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Working Paper Series

Paper 56

Skills, Qualifications and Training in the German Steel Industry: A Case Study

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July, 2004

ISBN 1 904815 22 7

Global Political Economy (GPE) Research Group

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GPE Working Paper No 6

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Acknowledgements

This Report is one of a series of 13 reports produced for the European Union funded study, ‘New Steel Industry Challenges’ (Leonardo Da Vinci, UK/00/B/F/pp-129 016). The project is led by the Steel Partnership Training (http://www.steelpartnershiptraining.org.uk/), and involves the following partners: Federation Europeenne des Metallurgistes (Belgium), Solidarnoŝċ (Poland), Talentis (Netherlands), Buro fur Organisationsentwicklung und Berufsbildung (Germany), Acas (UK), London North Learning Skills Council (UK), IDEC (Greece), ASTRA (Lithuania), Istituto Per la Cultura e la Storia d’Impresa (Italy) and Cardiff University Regeneration Institute (UK).

The aims of the project are to:

1. Promote Lifelong Learning within the European Steel Industry
2. Support workers’ adjustment to new ways of working.
3. Promote equal opportunities.
4. Support workers’ adjustment to new technologies.
5. Provide workers with transferable skills.

In meeting these aims the project undertook the following:

1. Mapped existing qualifications using new and existing research to ascertain the level of need in new and transferable skills.
2. Developed transnational qualification modules comprising new and transferable skills.
3. Developed an on-line training programme.

The duration of the project was three years, from December 2000 to November 2003.

The research for the Reports was undertaken by: Peter Fairbrother, Dean Stroud, Amanda Coffey, Jan Clark, Jenifer Daley, Nikolaus Hammer and Steve Davies, with contributions from all partners.

The Reports are:

1. New Steel Industry Challenges
2. The Internationalisation of the World Steel Industry.
3. The European Steel Industry: From a National to a Regional Industry.
4. The Changing European Steel Workforce.
5. Skills, Qualifications and Training in the German Steel Industry: A Case Study
6. Skills, Qualifications and Training in the Italian Steel Industry: A Case Study
7. Skills, Qualifications and Training in the Netherlands Steel Industry: A Case Study
8. Skills, Qualifications and Training in the Polish Steel Industry: A Case Study
9. Skills, Qualifications and Training in the British Steel Industry: A Case Study
10. Future Skill Needs in the European Steel Industry
11. Training and Qualifications in the European Steel Industry.
12. The Question of pan-European Vocational Qualifications
13. Equality and Diversity in the European Steel Industry

Skills, Qualifications and Training in the German Steel Industry: A Case Study

Introduction

The German case study focused on a large integrated plant in western Germany, in the Ruhr area. Although an old plant, it had redeveloped and renewed over time. The modernisation of plant and the introduction of technological improvements, there had been a major reduction of staff at the plant during the 1990s. As part of these changes, the plant management had promoted work re-organisation and an upskilling of the workforce, although in uneven ways. At the time of the study, the plant was one of the major sources of steel in Germany.

The material and analysis presented in this case study report should be viewed in the wider context of the restructuring of the world (including European) steel industry. The European (and world) steel industry has undergone significant adjustment over the last two decades. The changes are, in part at least, due to the deregulation and privatisation of this industry, and coincided with much cross-border merger activity. One result is an increasing concentration of ownership and the refocusing of production within international markets. There have also been other catalysts for change; for example a substantial degree of technological innovation, and an increasing emphasis on downstream activities and customisation. The corollary of these developments is that there has been pressure on companies to create the conditions for further automation and mechanisation of production (not least through significant technological development), as well as to centralise production into fewer facilities. One result of these activities has been a major reduction of steelwork employment, particularly in the advanced industrial countries, but also in the former Soviet Union and Eastern Europe, too. Along-side these shifts, new recruitment strategies and skills and training needs are likely to emerge. It is against this transformative context that the skill needs of the European steel workforce is set. A more in-depth discussion of the above issues is located in Work Package 1 Reports 1, 2, 3 and 4.

The Report is organised in five sections. Section One comprises an account of the company, followed by a more detailed presentation of the plant that was studied. In Section Two an overview of the workforce is provided including a schematic presentation of the managerial and work organisation. Section Three examines the skills, qualifications and occupational profile of the plant. In Section Four the training profile is reviewed. In Section Five future skills needs are identified.

Section One: German Steel Co.

ThyssenKrupp AG came out of a merger of the German based Thyssen and Krupp AG Hoesch-Krupp groups in 1999. The merger was agreed in 1998 and finally completed in March 1999. However, in 1997 the two groups' flat steel activities had already combined to form ThyssenKrupp Stahl AG. This was part of a general trend of merger and acquisition activity of steel interests, which has followed on the heels of a wider process of privatisation and deregulation in the steel industry. ThyssenKrupp AG comprised five major divisions: Steel; Automotive – parts; Industries – manufacturing and processing technologies; Engineering – manufacturing and process plant design and construction; and Materials and Services – delivery of production ready materials. There is a sixth element to the group, which comprised ‘other group companies’ (ThyssenKrupp 1999). In 2002, the company had approximately 170,000 employees (50,000 in steel), with a third of its production located outside Germany.

The Company

ThyssenKrupp Stahl is a major subsidiary of Thyssen Krupp AG, comprising two divisions, one concerned with the production of carbon steel and the other with the production of stainless steel. One company within the carbon division is ThyssenKrupp Stahl, with large and comprehensive production facilities. The carbon division produces carbon flat steel products. Over the last decade there had been considerable emphasis on finished production, and the company produces high strength lightweight engineering steels, coating processes, and tailored blanks. ThyssenKrupp Stahl has interests world-wide, and six principal centres of steel production in Germany: Duisberg, Bochom, Dortmund, Finnentrop, Neuwied and Kreuztal-Eichen. The German case study was conducted at the ThyssenKrupp Stahl plant in Duisberg. This particular steel plant is engaged in all the processes related to pig iron and crude steel production, as well as extensive rolling, processing and coating facilities, involving the production of tailored blanks for the white goods and particularly the automobile industry. In 1999, just after the merger between Thyssen and Krupp AG, 24,000 employees were employed in steel and by 2002 this figure had been reduced to 20,000 with a target of 18,000 by October 2003.

The Plant

Duisberg is in north-west Germany, situated just a few kilometres north of Düsseldorf. Important industries for the city include; engineering, brewing, oil refining, manufacturing, and the manufacture of copper, plastics and, of course, steel. It is strategically situated on the confluence of the Rhine and Rhur rivers in North-Rhine Westphalia, with access to the Rhine-Main-Danube canal. The steel plant was serviced by the largest inland port facility in Europe. Iron ore and related materials were brought in by barge, where they are prepared for the coking furnaces, as the start for the production processes, that all take place on site, involving hot mills, cold mills and related finishing facilities. The site was divided into two main areas, and is serviced by extensive road and rail facilities inside the site, as well as to and from the site. Nearby on another site in the city, ISPAT also produces lump steel products. This site was formerly owned by ThyssenKrupp, which continued to supply the ISPAT plant.

The plant comprised a range of facilities, dating back to the 1960s. It was however, much modernised and refurbished and possesses the most advanced and innovative casting mills in the world, the Compact Strip Production (CSP) line (see Report Two for further details). In addition, there was extensive new building taking place on site, in particular with the construction of a new coking plant. The spread of the plant was extensive, covering twelve kilometres square, and comprises the production facilities, technical and commercial training centres, headquarters buildings, and several other administrative centres.

<u>The Plant Entrance:</u> The headquarters buildings, two office blocks that are several storeys tall, stood virtually opposite the main entrance to the plant. Uniformed security guards operated security barriers at this and other entrances/gates to the plant. Adjacent to the entrance of the plant was another small two-storey office block, which housed the works council and union representatives’ offices. These offices also doubled up as an information/visitor centre. The building appeared relatively well kept, and was furnished in the ThyssenKrupp livery, silver and blue. The visitor centre was at one end of this building, and comprises two large rooms on two

floors. The ground floor room was furnished with a reception desk; a comfortable waiting area complete with a television; pictures of the steel-making process on the walls; and cabinets containing products made from ThyssenKrupp steel. On the first floor, a scaled-down model of the Duisberg plant dominated the room; other bits of steel and steel industry paraphernalia are dotted around.

A road network ran throughout the plant, with a main thoroughfare leading finally to the harbour area, which received 365,000 tonnes of iron ore per annum. The main suppliers are Brazil (50%), Australia (18%) and Sweden (3%). The harbour is the largest private harbour in the world, and receives much of its material via Rotterdam. In addition to the harbour facility, the plant had all the facilities of a major steel-making enterprise. These included: hot and cold strip mills (the hot strip mill has been in existence since 1953 and another since 1964; the cold mill produced 170 kilo-tonne of steel per month); rolling and continuous casting facilities; a new coat-strip mill (built in 2000/01); blast furnaces; water, gas and steel recycling plants; coke and sintering plants (a new coking plant is costing €800 million to construct); warehouse and distribution centres; research departments, and power plants (the plant uses enough power per day [250mw and soon to be 350mw] to supply all Duisberg's domestic needs). It was very much an industrial landscape.

A snapshot of the steel making process on the site in 2002 is presented below:

<u>Blast Furnace Area:</u> The Blast Furnace Area comprised a comfortable, light and airy control area, where ten young male employees in clean buff coloured uniforms monitored a number of VDUs and a large central screen. The actual blast furnace was manned by between seven and ten middle aged men in uniform; they worked in very different conditions to those in the control area. A red and green light system above the entrance indicated when it was safe to enter this area. The furnace area was small (about 30 metres square) and quite dark and dirty (lit mainly by the flame from the furnace), but not as much as might be expected – neither was it particularly hot, despite the nature of the work. Plant equipment was in evidence (e.g. forklift trucks with long polls attached), which was used to free up the material being smelted, the driver of this vehicle wore protective clothing (i.e. a hard hat with protective visor). The majority of workers wore hard hats. There was pipe-work overhead and digital gauges line the walls.

<u>Hot-Dip Galvanising (HDG):</u> This area was relatively quiet; it was also cleaner, brighter – almost pristine – and much larger than the furnace area. Overall, HDG was about 15 to 20 football pitches long and 1 to 2 wide. A 10 tonne orange crane moved overhead taking coke from one area of the plant to another. Most of the other machinery was of a yellow and green livery and carries the manufacturers mark: SMS. A diagram of the HDG process was placed prominently on the wall. The whole HDG process seemed very linear, flowing vertically at either end of the process and horizontally at its centre. Some basic metalworking tasks were conducted here. For instance, workers were performing welding and grinding on site. Very few workers were visible, although five worked in the area.

A small control room, about 7 by 4 metres, was at the centre of the process and manned by one worker. It comprised several computers and VDUs. At the far end of the control room the steel passed horizontally between mirrors and was lit by florescent lighting; this seems to be part of a quality monitoring process. Pinned to the outside of the control room on a notice-board were graphs detailing manufacturer quality and thickness specifications, these included car manufacturers and the country from which they operate, e.g. Volkswagen – Mexico, Ford – Germany. There was a store for galvanised rolls of steel; huge steel ingots were also stored alongside the HDG process.

Tapping Area: This area had a ground floor complete with railway and a gantry level. It is quite a dark area, with little natural light and seems generally to be a hostile and dangerous environment in which to work. People work just a few metres from huge vats of molten steel and furnaces at thousands of degrees, with it seems little more than their uniform and hard hat to protect them. The work processes here centred around the activities of large overhead cranes and the decarbonising, de-sulphuring and mixing of steel. On one part of the gantry level huge sacks of material were stored, for use in the above processes.

The main purpose of this area of the plant was to 'de-carbonise' and mix steel. Carbon was used in the process of turning iron ore to steel. Some of the carbon needs removing after this initial steel-making process, to create steel with different qualities. Oxygen and argon was used to lower the carbon content of the steel; this was a secondary metallurgy to the initial steel-making processes. Steel at this stage also had a high sulphur content. The de-carbonising and de-sulphuring took place in two huge vats, which were moved into position by crane. These were capped and a de-carbonising/sulpharising rod entered into the vat of molten steel. Each vat contained 65 tonnes of steel. The area had another function, whereby 200 tonnes of de-carbonised and de-suplhurised steel was mixed with 60 tonnes of previously treated scrap steel. Huge scoops and cranes manoeuvred all the material into the furnace, which belched flame when fed the steel. Like other areas of the plant visited, few workers seemed to be in evidence here. The work was largely automated and seems to involve considerable crane and scoop work. The workers employed in this area work in high temperatures, were exposed to chemicals, gases and open flame and also regularly moved huge vats of molten steel.

Continuous Casting and Hot Strip Mill: The continuous casting mill was a very noisy place to work and yet the few workers in evidence wore no ear protection. It seemed quite a simple process, which was heavily automated. Thick steel slabs passed through the continuous casting machine, and the sheets produced were then cut into sections and lifted by overhead crane to be stored.

The hot-strip mill was brought into service in 1964; it has five furnaces which operated at 1,250˚C. The steel followed a process whereby it is de-scaled, and reduced in width (if required). This latter 'sizing-process' allowed steel to be reduced in width by 200 to 300mm, a process that only began in 1990. The rollers in the hot-strip process were changed after every 150 'rolls'. The steel spent three hours in the furnace and the charge depends on the qualities of the steel required. Fifteen tonnes of hot-strip were produced per day, 400,000 tonnes per annum. Like other areas of the plant this was a largely linear and automated process, which required few workers, covering a process 1.5km long. They seemed to be largely middle aged, and wearing the ThyssenKrupp uniform and hardhat.

> Health and safety was an issue in this area. One worker when handling the final product, in a process whereby steel sheets are coiled and require strapping, wore reflective gloves and hardhat with visor. However, later this same worker re-strapped a coil that had unravelled, with no apparent concern for his safety. It appeared that if the coil had sprung back while he was carrying out this operation then he would have risked injury.

While the sequence of jobs and the movement of materials around the plant is conveyed by the above sequence of activity, the overall site is vast and comprises a range of traditional and very new technologies and processes.

Section Two: The Workforce

The workforce at Duisberg comprised 13,500 employees in 2002, whereas thirty years ago this number was nearer 35,000. A third of the employees at this plant were sub-contracted. In addition, there was much building work going on at the plant, and whilst the design of the building was done by ThyssenKrupp employees, contractors carried out the building work.

The majority of employees at the plant are of German origin, although approximately 20-25 per cent were of non-German origin by birth or family. Nearly 10 per cent of the workforce were born outside Germany, a long-standing feature of the workforce.

> Well, in the 60´s, 50´s, 60´s, we had a great many foreign employees, guest workers here. That … is a historical fact. In the respective countries, in Turkey, also in Italy and former Yugoslavia, unskilled workers were recruited… because the need was there, and these people were taking on tasks that German skilled workers were not prepared to do. They just didn't want to do that kind of work, and of course, in those days we recruited thousands of people with certain nationalities. Nowadays, the share of foreigners is… with a total workforce of 20,000, perhaps 2,500 foreigners, so a bit more than 10%. (Personnel, 2002)

A sizeable proportion of the workforce is of Turkish origin by birth or family.

> … these foreign employees, are no longer working here. Their children, they're here, but they are not really foreigners anymore. In principle they are German. Part of them was born here, they went to school here, and they're just as qualified as Germans… children from German employees. Of course, we also have many of those working for us. (Personnel, 2002)

Many of these workers live adjacent to the plant.

The majority of the workforce is white, middle-aged men.

> Currently, we have an average of 43 years, and will in ten years have an average of 53 years, if no major changes take place, and this is a huge problem of our industry. (Personnel, 2002)

As indicated, the reason the average is 43 years in the context of little recruitment, is that there have been sizeable redundancies and early retirement packages at the plant, reducing the workforce by at least 4000 in three years. These patterns were acknowledged and it was estimated by the staff responsible for staff levels and planning that in ten years time the bulk of their workforce will be close to the retirement age.

It is not clear exactly how many women are employed at the plant, although the number is certainly small and those that are employed tend to work in administrative and domestic roles. A major barrier to women working in the production process is German labour law, which prohibits women from working shifts – a mainstay of work organisation in the steel industry (Works Council, 2002). Interviewees thought that steel work is becoming more automated and positions for women will open up (Works Council and Personnel, 2002). It was envisaged nevertheless, that it would be very difficult for women to assimilate themselves with what is an overtly 'male' working environment and culture (Works Council and Personnel, 2002).

The Management Hierarchy

The management hierarchy is extensive comprising the following lay out:

Board

Directors

Senior Divisional Managers

Divisional managers

Department Managers

Maester

Foremen

Operators

This structure is relatively attenuated with five levels of operational management. It is within this context that the senior management have attempted to promote a team based form of work organisation.

Work Organisation

The plant operated a five-shift rota and production workers work 6 days (mornings, afternoons and nights) on/4 days off. There was an ambition to introduce flexible working practices and team working into the operating sections of the plant, although in 2002 this was largely confined to new production facilities, such as the CSP line, established some two years previously. A particular problem related to the objective of creating a multi-skilled workforce. While the management had the aim of moving towards a multi-skilled and it was assumed a more flexible workforce, these moves had been stymied by the current wage structure. Such a move would require a complete renegotiation of wage structures and job specifications, which were subject to on-going debate between the social partners, the management and the trade unions.

The management of the company has attempted to promote a shift towards team based forms of working in the operational areas (Interviews 2002). However, in practice this has proved difficult and teams have been introduced in the new production facilities as they come on line, with much more diluted arrangements introduced elsewhere. One problem was that management was unclear about the form of team working desired:

> What's a team? What do you want to be… a team has to have special ... aims… so, if one aim is everything has to be possible to do everything, it's maybe one aim. Another aim may be to get the best results and the best output and the best quality. And often, also our shift leaders answer this question 'not everybody is capable of doing every job'. (Production manager, 2002)

This lack of clarity about teams and the view that staff have intrinsic limits to their abilities was complemented by payment arrangements on work lines, which often differentiated workers according to job description and work station. The result was that it was difficult to move to any form of team-based working, without a thorough revision of job specifications and the associated payment systems. As stated:

> So… you have different payments for different places … every place can be twice fixed for different payments. For example, we have the entry point and the welding point. So, at the shift of 12 people, 2 can get the … fixed payment for the entry section. And only if these two people are not [available]… (maybe they are at holidays), another person can get it, but only for the time they are on holiday. So we have no team payment, let's say Euro per hour (Production manager, 2002)

However, these arrangements were partly determined outside through the co-determination arrangements as well as via the social partners within the company (Interviews, 2002).

There had been an intensification of work at the plant in the recent past. This aspect of work organisation was identified by many workers, with "less people doing more work", which in turn required "new skills to be trained" (Interviews 2002). Indeed, it was claimed that 'in last five years more skills are required for the same level of job' (Interviews 2002). This experience was associated with increased levels of automation and technology, which influenced the way work was organised and practised. One example that was given was that two years earlier in the Hot-Rolling Mill there were 75 computers, whereas in 2002 there were 200 and staff numbers continued to decline (Interview 2002).

The workforce in the plant had been recomposed over the last few years, with increased use of contractors, as well as contracting-out former in-house services. In the main this involved ancillary areas to steel production, such as refectories and cleaning services, but it also involves some specialist areas of production related work. It was estimated that this type of employment could comprise up to a third of the personnel on site.

Section Three: Skills, Qualifications and Occupational Profile

As far as can be ascertained the skills and qualification profile of the ThyssenKrupp workforce had been relatively stable for some time. There was evidence that ThyssenKrupp had always recruited individuals with high credentials and skill levels. Even so, when employees were recruited into the plant, even with extensive prior training, it took a long time to gain the experience that was required to do the job. As one production worker noted:

> One is forced to jump in at the deep end, without having been given a concrete task, and most people then look for tasks themselves, or some people recognise – and that is what they like to see most – themselves which task is the task they could take on in order to help the department. Perhaps that's not even typical for Thyssen-Krupp, but maybe this goes for all industries, especially heavy industry, also because of the size… there is not always somebody there who can guide the man, there isn't enough time for that. But if one recognises that a new man takes initiatives quickly and therefore supports the crew at an early stage, the sooner one has a stable basis and the sooner things move ahead. And in that case one doesn't really think about what one would like to do, one just does what is needed, and in some way things work… That should be achieved within the first 2 years, so after 2 years, a person should be fully functional, even one isn't completely ready until after 4, 5 years. In a company like this, that takes such a long time. (Interviews 2002)

Thus, the skills profile for the workforce was built up over time, and was embedded in the experience and activity that took place in the plant.

One feature of a work situation where there was a lengthy process of learning the job is that there was likely to be pressure on the company to recruit well-qualified staff. However, this objective was hard to realise in a company such as ThyssenKrupp where it struggled to attract the brightest students to their apprenticeship schemes – a problem experienced across manufacturing more generally.

> … it [the steel industry] hasn't only been us that have been downsizing in this way, that was something that went on throughout the country. And we will be confronted with a fierce competition, with respect to nowadays finding qualified people on the labour market. Personnel, 2002)

One result was that the company placed a premium on maintaining a comprehensive apprentice scheme as an integral part of the recruitment of appropriately qualified workers.

In view of these difficulties it is likely to be the case that skills gaps are likely to emerge in relation to the changing age profile at the plant. As stated:

> we have a lack of employees between 35 and 45 years, who would need to fill management positions, being those of the foreman, the works managers, and the works director. And we cannot train those either. These people will have to be supplied additionally via the labour market. (Personnel, 2002)

The solution to the gap was to attempt to recruit suitably qualified and experienced staff, but this was also taking place in the context of a competitive labour market.

Part of the problem was the complex relationship between qualifications and time in post. For instance, promotion to Meister (first line supervision) level in the plant did not necessarily correspond with the acquisition of the Meister qualification, but often occurred on a time-served basis. This approach to hierarchy and promotion opportunities meant that the most highly qualified personnel in the plant often experienced blocked promotion paths, and might also act as a disincentive to younger highly qualified individuals to find employment in the plant.

A related feature of the occupational profile of the plant and the related skills requirements was that with the technical up-grading and development of steel plants, there had been an increased emphasis on creating a multi-skilled and flexible workforce. One result was the employment of fewer but more highly qualified workers. Such shifts in emphasis were experienced in particular ways.

> Let's say that the qualifications are set higher and higher. That means that the number of people is decreasing, but the work stays the same. If you compare the number of blast furnaces we had in 1960, we had 35, 40, and the number of people that were working there, and the iron production… If you compare that with today, now they have four blast furnaces, a lot fewer people, but they're producing the same volume. For the people on the shop floor, that means that they have to work more, and that they have to know more because they have to do several things at the same time. For instance, we have to learn how to drive cranes, forklifts, we have to… no, not specific for blast furnaces, things that are specific where it concerns training. That is in the end all that we do. (Production Worker Panel, 2002)

Many workers experienced these changes as an intensification in work procedures and demands.

For these workers, flexibility meant uncertainty and unpredictability.

> … you can do this, you can do that, there aren't enough people over there, so you go over there. So that a person is not only able to do one job, but several at the same time. (Production Worker Panel, 2002)

These patterns of change were linked to two sorts of demands on staff, both of which indicated shifting skills requirements. First, there was a recognition that the technical changes in part arose out of the context of staff reductions. Second, and linked as staff levels declined and technology was up-graded then there was pressure on staff to acquire appropriate qualifications. These changes were commented upon as follows:

> … a situation in which less and less people have to carry out more and more work, and the consequence of that is that they can only decrease the number of employees by means of automation of the machinery, and the more automation is used, the more PCs are introduced… and the people are forced, because there are less people to operate the machinery, and also do the maintenance with less people, because they have a lot of automated equipment, to get further training, and to keep their knowledge up to date. Over the last few years, this has taken place in an increasing manner, so the redundancies and having to learn. (Maintenance Workers Panel, 2002)

However, while there was pressure for various forms of multi-tasking, this was not team working, although there clearly was a need for such forms of work organisation. The current situation was described by a trainer thus:

> …we have a structure in the plants that is made up out of, on one side, the electrical side, then the mechanical side, and the control, the process-side. This means that we

> have three pillars in the plants. The entire plant that carries out production has three legs, of course, the management is above this, but we have the electrical side, electrical repairs electrical maintenance, responsibility for machines and the like, then we have the same for the mechanical side, the second leg or pillar, and the third pillar is the production itself, so the people that operate the machines. These are in a way partitioned. In reality, it is like this; the machine is up and running. The man at the control station is calling his foreman. The foreman asks "What happened?". "The roll isn't working". Then the foreman calls the electricians. The electrician goes out and has a look at it, and says – I mean this jokingly, of course – "That's mechanical". Then the fitter is called, he comes over and says "That can't be mechanical, that's electrical". In the end they agree on what the problem must be, and one of them is then carrying out the repair. After that, the machine can be taken into operation again. This is a rather black-and-white picture. That to begin with. That's how it was until now. (Trainer, 2002)

Given this situation and the pressures on the company, the trainer then went onto argue that there was a pressing need for multi-skilled workers.

> [In other steel plants] they crack the old structure, and create a production team, they have a certain number of people with certain qualifications, but the team is now producing, this involves the operation of machinery, so the running of the machines, but also the problem-solving, and repairs, electrical and mechanical. And in that situation, I need skilled workers, that I deeply immersed in a certain specialisation, and I need the more generally skilled people, that know how to do everything, and have an overview of everything (Trainer, 2002)

To date, the plant remains organised in a fairly conventional way, with nominal teams, but no real base for team working, involving multi-skilled workers.

Thus, the skills profile of the workforce was relatively narrow, with workers trained and qualified in a job or task specific way. It was often the case that individuals had a good general understanding of their field, but that they had a limited capacity to move beyond their speciality. These features were highlighted on several occasions, with workers complaining of a 'sink or swim' introduction to the workplace and of limited moves towards a genuine recognition of the multi-tasking requirements increasingly demanded in jobs (Interviews 2002). As already discussed, drives towards a multi-skilled workforce were hindered by work organised around narrow job specifications and rigid wage structures. Even where apprentices were trained on site as multi-skilled workers, they were not subsequently employed in the plant because of the way in which work was organised. Broadly speaking then, the occupational profile of the plant is relatively rigid and reflected the skills profile of the workforce.

Section Four: Training

The staff complement in training and education was 153. Much of the training of steelworkers (and apprentices) took place at an extensive and well provisioned training facility adjacent to the headquarters building. It comprised seven work halls for technical training, a teaching centre for commercial and managerial trainees, plus adjacent facilities, for offices, seminar rooms, conference facilities and a refectory. The training centre also offered a range of short courses to existing employees. These range from half-day sessions, to three day. They were job related and job specific, for example the acquisition of crane driving licences. In addition, there was an opportunity for safety training. There was some provision for team-building training, often involving courses provided externally, by external teachers as well as off-site locations. In 2002, ThyssenKrupp Stahl admitted 171 technical apprentices annually, although there were plans to reduce this figure. The company at the plant also provided training for 80 commercial apprentices and trained in the region of 430 students and workers from other companies. The commercial apprentices were trained in a separate building from the technical training centre, which was a hundred metres or so further up the road. A new centre for commercial apprentices is to be built on the lawn directly outside the centre at a cost of between €60 and €80 million.

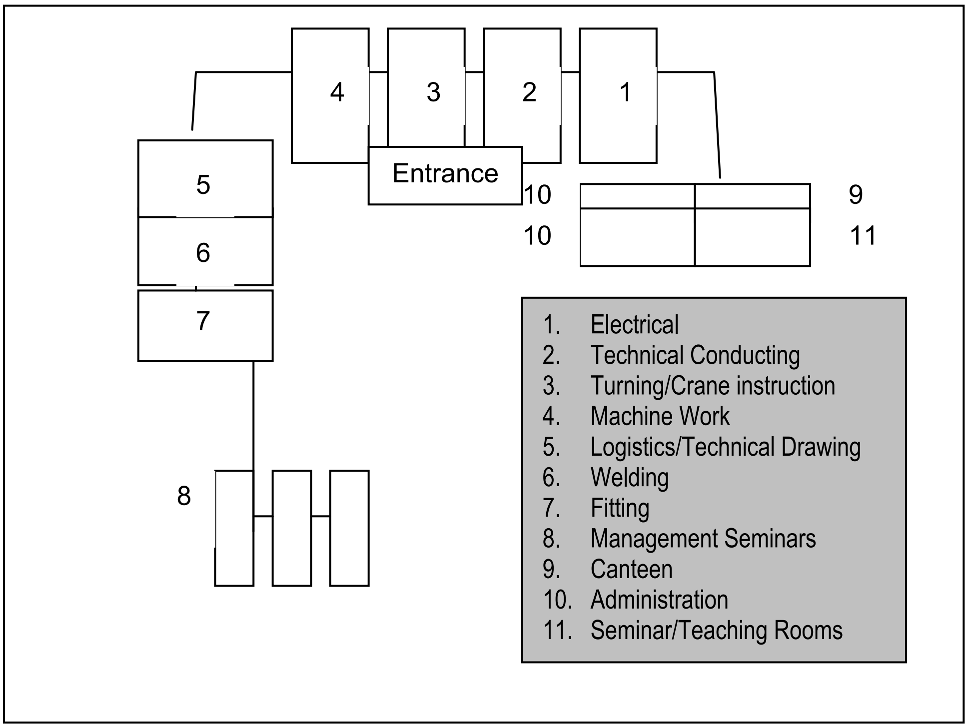
Training Organisation

The ThyssenKrupp Training Centre was established in 1977, and serves the training needs of ThyssenKrupp's apprentices and workers (commercial and production). Before the merger of Thyssen with Hoesch-Krupp in 1997, the centre belonged solely to Thyssen. Since the merger however, it provided training for the merged company (along with six other ThyssenKrupp training centres – of both Thyssen and Hoesch-Krupp parentage). It also provided training for other employers who wished to contract training services, including those from abroad.

<u>The Technical Training Centre:</u> The Training Centre was a well-maintained building of one and two floors and painted red, yellow and green. It was located just a few hundred metres from the steel plant and the ThyssenKrupp headquarters, and was set back from the road about 125 metres. The path from the road to the centre was bordered on either side by expanses of lawn, and a car park was located across the green to the right of the building. To the left, the training centre arcs round towards the road, which passed in front.

The Training Centre was laid out as indicated.

Figure 1: Layout of ThyssenKrupp Training Centre



There was a waiting area immediately opposite the main entrance, situated in front of Workshop Area 3. It comprised two chest height pedestal tables (built by the apprentices) and a white board. A business news programme, information section (with web address) and timetable of training events was projected on to the board. The timetable included language courses in English, French, Italian, Spanish and Chinese, IT courses such as Word for Windows, and other technical courses. As a general guide the courses catered for the needs of the apprentices between 7am and 3.30pm and for workers from 3pm onwards. Adjacent to the board on the next wall was a map of the centre (see figure 1). The apprentices could be viewed at work through windows to the workshops (all the workshops had this ‘surveillance’ type access).

<u>The Workshops:</u> Workshop Area 1 was for training in electro-technical practices. There were about thirty apprentices in this area, all male, bar one woman, and aged between 16 and 22. The apprentices were organised into groups or teams, and supervised by two trainers. The apprentices wore buff coloured overalls, this comprised a jacket and trousers – although the majority chose to wear just the trousers and a T-shirt or sweatshirt from their own wardrobe. (The uniform was the same as worn by ThyssenKrupp workers.).

Workshop Area 1 comprised a large room roughly about 25 to 35 metres square. Several offices and smaller workshops fed off the main room, some with computers and electrical testing equipment, and there were stairs just inside the main door, which led down to changing rooms.

Workshop Area 2 was for training in more advanced technical-electrical procedures. It was smaller workshop than Area 1, but similar in lay out. The equipment in this area was more highly technical. More women worked in this area than elsewhere. One view was that this gender pattern was because training in this area was based more on manual dexterity and less on physical strength (Interview 2002). There was some opportunity for training through simulation exercises in this area, as well as working with automated production processes, and the electronic measurement equipment.

Workshop Area 3 was used to train apprentices in mechanical processes, such as turning, and instruction in crane driving. The room was large, and equipped with many fixed lathes, drills, workbenches, vices and other metal and wood working tools. The equipment was not particularly modern and technically advanced, but it was well maintained. Only six professional Turning apprentices were recruited per year. At the far end of the workshop, there was a manual crane for training purposes. While crane driving and fork-lift truck driving formed a routine part of the Mechanics apprenticeship, from 2003 this was no longer be the case. Nonetheless, this area was also used to train established workers for their crane and fork-life truck licenses.

Workshop Area 4 was used to train Mecha-troniks apprentices. These apprentices received training in both mechanical and electrical engineering processes. This is a first step towards the training of multi-skilled workers, although there were significant problems introducing them to the workplace. Workshop Area 4 comprised different types of equipment, including vices, lathes, drills and so forth for metal working and electronic testing and measuring devices. Robotic equipment was also located in this area. The claim was made by staff that the most ‘talented’ apprentices are recruited to this area. All the apprentices here were male.

Workshop areas 5, 6, and 7 covered Technical Drawing, Fitting and Welding. These areas were laid in similar ways to Workshop 3. They had a similar standard in terms of facilities as the workshops described above.

The Commercial Training Centre (CTC): At the time of the research, the CTC was one hundred metres or so away from the technical training centre, on the same road. The current CTC had been built some years ago and the buildings was initially used by ThyssenKrupp staff as a temporary measure, however it has been in use much longer than expected. It is now regarded as unsuitable for the demands of a ThyssenKrupp CTC and there are plans for a new building. The commercial centre backs on to part of the technical centre, and is separated from it by a fence. The commercial apprentices do not mix with the technical apprentices, apart from on an induction week held in Bonn.

The building comprised a square-ring pre-fabricated structure, with five teaching rooms and a number of offices. The middle of the 'ring' was a garden area. There was a small porch area at the entrance to the building, and on the wall there was a list of the people who work here and their office number. The notable feature of this area was that there were many more female apprentices than in the technical centre. There was no uniform for the commercial apprentices, and the students dressed casually.

Training Practice

The training at the plant was comprehensive.

Technical Apprentices: While the annual apprentice intake for ThyssenKrupp was 170 technical workers, the Training Centre also offered places to outside firms, which in 2002 had taken up nearly 430 places. Apprentices came from as far afield as Essen, 30km away. The Centre received in the region of 1000 applications a year (Training manager 2002). There were complaints that the quality of people applying to become apprentices was poor. The technical apprenticeship programme was divided into three sections: a school section for theory training, which is roughly three days in every fortnight; practical work at the training centre; and short blocks of work placement at TKS. This programme (technical and commercial) was part of the German dual system (see Report 10 and 11). Apprentices received a wage of €600 (for commercial also).

Apprentices were recruited by completing an interview and test, after having formerly applied for an apprenticeship place to TKS. The company preferred that the recruits have a basic knowledge of the area in which they wished to pursue further study. Some staff complained, however, that it was increasingly difficult to discern levels of knowledge and know-how from the short interviews (Interviews, 2002). The teaching practice for all courses was by 'purposeful' projects, complemented by teaching and learning involving familiarisation with basic mechanical and electrical practices (Interviews, 2002).

For technical apprentices, training took place in a series of work halls:

1. Basic Electrical
2. Advanced Electrical/Technical
3. Turning and Crane/Forklift instruction
4. Machine Work and Mecha-tronics
5. Logistics and Technical Drawing

6. Welding
7. Fitting

Complementing these programmes was a relatively extensive provision of language training, in both the technical and the commercial areas. These mainly focused on the main languages in the commercial world: German, English, Spanish and French. Nonetheless, there was a recognition of the diverse migrant/ethnic background of the workforce, and language courses in Turkish have been offered although the take-up has been limited. There has also been a serious engagement with questions relating to racism, and the apprentices have actively participated in anti-racist activities, such as collectively producing anti-racist banners for public view (Interviews and observation, 2002).

For all apprentices the programme of instruction was divided into three parts: theory, undertaken at the vocational schools, practical sessions, undertaken in the halls, and three week periodic placements in the plant. However, while efforts were made to ensure that the placements resulted in active on-the-job learning, in practice this involved apprentices watching others at work or doing straightforward non-demanding and routine tasks (Interviews 2001). All apprenticeships led to a nationally recognised qualification, with high degrees of transferability of technical skills

<u>Commercial Apprentices:</u> The Centre recruited 80 commercial apprentices annually, for which there are 2000 applications. Applicants send in their curriculum vitae to the company, who then select candidates for a test and a panel interview. The panel comprises four ThyssenKrupp examiners and four members of the Works Council. No formal qualifications are required for these positions and much emphasis is placed on the entrance exam. In part the reason for this approach, is that the apprenticeship is integrated into the external educational structures and comprises a programme of formal education in itself. Some apprentices continued their education at university, or undertook some other qualification in parallel with their apprenticeship (this was the same for technical apprentices).

The apprenticeship offered training in computer studies, business studies and languages, across three apprenticeship schemes: Industrial Commercial, Information Technology and Office Commercial. These studies took a similar form to the technical apprenticeship, combining the three dimensions of practice, theory (at external school twice weekly) and work placement. Training at ThyssenKrupp was very much based around the company's needs, whereas training at the school provided a more general education. There was however, no overlap between commercial and technical apprenticeships. In short, the commercial apprentices knew little about the steel-making process, and expressed little desire to acquire knowledge in this area (Interviews 2002). If an apprentice returned good exam results they were offered the opportunity to complete the apprenticeship 6 months before schedule, and were offered a permanent contract with ThyssenKrupp in return.

<u>Employees:</u> The work halls were used extensively by the plant employees, after the apprentices had finished their instruction, in the early afternoon. Employees, who were seeking further qualifications, such as crane driver certificates, or undergoing refresher training of one sort or another, then used the facilities, under instruction. These workers were paid for this training. Much of the training was specific to and shaped by the needs of the steel industry, resulting in a workforce limited in its capacity to move across employment sectors. Nonetheless, some areas of training resulted in certificates of recognition (crane driving) that were transferable across different industries. It was claimed by many that the amount of

training had increased significantly over the last ten years, but this varied by job (Interviews 2002). It was the case, for example, that mechanics and electricians skills needed to be updated regularly as a result of technological change and the purchase of new equipment or the introduction of new processes. In these instances, the company offered training and refresher courses, generally of a technical nature.

The employee training was on the basis of self-selection, unless the job specifically required further training. Courses were advertised on the company intranet, but only some workers had access to a Personal Computer. It is important to note that one of the stated principles in relation to employee training was ‘Learning by doing’ (Interviews, 2002). In effect, this approach reinforced a practically and locally-based focus on jobs, rather than a broader set of training arrangements, tailored to meet the ambitions to create a team-based and relatively flexible workforce. The result was that there was no overall strategy of recruitment to these courses. Each employee had an appraisal meeting with their manager each year and discusses training needs, which was passed on to Personnel and the Works Council. Each department/work unit manager then agreed which employees should take each course offered. Thus, while there was a recognition that employees should have an opportunity for on-going training there was only a partial take-up of these provisions.

Training on health and safety was promoted in the plant. A ‘percentage’ of workers were trained in health and safety, on a voluntary basis and the number of health and safety representatives was dependent on the number of workers employed in a section/area. Other workers could volunteer to take health and safety courses if they wished. The training for this area of work was outsourced, and comprised a number of different levels. The training comprised four five-day courses over a two year period. Some standard level ‘work practice’ safety-training occurred. The fire service, for example, provided instruction to furnace workers on the safe use of gas masks and gases. However, it seemed that the workforce also relied heavily on ‘legal liability’ and the right to sue employers should anything go wrong.

The training programme for the plant was budgeted so that in 2002 70 per cent of the resources was allocated to apprentice training and 30 per cent to other staff. However, decisions were in the process of being taken to reverse the proportional distribution over a three year period. Such a change indicated the company’s commitment to move towards training a multi-skilled and team based workforce. Some training on team work had already take place, in the form of 3-day seminars. These seminars were found to have a positive influence on worker approaches and ‘commitment’ (Interviews 2002), Following on from this perceived success, shifts in a number of work areas began to meet every three months as a ‘team’ to discuss ‘problems’ and resolve work difficulties and blockages (Interview 2002). The workers met before the start of a shift and were paid €30 for the extra work. In terms of team work training there were also claims of training for integrated problem-solving.

In addition to ThyssenKrupp’s own training programmes, there was a system in place whereby all employees were entitled to one week paid leave for education and training[1]. However, the

[1] ‘Under legislative provisions of individual Länder employees are entitled, subject to certain conditions, to four or five days' educational leave per year. During this time they are given release from work to attend a course of instruction furthering their vocational or political education, for example in order to increase their knowledge of foreign languages, learn about computers or improve their political education. The cost of such further education must be borne by the participants themselves. Statutory entitlements to paid educational leave are provided for in the following Länder: Berlin, Bremen, Hamburg, Hesse, Lower Saxony, North Rhine-Westphalia, Saarland and Schleswig-Holstein.’ http://www.eurofound.eu.int/emire/GERMANY/EDUCATIONALLEAVE-DE.html

workers at ThyssenKrupp tended not to take advantage of this opportunity. Most of the training offered to workers was confined to the company provision. In addition, there were objections from within the company to these external arrangements, with some managers objecting to particular courses, such as political theory and asking how it complemented a worker's occupational requirements (Interview 2002).

Training and Skills

The majority of apprentices are trained in a single area of expertise, such as mechanics – albeit with a broad knowledge of the principles of machinery and production. Because of the way in which company was in the process of developing its work organisation strategy, more recent training initiatives have focused on multi-skills. The new Mechatroniks apprenticeship, for example, allowed individuals to train in more than one area of expertise, that is, mechanical and electrical skills:

> In short I think you could say that the focus is on a broad, sound basis. The emphasis is on broad. That means that this is partly achieved through the knowledge of metal, and the fact that the person is qualified electrical engineer, just like the energy electrical engineer and the electrical process engineer, and he is qualified electrical engineer. However, he also knows about fitter, he knows how to cleave, turn and cut. (Mechatronik Trainer, 2002)

In contrast, the Process Mechnanic apprenticeship, a prevalent qualification in the steel industry, was relatively focused in its skill base, as was the case for other apprenticeships, such as Mechanical Engineering and Electrical Engineering.

Within ThyssenKrupp Stahol, the Mechatronik apprenticeships were developed in response to a wider organisational strategy that was being promoted by management. This apprenticeship combined mechanical and electrical skills, and was designed to facilitate the development of a more flexible, responsive and highly skilled workforce, including team-working. The apprenticeship programme had been established in 1999, and recruited fifteen apprentices annually – of the total 171 technical apprentices recruited to the Duisberg Training Centre. Complementing this initiative, there was a planned reduction of Process Mechanic apprenticeships at the plant. Increasingly management took the view that these skills were largely irrelevant to the steel-making process. Several of those interviewed suggested that the Process Mechanic apprenticeship was out-dated and more skilled, and particularly multi-skilled workers, were required. This shift was described as follows:

> At one point in time, we were training process mechanics. Nowadays, nobody wants them anymore. Because process mechanics… in those days, young people that had a bad final result in school, etceteras, that based on their personal structure were hardly able to become a qualified skilled worker, became process mechanics. Our plants don't want them anymore, nowadays they only want fitters, electricians, installations electricians or whatever, and I have to assess, together with the plants, what kind of personnel is needed, what kind of qualifications are needed for the next 5, 6, 7, 8 years. (Personnel Director, 2002)

This decline of the Process Mechanic apprenticeship in favour of more highly skilled workers, signalled a more general trend towards a more highly qualified workforce and possible shifts in the way work was organised in the plant.

However, these shifts in focus were contested, with the result that no Mechantronik apprentices had been employed in the plant, despite the training centre promoting the qualification, on the assumption that it met a skills need. Formally, this unwillingness to employ such apprentices was in part, due to collective agreements on work organisation/job demarcations and wage structures, which prevented the company employing Mechatronik apprentices. It was part of a complex set of negotiations going on in the plant in relation to the introduction of team working. A further complication to this shift was the effects of the implementation of the social plan over the previous few years to reduce staffing levels at the plant.

These plans were questioned by the leadership of the plant Works Council:

> The company has a strong interest in possibly… high-quality training… well, the company would prefer to have as many people working with "mechatronics" as possible, and electricians that have a high training level, in order to possibly make them operational in nearly all areas of the company. In cases where there is any doubt, however, on posts that require less than the level they have acquired. And we're saying that in principal, the individual is more content if he is put to work in the profession that he was trained for. So, if the people are better qualified than the possibilities within the company will allow afterwards, fluctuation is accordingly high, motivation is at a bad level, which means that the work that is done is at a bad level. That is a permanent conflict we are faced with here, and that is a lasting conflict because there are always opposing views, and we then usually find a compromise somewhere on a certain level, but that's the classical conflict we have here. (Works Council, 2002)

Thus, while there may be recognition of skills needs in the plant, by management, unions and the workforce, meeting these demands was complicated.

This complex history might account for the continued recruitment of Process Mechanic apprentices, albeit in fewer numbers than previously. There seemed, moreover, to be some kind of impasse here, whereby individuals were prevented from becoming more highly skilled because their work did not require higher skill levels. However, at the same time changes to work practice that would necessitate more highly skilled workers might not be possible, in part, because workers are not skilled in the ways required. Nonetheless, there was an increasing emphasis on the future recruitment of the more highly skilled and qualified staff, and this was evidenced in the development of the Mechantronik programme. There was also evidence that the type of skills the apprentices (and workers) were being trained in was changing. Generic and transferable skills were finding there way into training programmes and this related directly to planned developments in work organisation (team-working) and signalled a sensitivity to wider developments that were taking place in the European steel industry.

Assessment

The training programmes at the ThyssenKrupp plant were both extensive in coverage and comprehensive in their depth. The facilities were large scale, well equipped (particularly when compared with other steel plants in Europe) and fully staffed. The programmes on offer were integrated into and part of the dual system of vocational education operating in Germany. By and large the training on offer was technically focused and based, particularly for established employees undertaking further training and refresher courses.

The apprenticeship system was organised to meet the skills needs of incoming technical and commercial staff. The focus of the programmes involved elements of work placement within the plant, often on a watching and learning basis, although attempts were made to counter these features with project work.

More broadly, there was a clear recognition in the plant of the link between skills needs and the development of appropriately focused training programmes. The difficulty facing both the management and the unions at the plant was how to meet these needs in a way that recognised the different and sometimes conflicting aspirations of different sections of the overall workforce. These concerns were expressed in relation to two related themes.

Firstly, there was a long-standing commitment to training amongst the workforce, many of whom had been employed at the plant for many years. In view of this, employees at the plant had clear views about how training could be further developed. When questioned many acknowledged that more customer relations training might be of benefit in both the organisation and conduct of their work. However, it was also the case that these same workers had matured in a working environment where traditionally the emphasis had been on the enhancement and development of technical skills. Against the background of considerable social upheaval within the plant, marked by the initial company mergers, the difficulties of meshing company practices, and the management drive to reduce staffing levels, it is understandable that many workers expressed an uncertainty about how such skills requirements might be met. Nevertheless, a clear recognition and acknowledgement changed, and as the context in which steel production took place developed in more commercial and market focused directions, then so too the skills needs changed. Features such as customer relations, problem solving skills, fault finding and use of information technology resources were frequently identified.

Secondly, there was an on-going focus at the plant on work organisation and the skills needs associated with change. For ThyssenKrupp Stahl at Duisberg, this concern has centred on the debates about team working, and the training that is necessary to establish and indeed enable the teams to operate in effective ways. More generally, these aspirations for team work are part of a more general recognition of the need for 'multi-skilling' in a modern steel plant, not just technically but also in terms of workers requiring skills to work well across sections of the plant. More generally, one of the consequences of the reductions in workforce numbers and the associated technological up-grading that has taken place at the plant, has been a marked intensification of work. To address this development, the management at the plant have emphasised the increased need for technical training to focus on the production workers who are multi-tasked or skilled. In one respect, this is an opportunistic response to the staff reductions that have taken place. In another respect, it is a recognition that the foundation of work organisation in such a plant will rest on workers with a more diverse range of skills than may have been the case in the past.

Part of this principal relates to the organisation of training. Some of the workers expressed a desire for more 'external training', which tends to give a broader overview of 'uses', whereas training at the plant is steel specific and restrictive in this way. This contrasts quite starkly with some of the apprentices who receive a broad education and then have problems adjusting to the demands of steel specific work on the shop-floor. This requires some thinking about the structure and content of training programmes, certainly there are implications for the acquisition of 'knowledge' and the pattern of its dissemination over time for steelworkers. What is brought into focus is disengagement between apprenticeship training and working practice, the former of which is too general. The more general knowledge provided by the apprenticeship seems to be more highly valued (and its practicalities understood) by more experienced workers.

Section Five: Future Needs

The skills needs for the company covered two types of development, first, technical and work related change and second the increasing emphasis on commercial and related activities as the company extended its client and market base. In the first case, there was recognition that team working was likely to become a major feature of work organisation in the plant. However, the process of reorganising the workforce to meet this aspiration had become complicated, with different views expressed by workers, management and the unions. Nevertheless, team working training was already offered on the established programmes offered by the Training Centre, although part of a wider programme and not in its own right. It is likely that overtime the impediments to the introduction of team working will be overcome and that this form of training will be further developed to meet the skills need. Second, as the company continues to reposition itself as the major German steel producing company and as a significant player in the European region (see Report Three), then there is likely to be an increasing need to develop the skills associated with these changes. As with team working, these needs were currently met via a range of relatively underdeveloped programmes, particularly focused on the commercial apprentices and related staff.

Skills Needs

The developments outlined above were linked to perceived gaps in the current training provision. Overall five principal needs identified.

- Customer relations training.
- Team-working/communication skills.
- Fault finding.
- Multi-skilling.
- Integrated training and work practice.

The production process at the plant was becoming increasingly centred on down-streaming activity, with steel produced in a more focused way. This development had been noticed by the majority of workers and management, and in a variety of ways there was a recognition that these changes implied a broadening of the skills requirements at the plant, particularly in relation to an increasing requirement to work with customers in a supportive way.

What was even more apparent was the parallel developments in the intensification of work, and the increasing need for multi-tasking, if not multi-skilling. This said, there appeared to be a need for 'new skills to be trained'. Some of these 'new skills' were technical, although it also was evident that a more collaborative form of work organisation was emerging (between workers and between plant and customer). Such developments, in turn, demanded training in new and different types of skills. More generally, it seems that there was a need for a more systematic approach to training organisation, which went beyond self-selection by workers.

Assessment

The training provision at the plant is extensive but is poorly integrated into the production process. Three points can be made.

First, there was a minimal integration between the training resources and the production needs. As a result, while job specific training was available to employees generally, and a thoroughgoing traditional form of apprentice training was on offer, there was an uneven connection between skills needs, training and the related qualifications, and the overall changes that are taking place in the steel labour process. One consequence of this situation was that there was an uneven introduction of training programmes addressing such themes as team building, problem solving and commercial developments in relation to steel production.

Second, there have been major attempts to address the diverse ethnic and migrant basis of the workforce, particularly with language training but this has focused on the major world languages, such as English, Spanish and French, as well as the German language and not the specific languages of the workforce itself. In addition, there has been a small and continuing recruitment of female apprentices into the technical areas, although the offer of places for females on the production lines has been relatively limited. Rather, there is implicit and on-going gender segregation between production (male) and commercial (male and female) areas of activity.

Third, one outcome of this complex history was that training programmes and focus were at an initial stage of development and delivery for the stated achievement of a more flexible and team based workforce. Nevertheless, it was also the case that moves had already been taken to meet these needs. The further development of such training programmes was however, hindered by the retention of a long established organisational structure. Present job specifications and pay structures tend to dictate how work is organised and skills are developed, which in turn impacts on what training is provided. Hence, the capacity to develop training to multi-skilled and team based working practices is limited, and the introduction of such practices to the shop-floor is minimal. In these circumstances, training tended not only to be specific to steel, but specific to a limited occupational and narrow skills base.

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