.

If press shop “management” got a frantic phone call from senior management or a customer demanding to know how many panels they could get and by when to avoid their stopping production, someone had to go down to the press shop floor to find out the situation. They might find that x panels had been produced, but where were they? The proposed system would answer the first part of the question.

The proposed system would record and report what actually happened. Each press stroke in AOK would be recorded along with its time and the strain gauge would denote the presence, or not, of metal. Thus, the number and length of stoppages would be accurate, as would the rounding of stoppage times. Analysis of the checkers records enabled us to gauge the number of press stoppages which we could use in designing the system.

System Design

Each large blanking press and each of the main bay presses would be fitted with a strain gauge.

Each would be linked back to the computer so that a signal would be received for every press stroke. At the point when a job moved from BOK to AOK a panel would be passed through and the Line Foreman would indicate that that press stroke had produced a quality approved panel Thus the strain could be noted and every subsequent press stroke within a percentage of that strain denoted panel production.

A light would be fitted on the press at the start of a press line which could be illuminated in the event of stopages requiring action from the relevant Line Foreman. Each Line Foreman would have a “ruggedised” visual display unit in a small cabin at the head of one of their press lines which they would use to record the reason for each stoppage, and to signal the end of the stoppage/book off the relevant trade. Ruggedised meant a simple, number only rugged keypad with a separate rugged screen, all suitable for a dirty, noisy environment.

A tradesman compound would be formed to which stoppage requirements could be routed and printed, removing the need for the Line Foreman to go hunting. All of the Senior press and trades foremen would be provided with a shared office (Control Centre) in the press shop which would also be the base for the press shop planners. This meant everyone responsible for running the shop would be in one place.

A new role was introduced to also reside in the new office. The role was System Co-ordinator, the job being to understand how the computer system worked, what had to be done for it to be effective and ensure that all participants in that press shop understood and carried out their required roles. For example, if a period of time had passed and a Line Foreman had not put in the reason for a press/job stoppage a message could be sent to the Control Centre and the Co-ordinator could notify the Senior Foreman. As with these other roles there would be a co-ordinator for each shift. This shared office was to be above another new office/area that would be the base for all press operators not currently allocated to jobs. They would no longer be scattered around the press shop in their hidey holes.

Elsewhere, office management would be supplied with regular (printed) reports that would provide them with information they had identified as being of value to them.

Our job was to specify the computer programs required to make the system work. Computer record keeping was still in its early stages of design back then. If one wanted variable length records this could only be achieved by having a start marker and end marker for each record. Not practical for real time computing as each element of each record would have to be read to discover the particular record you needed. If you designed fix length records you knew that, having decided this was not the record you needed, if you skipped ex word/bytes/bits ahead you would find the next record. Much quicker. And speed was important. With potentially 250 presses each capable of 10 or so strokes per minute, with each stroke having to be recorded, time recorded, checked to see if a stoppage needed to be created and checked to see if metal was present there was a lot to do! Thus, we dealt with fixed length records when designing our database with its relevant files and records

therein. We also ensured that each fixed length record had unused elements in it to allow for unexpected information/future expansion.

Program specification was best started using flow charts for each program showing the procedures to be carried out (read/write/add/subtract/store etc.) and the decisions and subsequent actions. From these flow charts a detailed specification for each program could be written. We analysts designed the database, produced the flow charts and the program specifications. A team of programmers coded the resulting Fortran programs. Whilst not an official standard, it became a valuable habit to insert ordinary text every 6 or so lines of Fortran code explaining the purpose of that code.

We soon discovered that a team of six or so programmers could not work together on the single 11/70. It did not have the capacity. So, to maintain development timescales we had to split the team into shifts. A team of programmers and analysts on days, another on nights.

Nights were spooky! Although there was production work going on, we were the only people in the office block on nights. The offices were on the outside of the block with a corridor running the length on the inside. We were on the first floor. The corridor had high level glass windows into the die workshop. Whilst the windows were too high to look through, they did admit light from the workshop. That light would be overshadowed every so often by the overhead crane that moved along its rails within the workshop. This created a spooky effect. We worked hard and effectively very much as a team. Our management encouraged this and organised regular social get-togethers for members and their partners, recognising that, if we worked night and/or weekends the partners were affected, part of the “team”.

Although not able to do any “real” work, our project manager also spent time on nights to show “solidarity”. We discovered that he really was spooked by the blacked out office block and the shadowy overhead cranes. The toilets serving the offices were at the end of the first floor, some distance along the corridor. Their lights were the only other lights in the whole block. The toilets were of the traditional design: combination of open trough and a number of cubicles with doors that did not reach the floor. When our manager announced one night that he was off to “trap 4” we snook after him, peaked into the toilets to check where he was, and spotted the cleaners bucket and mop. The mop was one of those large floppy jobs. A quick plan was made for one to position outside the “trap” with the mop. When the other switched off the lights the mop would be thrust under the door in an upward direction. It was a success!!!

In due course the technical software from DEC was received and our own development had reached the stage of being able to start system testing/simulating the finished system. This also meant that the second PDP11/70 could move from DEC to our computer room and dual running was tested, proved and demonstrable. To this end the plant apprentice school built a simulated press shop for us. It comprised a large wooden board with blocks of wood representing presses set up in lines. Each press had a switch and light on it, enabling press strokes to be simulated by the flashing of the light. Each stroke caused an electric signal to be sent to the computer, exactly as it would in real time. The demonstration was set up in the computer room. Thus, we could prove, and demonstrate that the system could accurately count press strokes and record stoppages. It also proved that the length of stoppages was actually recorded and also rounded exactly as per agreements. This was invaluable in proving to foremen and union representatives that the system could do its job. It also

dis-proved the story that had spread around that all press operatives would be observed via cameras on the presses and TV displays in the foremen and management offices. Such was the (mis)understanding of what VDUs were! Building on this, we could simulate the reason for a stoppage being recorded and a message being routed to a trades compound.

However, not everything was quite so smooth. In order to obtain electrical signals relating to press strokes, a single multi core cable run was required from C Building to the computer room in the office block. Any joins in the cable would adversely affect the electrical signal denoting the press stroke and the strain exerted. The cable had been ordered from BICC. As the expected delivery date approached BICC announced that delivery would be delayed as the cable run had failed their quality tests. As the delayed date approached we got the same message. Our manager and technical expert went up north to the BICC plant to find out for themselves what the problem was. It appeared that their quality test included running 50,000 volts through the cable, and this is the test that kept failing. Our manager signed required documents waiving this test as we only needed a few milli volts! We got the cable and its installation could commence.

Throughout all the latter parts of development and testing the persons taking on the role of System Co-ordinator worked with us to develop their understanding of the system, how it worked and how information was to be obtained in order to feature in future presentations and training.

Implementation

Another round of presentations was initiated. This time the presentation used slides and a projector with a series of conference room presentations to the plant director, all senior management and downwards to all press management of all buildings, HR, IE, Finance, Purchasing and other departments, union reps etc. Plans were made for implementation on three lines in C Building initially. If successful, after a few weeks trial, it would gradually spread to other lines in C Building. Meantime the offices in C Building along with the trade compound and foremen cubicles were being built, the presses had their strain gauges fitted and system testing was completed.

A round of training presentations were prepared. They would take place in the new Control Centre office and given to everyone in C Building who would be affected by the system on both day and night shifts. Training was given by the Analysts and the new Co-ordinators.

These presentations were immediately followed by implementation on press lines 1, 2 and 3 in C Building on days and night shifts. Based in the new office we had the Co-ordinator and an analyst. The remaining systems staff were in the offices on days, with one technical person present in the offices on nights to address any problems. The various shop floor people soon got comfortable with their changed procedures and there were no system problems that affected performance. On nights the only phone calls to the technical person were to ensure he woke up when/if the phone rang!

However, it was immediately obvious that the design of the files that enabled press stoppages to be recorded was insufficient. There were far more AOK stoppages (in excess of two and a half minutes) than had been allowed for. We had designed a stoppage file that allowed each press to have x records of stoppage per shift. Given that we only had 3 press lines to start with, it was not too difficult

to re-arrange this initially. But once we had 18 press lines operating, we could not afford each press to have x number of dedicated records. Problem.

A redesign provided a large file area of fixed length stoppage records to be used on a first come first used basis with records for a particular press “chained” to each other. Given that, at any point in time approximately 40% of presses were in BOK, we could afford this amount of file/disc space. Each press had a record holding details about itself, the job on it and it would now have a pointer to its 1st and last stoppage record. Each stoppage record to have pointers to the previous record and to the next record for that press (chaining).

Using spare space within each press record, and re-designing the stoppage file, this change could be introduced before we implemented on further press lines. It was not too long before we had all of C Building operating PLM with A & B to follow.

The Impact

By implementing the system, the following benefits were obtained.

- By alerting shop floor management to problems promptly the amount of stoppage time was reduced overall, despite there being more small (in excess of 2.5 minutes) stoppages.
- Much improved information for management at all levels and across departments led to improved performance in terms of customer satisfaction and improved planning and execution.
- It served to highlight the need for improved information regarding the parts/panels produced: how many are there, where are they, when last shipped etc. A future system would address this.
- It highlighted the amount of production time lost, not just owing to breakdowns, but to sitting idle because targets have been met.
- It enabled proper, true records of the amount of time lost to fault types, leading to justification of increases/decreases in trade skill numbers and/or the introduction of multi-skilled tradesmen.
- It enabled subsequent identification of press operators by their clock card number and, thus, the makeup of gangs. An individual who joined a gang halfway through a shift did not get credited with the whole shifts worth of earned relief”.
- It subsequently enabled “earned relief” to be taken off the job. Thus, a new gang could be put on the job when the 1st gang had completed their shift target. However, members of the 1st gang could not be re-employed until their earned relief had expired.

- Subsequent re-negotiation of agreements was made possible. One such enabled stoppage time to be clawed back and not taken out of production time.

Further, we now had a team of systems staff experienced in the design, development and implementation of a complex, real-time, DEC, mini-computer based system. This pool of expertised could then be utilised on subsequent projects.

Rogan Meadows

From The Real Times 1987

LINE MONITORING IS DEAD –
LONG LIVE LINE MONITORING!

IS THIS THE WAY TO REWARD A DECADE OF LOYAL SERVICE?

Yes, on Friday, June 5 1987 the Line Monitoring system at Swindon was closed down for the last time. Why make a fuss about one of our systems being switched off (who said it happens every day?) Because there is such a thing as re-incarnation.

So, what is it all about? Well, yes it is true that the original Line Monitoring system, first switched on in October 1978, is now switched off. The reason for this is that for some time now Austin Rover Swindon Plant management have been considering the introduction of three-shift working into their press shops. Effectively three-shift working means non-stop production, commencing 06:00 Monday through to 06:00 Saturday, with no breaks between shifts. Behind this plan is an increasing demand for Swindon's pressings from Austin Rover, Jaguar and certain Swedish car makers. As from Monday, June 8 the three shift plan became reality.

But why switch off the system? Because, eleven years ago, when the Line Monitoring system was being designed it was envisaged that there would always be time for 'between-shift-housekeeping' – tidying up records and files for one shift and opening up others for the next. The database was designed on this premise, and amendment to enable continuous operation proved impractical.

Remember, the Line Monitoring system represented a number of firsts for the time:-

– first system in a press shop
– first use within BL of DEC equipment
– first shop-floor system put into an existing shop-floor environment
– first use of strain-gauge technology

and it was the forerunner of over a decade of successful PDP implementations by BL's systems departments/BL Systems and now ISTEL. In fact, since it was first implemented the system has undergone steady enhancement and expansion right up to the day it was switched off (the last enhancement was implemented less than six weeks before switch-off day) at which time the performance of approximately 250 presses and 727 press operators was being monitored.

However, continual operation was the final straw – but not the end of the story. By planning ahead with Swindon Plant management we put forward a proposal aimed at providing what was identified as being a minimum level of functionality on a multiple, continuous-shift basis. A major benefit of this plan was that the original hardware could still be used. Once development of this minimum 'interim system' of press monitoring was underway, plans could be made for the system to be grown steadily back up to the full level of functionality.

The problem was, though, that such a development necessitated a complete redesign of the database and 100 per cent application software redevelopment. So whilst Swindon management can, and have, implemented three-shift working over a weekend, we need somewhat longer to develop a system. Thus a 'stop gap' system was put together some weeks before and left on the shelf in case. Meanwhile the order for the interim system (£60,000) was signed off and work commenced.

The stop gap system prevents the need for complete switch off of all computer assistance to the shop floor by providing:-

– capture of press strokes on a continuous basis.

– ability to load current job data against press.

– reporting of strokes, job-to-date and job-to-date in current period by press.

– ability to record and report, by job operation on a press, standard hours generated and actual hours booked for current or previous period.

– ability to produce a single mainframe tape for both B and C Buildings with actual hours booked by press per reporting period.

But not any other press monitoring functions eg:

– press/job status monitoring, up/down.

– next job planning.

– press/labour performance monitoring.

– booking of downtime codes.

– routing of trade requests.

– message prompting.

– password maintenance.

– direct labour management and reporting.

– off standards input on current jobs.

– downtime recording.

However on Monday, June 8 Swindon management were able to implement three shift working (6–2, 2–10, 10–6) as they wished and did not have to switch off the computer. Line Monitoring is dead but reincarnation is underway and soon Press Monitoring, The Interim Solution, will be on general release. The current team of John Dickinson, Rogan Meadows, Andy Pope and Mark Shaw have made a good start, but can their system beat nine years of life?

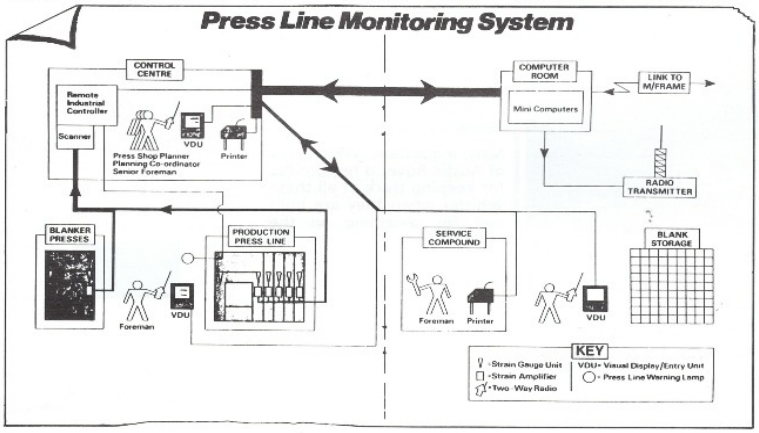
By the way, who were the original designers of the first continuous press-shop control system eleven years ago who didn't make allowance for continuous operation? Well they were:–

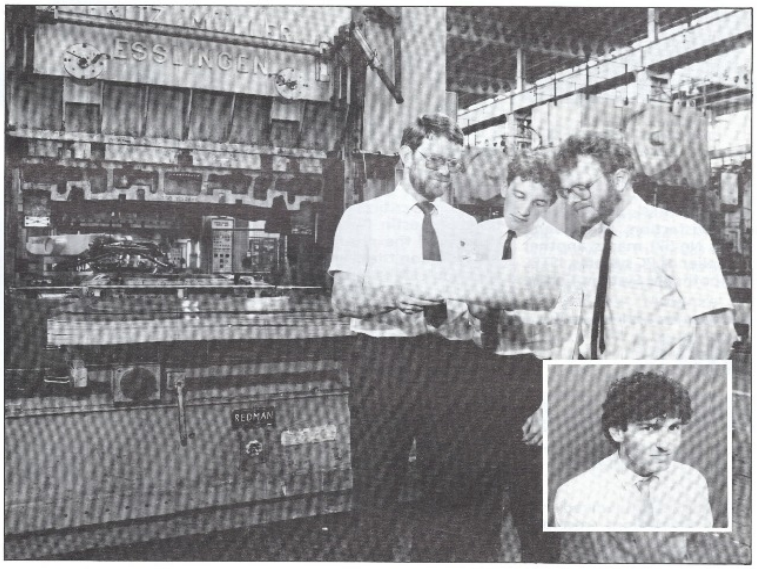
Adrian Faulkner
Mike Grant
Roger Gray
John Mayell
Rogan Meadows
Cliff Shuker

Need I say more!

Rogan Meadows
Manager –
Systems Development
Manufacturing Control
Systems, ARD

Note from Cliff Shuker:–
One John Snook was also a member of the team and since he has left the company for sunnier climes in the USA, let's blame it all on him.





WE HAVE THE TECHNOLOGY — WE CAN REBUILD IT

Charged with producing The Interim Solution – Rogan Meadows, John Dickinson, Andy Pope and (inset) Mark Shaw – can their system beat nine years of life?