Memories of a Steelworks Electrician

Cardiff - Dowlais, East Moors Steel Works.

1960 to 1974

Geoffrey Harris

Memories of a steel works electrician in the Cardiff – Dowlas works, later called GKN then GKIS and then after nationalization East Moors Steel Works, from 1961 to 1974.

The Beginnings

I was born on the 8th September 1945, in St. David's Hospital, Cardiff, to Catherine Harris and Earnest Llewellyn Harris. I lived in 8, Dorset Street, Grangetown, Cardiff until 1968 when I got married and left home. I had an elder brother, Kenneth and a younger sister Elaine. I attended Ninian Park Infants School, Court Road Primary School and Ninian Park Secondary Modern School

As I was born on the 8th September 1945, I fell into the 1946 year intake. As this coincided with men returning from wartime service it was the high point of the baby boom period and there were insufficient places in grammar schools. My future life was decided at the age of eleven. I was sent to Ninian Park Secondary Modern School. It was made clear to us by the teachers that if we were in the previous year's catchments, I and several others would have gone to a grammar school. As Ninian Park school was one of the worst schools imaginable, with poor quality teaching, by poor quality teachers, I have often wondered what my life would be like if I had been born five days earlier and qualified for the 1945 intake. What I can say without a doubt is that this school was a very violent place, most of the violence by the teachers. The only thing we were taught was discipline. I hated that School. It wasn't until I left and went to Technical College that it became clear how educationally far behind I was.

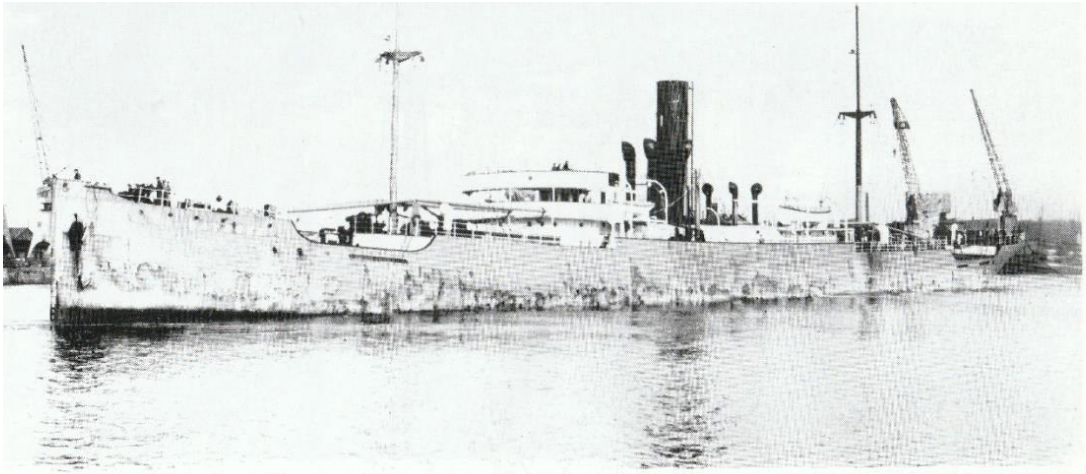
One day in May 1961, aged 15, my father said, "I've got you a job in the steel works, you start on Monday". My school days were over with just three days notice!

My father worked in the Coke Ovens B and my elder brother was a Boiler Maker in the Sinter Plant.

My Dad

In the pre-war years, during the depression, my father was a seaman working for the Claymore Line, on a steamer called The Day Rose - on the Cardiff to Argentina route, taking out coal and returning with timber. He was employed as a seaman but was only paid a cabin boys rate - in those days you took whatever job you could get. He worked as such for many years often away for years, going wherever the cargo took them. He married my mother and left for sea the next day. Not the life for a newly married man, but he continued until he broke his leg in an onboard accident. He was left behind in Argentina in the seaman's mission. When sufficiently recovered he found another birth and returned to Cardiff, determined to find a shore job.

Fortune had favoured my father, as The Day Rose was later sunk by a U boat, with the loss of 38 of the 42 crew…


The "Dayrose" (1) was built in 1928 by R. Thompson and Sons Ltd., Sunderland. (York Collection)

My dad secured a job with contractors working in the Coke Ovens and was later kept on to work in the plant. After the building of Coke Ovens B, he transferred and remained there for the rest of his working life.

Off to work I go…

Early Monday morning, alone, I walked through the main doors of the office block on East Moors Road and reported to the Commissionaire, to start work as an office boy in the post room with the hope of starting an apprenticeship that September. A five-day week earned me a wage of £2 17s. This was more than I earned as a grocery delivery boy in a local shop in Cornwell Street and was away from school, so I was very happy. The work involved delivering mail to the various offices in the building and occasionally to the offices out on the plant. These visits outside were very exciting and a bit overwhelming. I would be told to take a parcel to say, the Mills Office with a brief description of where it was and left to my own initiative to find it. Rail traffic was everywhere and large lorries and mobile cranes used the same roads and there were no pavements. No such thing as safety training to warn of the hazards of liquid metal and slag traffic or large lorries reversing in the high ambient noise levels - you just had to use your common sense. To a fifteen year old boy it was very exciting. I loved it. I left the office at the beginning of the "stop fortnight" period, the last week of July and the first week of August when the rest of the staff were on holiday. As I hadn't been there long enough to qualify for paid holiday, I was sent to the training school until the intake period of this years' apprenticeship entrants. I was alone there with just the training officers, who gave me enough work to keep me mildly busy.

Apprenticeship Training School

I started my electrical apprenticeship training along with about thirty others on the first week of September, just after my sixteenth birthday. These included Electrical, Mechanical and Instrument Technician apprentices. The centre had classrooms, fitting benches for metal work, a machine shop with several lathes, shaping machines, drilling machines and grinders. There were also benches for motor vehicle maintenance by way of an old car and a motorcycle, fixed to benches, which we had to strip down and rebuild and get running on completion.

We started training in the use of hand tools, cutting and filing metal. Making different shapes in steel and making some tools such as a set square, inside and outside calipers, which I still have in my workshop today, and experience on the use of lathes, drilling machines, shaper machines and grinders. Electrical work included the building of simple circuits and stripping and building of electrical motors.

The three instructors were Roland Jones, Mike Alan and the senior instructor Trevor Evans.

We were split into three groups and all trainees had identical training, so we had a good foundation in all skills. Between workshop periods we had classroom training in the theory of electrical, mechanical and motor vehicle practice. One day a week we went to Llandaff Technical College to start a general Course in Electrical Engineering, which would lead me on to ONC and HNC studies.

As most of my fellow students were grammar school pupils talking about their O-level results, it was very clear to me that I had an enormous amount of work to just to catch up.

My time in the training school was a complete revelation for me; the tutors were excellent, kind, considerate and respectful. They addressed you as young adults, referring to me as Mr. Harris; until they got to know you then it was first name terms.

We had regular tests throughout this training and at the end, one final exam which included assessment on all the practical work and a written theory test.

The final test results were given to us during our final week and to my immense delight I finished top apprentice.

We were sent out to various sections of the plant, and the process was that you would spend a three month period working with an electrician and mate in each of the major departments. It was very much up to you to make the most of the opportunities to have to learn from each.

The following were included:

- Blast Furnace.
- Rolling Mills.
- Coke Ovens.
- Melting Shop.
- Central Repair Shop.
- Electrical Installation Gang.
- Telephone and communications.
- Wharf and sinter plant.

Apprentices were to work a normal day shift which was a forty eight hour week of five days plus Saturday mornings, eight to twelve. At the age of eighteen you were moved to shift work on the Continental System, which was two days mornings six to two, two days afternoon’s two till ten and three nights' ten till six, then two days off. As this accounted for nine days the shift moves through the week, so one week in four you had three days off. Throughout you attended college on a day release basis.

At the end of your five year apprenticeship you were asked what department you would like to work in but actuality, you were offered a job in a department as decided by the relevant engineers and training officers. In my case, I suggested that the Coke Ovens would suit me nicely. The reply was that they understood I had family relations in the Coke Ovens, but I was to go to the Rolling Mills. You could if you wished, leave the plant and look elsewhere, but most chose to stay on and continue in the works. Some left to go to sea and others to work in contracting where the money was better. I am only aware of one person who was not offered a job in the plant and was required to leave.

Post Apprenticeship

For me it was a little different. As I had done well in college and had obtained my ONC Certificate and was on a HNC course, I was offered a job in the Drawing Office in the main office block. This was considered a great honour as it was the first step to becoming a recognised engineer. I was invited to the Chief Engineers Office, where Mr. Dew offered me the job. He was shocked when I declined. I felt that I had too much still to learn in the plant, and I was not yet ready to move into an office. I don't think he ever forgave me for refusing, but later events were to prove that was a correct decision on my part.

At the age of 21, at the end of my five year apprenticeship, I began work in the Rolling Mills as an Electrician, working days from 8am till 5pm five days a week and 8.30am till 12.00 on Saturdays. Shortly afterwards I was transferred to shift working with the Continental System, on "B" shift with Arthur Lowery as foreman. I worked in the Grit Blast Section and then in The Morgan Mills Section. Later I was made Shift charge hand on "C" shift with Albert Robinson as foreman. I was then made Shift Foreman on "D" shift, the position I was to hold until I left in 1974. I recall how I was informed I was chosen to be a Foreman and move from the "workers" section to "staff". I was invited to the head office where I was officially welcomed to the staff status with a white safety helmet and a key to the various staff toilets around the works. It also entitled me to use the staff canteen where table service was provided by young ladies. This was considered a great honour, but I never used it. The Chief Electrical Engineer Clem Dew carried out this ceremony and told me that I was, at 25, the youngest foreman they had ever had in the Engineering Department - and they had examined the records going back to 1905! He also admitted I had been right to refuse his offer of becoming a draughtsman.

I probably would have continued to work in The Dowlas Works, but when the planned closure of the whole works was announced, I was married with two small children and a mortgage, I decided not to stay on and get the redundancy payment as most did, but instead left with great regret and started as a site engineer with Mid Glamorgan County Council, Architects Department. I remained there for 18 years rising to Principle Electrical Engineer. Following that I became a Lecturer in Engineering at Bridgend College of Technology, until retirement.

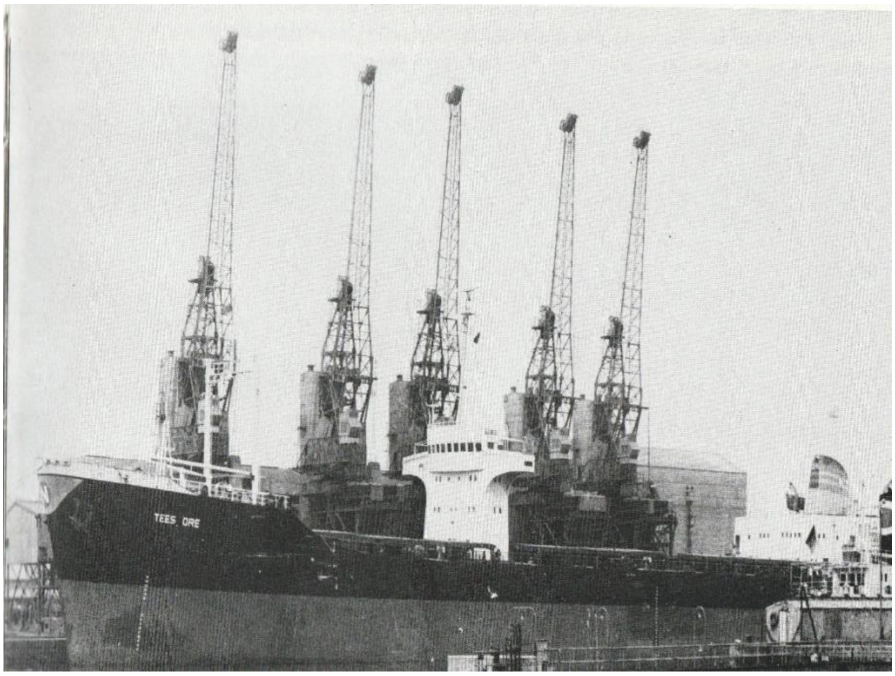
I have often been asked to record my memories of my time in the steel works. I always intended to do this and as I am approaching my 80th year I think I had better do something now, so here we go.

Memories are transient and are sometimes distorted and filtered by later events, but I will try and record those of which I am certain. Some of these will be from the time of my apprenticeship, others related to the time I was an Electrician, Charge hand Electrician and Foreman Electrician in the Rolling Mills.

If I follow the Steel Making Process we will have to start in the dock side.

Wharf and Sinter Plant

This Wharf side had an advanced production system which was mechanically operated from beginning to end. Ore-Carrying ships would tie up along the wharf and five “Kangaroo” cranes would off load the iron ore using large “Grabs”. They were called Kangaroo cranes because they had a hopper built into the lower front, like a Kangaroo pouch, which the crane driver would drop each grab full of ore. It would then go on conveyor belts directly to the Sinter Plant where the ore would be roasted and processed into sinter, a sort of pellets which would then be taken by conveyor belt to the Blast Furnace.



This plant was highly efficient whereas the Sinter Plant in Llanwern Steel Works was an engineering disaster and East Moors supplied them with large amounts of Sinter to make up their short fall. I really did expect that the Wharf and Sinter plant would survive the works closure, but clearly it didn't.

There was one electrician and mate in this section and as pressure was only on them when a boat was in dock, this was a very easy job. They had lots of spare time which should have been used to carry out preventative maintenance, but of course it wasn't. This was the time I learnt to cook, as we had plenty of time to make some exceptional meals.

By this time, I had become a keen motorcyclist and bought myself a 1956 600cc Norton Dominator and, as is common with most old British bikes, it broke down frequently. This was my opportunity; I took the bike into one of the 11KV substations and stripped the engine down. Laying it out carefully on the floor and with some on top of the circuit breakers, I carried out a complete overhaul. The department electrical engineer at this time was Reg Keymer, who was a very talented engineer and a wonderful man who would have a great influence on me. He saw what I was doing in the substation and didn't say a word. He walked over to the Coke Ovens where my father worked and asked him if he would tell me to take the engine bits off the circuit breakers.

The most difficult time on the wharf was winter, when the weather was cold. It was freezing working on the cranes at height when the wind was blowing gale force, but when a boat was in you had to do what was necessary cold or no. And they always did.

The Sinter Plant was a very dusty process and red dust pollution spread across the lower part of Splott, particularly the lower part of Portmanmoor Road where all the white washing on the clothesline would become pink and most of the workers and local residents had a healthy pink glow.

The three months of my apprenticeship in the Warf was very pleasant as it was in the summer and I learned quite a bit, particularly with AC motor systems. My rebuilt Norton motorcycle engine didn't take long to break down again and anyway, I soon crashed it into a car which caused the bike and me quite a bit of damage.

Coke Ovens

The steel making process used Coke as the fuel for combustion. Coke is coal that is baked in an airtight oven to a very high temperature when it gives off a large quantity of gas, which was called Town Gas. This was stored in a large gas container, which dominated the works, and was sold for general domestic consumption. Other by products were a Tar, Benzene, Naphthalene, Ammonia and lots of other chemicals which are today considered highly dangerous.

The Coke Ovens consisted of two separate plants A and B.

Coke Ovens B

Each set of ovens was laid out in a row called a Battery. The ovens were of the Slot type, being narrow, tall and deep. The whole process is quite spectacular to watch.

First, the coal was crushed to a fine powder then loaded onto a Charge Car, which ran along the top of the Battery. Each oven had an access door in the top and the Charge Car would remove the top door and pour a measure of crushed coal into the oven. The top was replaced and sealed. Heat was applied, and the coal was baked until it was complete. The oven also had a door in the front and rear, each being the full height and width of the oven. All the openings were airtight.

Once the process was complete the Door Machine would remove the door at the rear, and a similar machine would do the same at the front. The Ram machine would position itself at the rear, facing what was at this point a wall of white hot coke. At the front the Guide machine would position itself. At the same time the Larry Car, which was like a long open railway wagon pulled by an electrical engine, would position itself alongside the Guide. This process had to be coordinated between three men driving each machine. The Ram had to be in position with the door removed, the guide had to be in position with its door removed, and the Larry car had to be in its position. This process was carried out by a series of Hoots between the three operators; a mistake would be a disaster.

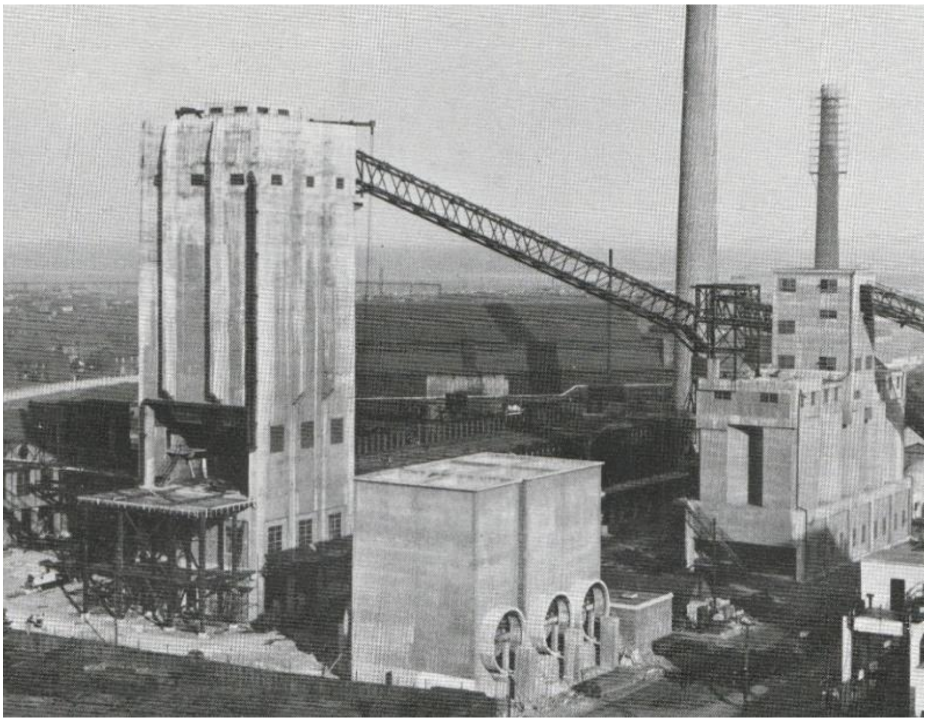
The Ram would start to push out the wall of hot coke from behind, at the front the Guide would be in position to guide the falling coke into the Larry car which would slowly move forward along the railway and collect the falling hot coke.

Pushing a Coke Oven

Once the complete oven had been pushed, the Larry car driver would take it and position it below a Quencher, which was a structure that stood across the railway, with a large tank of cold water. The driver would step out of the cab and open a large valve. Hundreds of gallons of water would poor onto the red-hot coke, cooling it. A volcanic like eruption of steam would burst into the air.

The area around the Quencher would be permanently wet and in winter frozen. At the completion of the Pushing Operation, men would stand in front of the open red-hot oven and clean the door face with a long steel pole tool before the door machine replaced the doors.

The cooled coke would then be poured into a hopper where conveyer belts would take it to the Screening House, which was a five-story building. The coke was taken by belt to the top and gradually poured into a hopper, which vibrated, like a large sieve, separating the larger pieces from smaller. This process continued on each floor, removing the larger and allowing the smaller to fall to the level below, until it was practically dust on the ground floor. I hated the Screen House as the noise levels were indescribable and the dust levels extreme. Even a short job of work here resulted in you being dirty from head to foot. One thing about the Coal Oven Plant, it was the only place in the works that had washing facilities and showers provided.



The coking process produced enormous amounts of pollution which was an occupational and an environmental hazard. Coke oven workers had an increase chance of lung cancer and other serious conditions from this exposure.

The plant ran at full capacity throughout the war as the steel production and the town gas produced was of the highest importance. When an oven was pushed, the glow of the hot coke could be seen from miles away and was therefore very vulnerable to being attacked by German bombers. To avoid this whole area was roofed over. This stopped the glow from being seen from the air but added considerably to the difficult and unhealthy working conditions of the men employed on essential war work. Few lived to retirement.

My father in the By-Products area.

Many of the coke oven workers were brought in especially from Malta. The first time I ever saw a bilingual sign was here - in English and Maltese.

Blast Furnace

Dowlas/ Cardiff had four Blast Furnaces. I spent three months in this section as an apprentice.

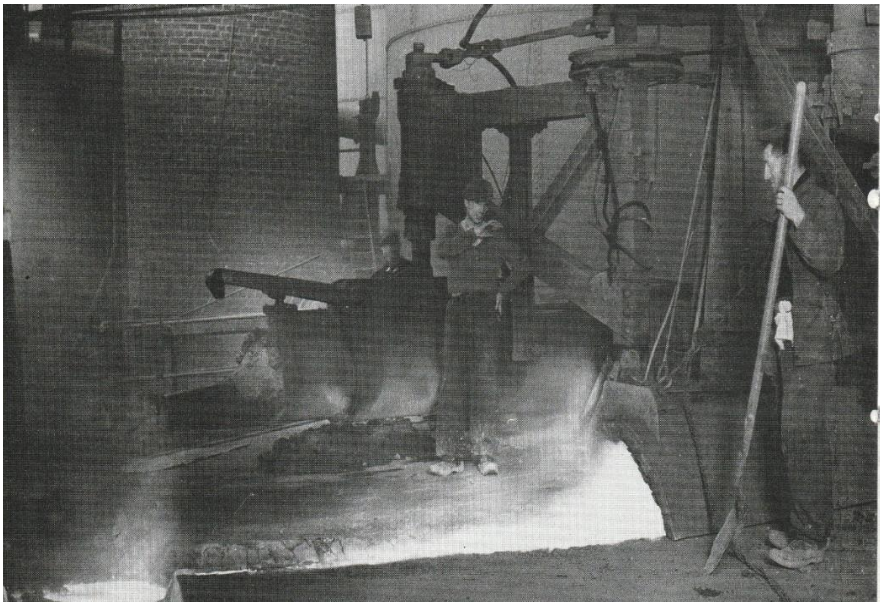
Three furnaces were in continuous operation and one was on standby or maintenance. The process followed a set pattern which, if there were no problems, took a set time and as such was unhurried and fairly straight forward.

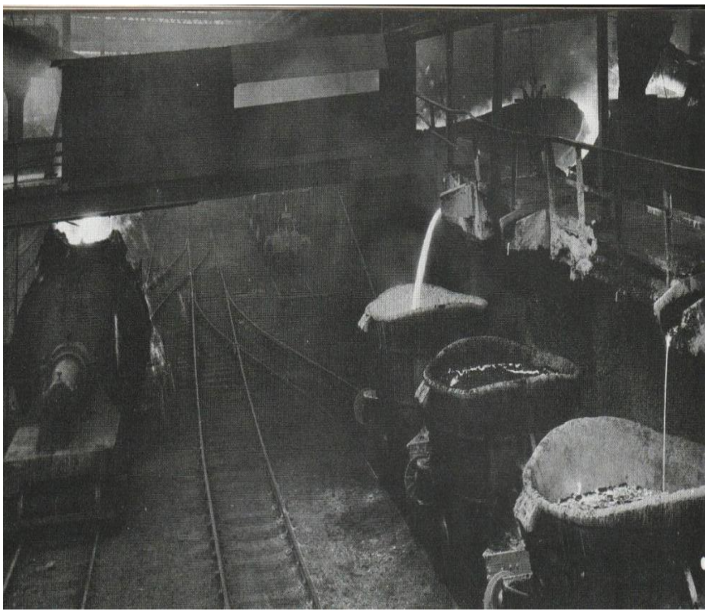
The overriding sensation of a blast furnace was the continuous roar of the furnace.

The furnace was fed from the top and tapped from the bottom. A steep ramp was located to the rear where a rail trolley car was pulled up by an electrical motor from bottom to top. This car was filled by overhead gantry cranes with iron ore, scrap metal and limestone. On reaching the top it was tipped it into the furnace. The furnace ran at a very high temperature and was filled with a powerful explosive and poisonous gas. To prevent this escaping a door opened and closed allowing the material to be tipped in to a sealed chamber, referred to as the Small Bell. The top was able to rotate a given distance allowing several carloads to be tipped into it, spreading material evenly. Once the small bell was full the door remained closed and the Large Bell opened allowing all the material to fall into the furnace. As it fell the temperature was so high it was molten before it reached the bottom, or so I was told.

The process of tapping the furnace was spectacular to watch. The only person in this location was the Tap Man, all electricians and apprentices were kept well away, so my view was from a distance. The man starting the tap was covered head to foot in protective material. He operated an Oxy Lance suspended from overhead boom by chains. The furnace had a Tap Hole at the very bottom which was plugged by special clay, and this was burned out by the oxy lance. During this process naturally the blast was off. Even so, when the burn broke through an explosion of hot material flew about. Then the molten iron began to slowly flow through sand channels across the floor to a Torpedo ladle on a lower level with the iron flowing into its top opening.

As the furnace also produced Slag, and this was of a lighter density, it was skimmed off and flowed into a slag ladle via a separate path.

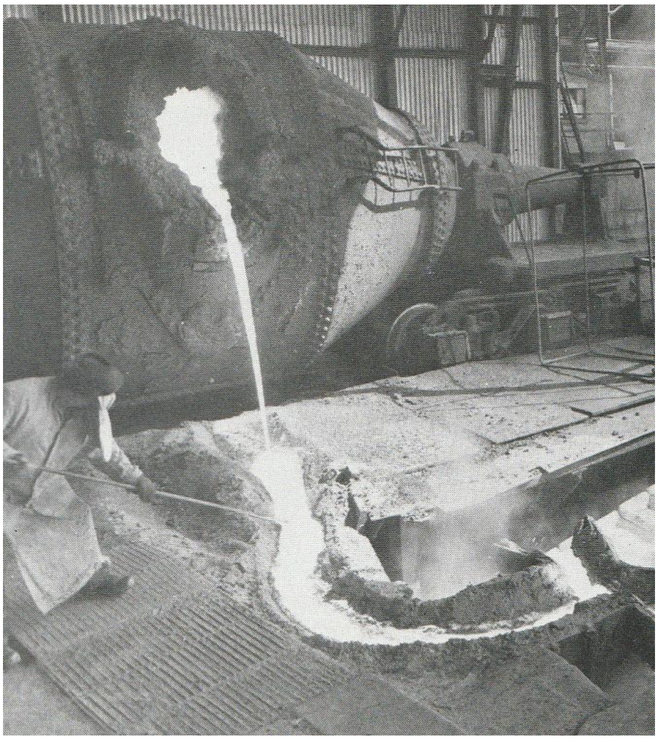




Once the tap was completed the Tap Hole was again plugged with clay by a machine which also swung from a boom suspended by chains.

Pig Iron

Where iron was required, referred to as Pig Iron, it would be cast directly from the torpedo ladle to moulds on a conveyor system.



Life as a blast furnace electrician was not rushed, stress levels were normally low and it was considered a good place to work. The electrical equipment was relatively basic, fault finding was simple, and the atmosphere was unhurried. The only major problem we had was number two furnace blew out the "Monkey" which was the heavy steel casting in which the tap hole was located. Fortunately, the furnace had been tapped, or the result would have been a major disaster. Even so damage was extensive and we and the fitters along with just about the whole blast furnace staff had a lot of work for several weeks before the furnace was put back into operation. At the time of the explosion, I was on the top landing of number four furnace looking at a fault on the rotating top control panel. This is just about as far away as you could get but the blast shock knocked the breath out of me and I struggled for breath for some time. Fortunately, I was able to sit down rather than fall down.

Another problem was the gas. One small amount inhaled would cause severe sickness. I escaped that unpleasant experience.

Myself (right) as third year apprentice with shift electrician David Llewellyn

From the Blast Furnace the molten iron was taken by rail in the torpedo ladle to the Melting shop.

Melting shop

The Melting Shop is where Iron is converted into steel by the Open Hearth Furnace method. I spent three months here as an apprentice.

The building which contained eight furnaces and one Re-Heat furnace, consisted of a large steel construction formed into two parts, the Furnace Side and the Pit Side. The Furnace Side was separated into two floors, and the Pit Side was one large section, open up to the roof.

Furnace Side

The first-floor level of the Furnace Side contained the working area of the furnace where the operation of the furnace took place. The ground floor level contained the Checkers, to provide the reheat process.

This was also a fixed time process for the furnace to convert molten iron into molten steel. The furnaces required constant attendance by the operative staffs which were a very skilled. It was a process that took many years of experience to learn. The top hand furnace man was a very responsible job and highly regarded.

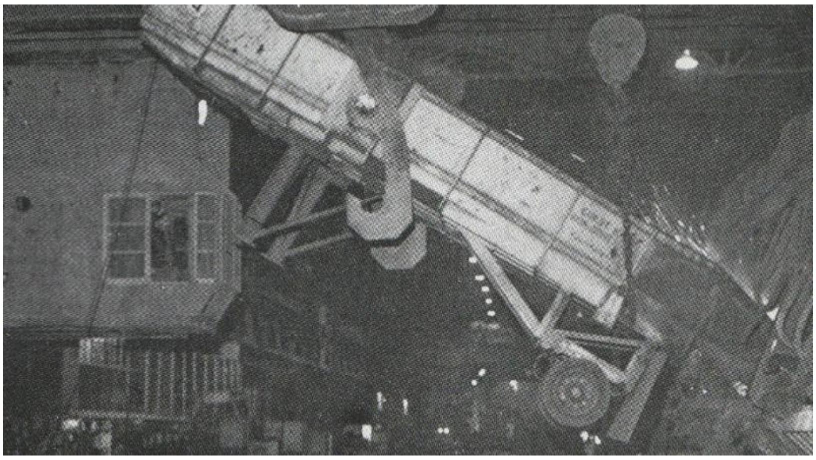
Furnace Side Melting Shop

Molten Iron was brought to the melting shop by Torpedo ladle and poured into a large ladle on the ground floor below an open area to the first floor. This was then lifted through the floor by overhead gantry crane to the upper floor. The open hearth furnaces could tilt backward and forward, and they were also fitted with several doors that could rise and fall. With the furnace tilted, the overhead crane using the main and auxiliary hoists could tip the ladle of molten iron into the open furnace via one of the open doors using a tilted pouring shoot.

Pouring Iron into the furnace

Additional material such as scrap metal and other minerals that were required to create the specific metal requirements were put into the furnace by Floor Chargers. The Chargers were 480 volt DC electrical machines that ran along the floor on rails in front of the furnaces, with a driver sat in a covered cab open on three sides. It was mainly a vehicle equipped with a long arm that could turn on its axis. The cab and arm could rotate 360 degrees, cross travel, rotate, and skew up and down.

The Chargers arm locked into a socket on large rectangular buckets lined up on railway wagons positioned behind the chargers in front of the furnace. So the charger would drive to the rail wagons and swing around and pick up a full container by locking the latch on the arm end into a socket, skew upwards lift the container, swing around, travel to the furnace when a door would be opened. The driver would cross travel putting the container into the furnace and rotate the arm tipping the material into the furnace.



Rapid Charging

These floor chargers were an electrical nightmare. Most of the operation was Direct Drive, that meant the full voltage and current to the motor went through the controller used by the driver thereby introducing or removing electrical resistance to control the motor speed. As a consequence, they required constant attention. The whole vehicle was supplied with its power by collector arms protruding through the floor to heavy duty Bus Bars located in the area below the floor. The rotating cab was supplied by a central column located below the cab. When it burnt out and blew up, which it frequently did, it was a major task having to push the charger over a part of the floor that could removed. Scaffolding built to get to the underside, the lower part of the cab dismantled giving access to the column which then could be dismantled part by part removed and a replacement installed. The burnt out unit was then taken to the electrical repair shop where it was generally worked on by apprentices. I did this job several times and if your column lasted more than 3 months in service it was considered a good job

The atmosphere in the steelworks was in many locations very poor. The melting shop was dark and dirty, the air was full of floating metal particles to such an extent that if you needed to consult the electrical drawings, you had to use a torch and were constantly shaking the drawing to clear away the metal partials to be able to read them. We just got used to working in such conditions.

The process of converting iron into steel required the burning off the carbon content in the iron by means of blowing a hot air and gas blast across the bed of the basic iron and adding a fixed amount of carbon and other additives. Later the Submerged Injection Process (SIP) of injecting Oxygen into the bath sped up the process considerably.

The design of these furnaces used the very hot gasses from the furnace which were passed through the Checkers, which were two large chambers below the furnace. Theses consisted of a chamber filled with heat retentive bricks laid in a chequered pattern so hot gas could circulate around them until they were up to white heat temperature. The direction of the furnace blast was the directed through these bricks preheating it, the process was reversed every half hour. Eventually, they became blocked and had to be stripped out and re-bricked. I have seen this work being carried out. It was so difficult and the work so unhealthy that substantial amount of money could be earned. This work was normally carried out by contractors. The furnace was run down but it took a considerable amount of time for the Checkers to cool sufficiently for men to go in and strip them out. We installed large Man Cooler Fans to blow a powerful blast of air across them; still the work was almost beyond endurance

The men on the Furnace Side were a close group, many having worked there since leaving school. They were all dressed in a similar manner wearing a heavy Welsh Flannel shirt and a heavy canvas apron. Most wore a flat cap but some manufactured a thick paper hat. All wore a pair of small blue glass spectacles, set on the end of the nose, which with the head tilted back you could look straight into the furnace bath of molten steel via a peep hole in the doors. Periodically materials had to be put into the furnace, such as lead, nickel, chrome etc and when the furnace was empty, Dolomite Dust had to be spread on the furnace wall. To do this task a pile of Dolomite Dust was tipped on the floor in front of the furnace and a party of men would form a circle around it and each in turn, with a shovel full would walk to the open furnace and with one swinging movement would throw a fan like spread of dust against the open furnace wall, each man following the one in front in a circular procession around the dust and back to the furnace with a full shovel. The task was soon completed, but this was hard labour.

The first hand would keep an experienced eye on the bath of bubbling steel looking through his glasses and sometimes stirring the bath with a long steel probe, until he thought that the furnace was ready to tap. This was the method traditionally used but, when I was there a more accurate method was used. The men would take a small ladle on the end of a long rod and dip it into the bath of steel taking a sample which was poured into a mould set on the floor. When this cooled it was taken to a Spectrographic Lab where it was tested to accurately confirm that it was to the correct speciation, only then would the furnace be tapped.

Pit Side

The pit side was massive, impressive an intimidating. The furnaces were on a level above you. The overhead gantry cranes were 150 tones rated, the ladles were enormous. Everything was massive.

The work carried out here was tapping the furnaces and carrying the molten steel to a landing where it was teemed into ingot moulds.

When the furnace was ready to be tapped, the crane would pick up a ladle with two hooks on a single boom and hold the ladle directly beneath the furnace outlet. The furnace would rotate to allow the steel to flow, gradually tilting further as the tapping proceeded. The ladle was filled above maximum to allow the slag floating on top to fall into a slag ladle alongside. Sometimes this didn't work well and slag would run onto the earth floor.

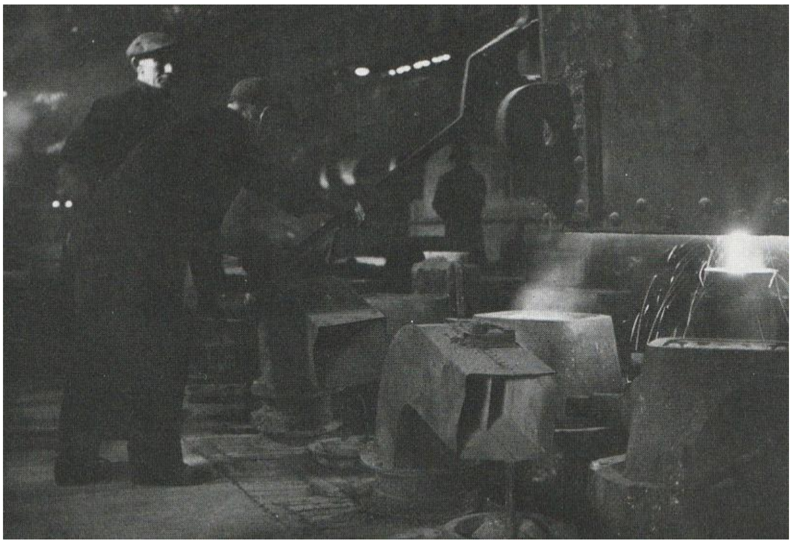
Tapping a Furnace

Teeming

The crane would travel to the Teeming area. Here it would be exactly positioned above the ingot mould entry point. The ingot moulds were teemed into a central spout that fed four ingot moulds simultaneously from the bottom.

This was both a highly skilled and dangerous job. The quality of the finished steel was initially dependant on the skill of the man teeming. The operation had to be a steady and controlled pour. Any air bubbles at this stage would result in long tubes in the finished rolled steel, and inconsistency in the rate of pouring caused faults, both would be classed as rejects. The Teemer stood alongside the full to the brim ladle and operated a long handle opening a valve to allow the molten steel to flow. This man's life was dependant on his skill and the skill of the crane driver, furthermore, any mechanical or electrical fault on the crane could be disastrous.

Teeming into Ingot Moulds



Let me explain a little about these cranes, because they were impressive. They were of 150 tones rating, 480 volt DC fed from the works DC system. I am unable to remember the power of the main hoist motor, but it was substantial. It was Series DC motor, which by its nature is extremely powerful. These motors produced in excess of full power at zero revs. The brake was S&M electromagnetic, which clamped a solid drum attached to the motor shaft. The driver operated a controller which moved notch to notch in the hoist or lower direction. We tested the brake and motor for correct operation by lifting a test weight of solid concrete with a mass of 166 tones. The brake was adjusted by a team of fitters, electricians and apprentices. The operation was, with the test weight hoisted and the controller in the OFF position the driver selected first notch hoist, which caused the motor to be energised and the brake to lift. At this moment, the motor would not move. The only thing that prevented the load from crashing to the floor was the power of the motor at standstill. Moving the controller to the second notch the motor would slowly hoist, moving to the third notch the motor would speed up, and again when moved to the fourth notch. If the controller was moved back to the off position, the brake had to hold the load with no more than one inch drop, so with the motor de-energised the brake had to hold the load against gravity almost instantly. One of my most memorable experiences was sitting on the back of this motor in the darkness of the roof holding the torch when the motor was first energised at full power, you could almost feel the power of the beast through the frame.

Alarms

Once a week an alarm for a gas Leak occurrence was tested at five minutes to ten on a Saturday morning. This consisted of several loud bells ringing for about two minutes, it was audible throughout the melting shop. One of the shift electrical mates, Terry Barry, was an ex-boxer who was once the army middleweight champion. He suffered from the condition of being “Punch Drunk;” and at the sound of a bell would instantly start punching anyone near him. His shift were well aware of this and at that time on Saturday morning would get themselves well away from him. He always came out punching.

The other alarm was for a Sulphur Tap. This was when sulphur was added to the steel at the time of the tap. The fumes were overpowering and could cause you to be violently sick if breathed in. Once experienced, never forgotten.

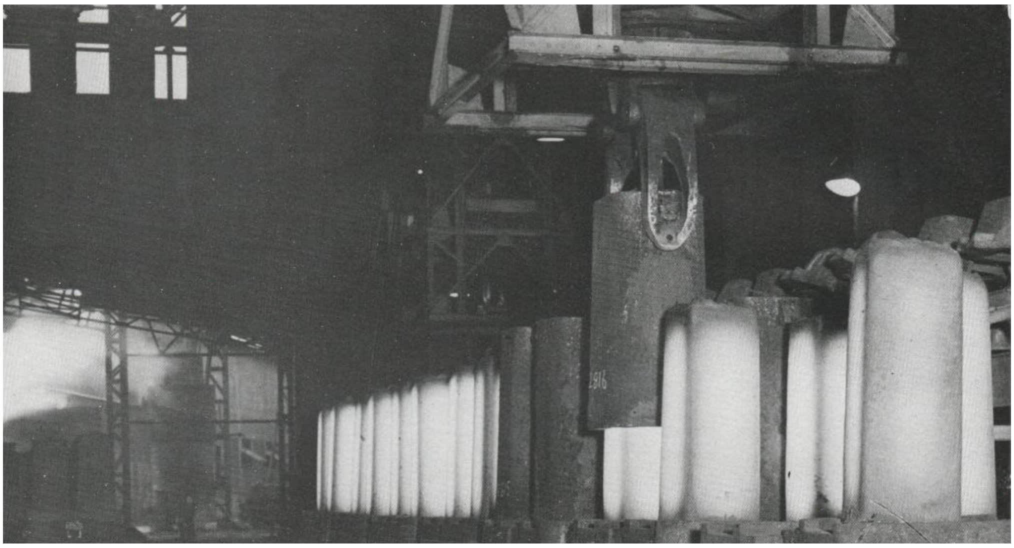
Once the teeming was complete the rail journey of moulds were taken to the Mould Stripper Bay, where they were left until solid but still white hot when the moulds were stripped off them. They then went to storage or to the soaking pits.

Slag disposal

All slag was taken from the Blast Furnace and the Melting Shop to the Cardiff foreshore and tipped into the sea. Over time this had the effect of pushing the shoreline further away creating new land. Most of Rover way is built on this system. Seeing the explosion as the slag hit the water was spectacular.

Mould Stripping

The Furnaces was heated by blast furnaces gas, piped in by a massive pipeline which ran through the melting shop and on to the soaking pits. On one occasion during the stop period, when I was working in the electrical repair shop, we heard a loud explosion which caused all the dirt and dust to fall from the girders above. The explosion came from the pit side directly across the road. We ran over and found three men had been killed. They were contractors working on the pipe. The section they were working on was a stop end Tee junction where a heavy plate was bolted on by a series of nuts and bolts. The gas was off, and they were to remove this plate. Apparently, they should have flooded to pipe with water, which they failed to do, also they were supposed to unbolt the plate bolt by bolt. They decided to burn the nuts off, saving considerable time. Unknown to them there was a residue of gas in the pipe which exploded blowing the whole of the end section off, killing the men. When we got there, you could hardly see but as the dust settled, I could see a man lying on the floor. The thing that sticks in my mind most was that all his cloths had been blown off. We apprentices were ordered away back to the electrical repair shop.



Rolling Mills

Soaking Pits

The pits had movable lids and were at an even temperature throughout, i.e. white hot.

The ingots were placed standing upright and leaning against the pit wall, so that they were easy for an overhead crane to lift them. The cranes had a movable central column which had a two-pronged grab that could be lowered to grip the ingot, lift it and place it in the Ingot Bogie.

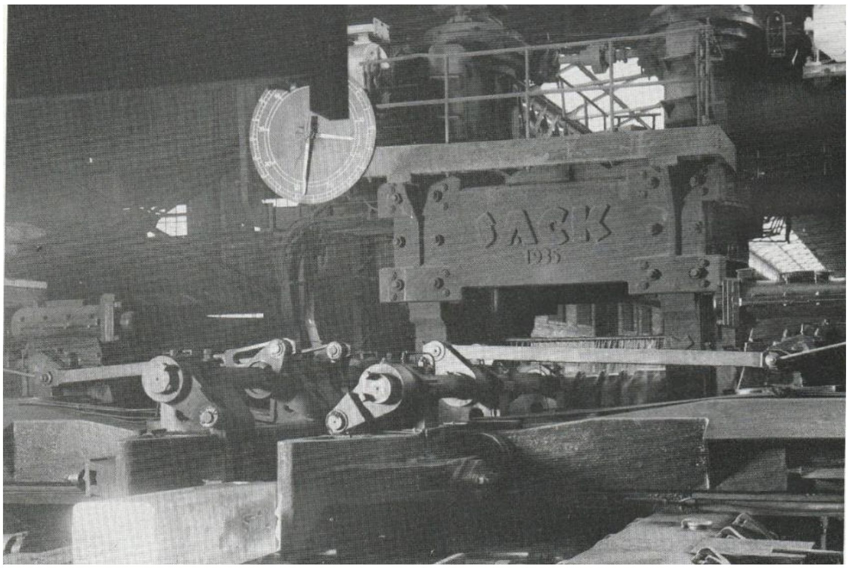
This had a remote electrically operated winch that travelled the length of the soaking pits and delivered the ingot to the Approach Rollers to the Main Mill. The control system of the Bogie Winch was quite a complex system, controlled by an Amplidine Feedback Closed Loop system. From standstill it accelerated to full speed and slowed down as it approached the rollers, when it slowed to “crawl speed” as it entered a frame which guided the bogie to tip and realise the ingot onto the rolls. The bogie would then slowly pull itself out of the frame and return at speed to the relevant pit.

Main, Cogging or Sack Mill

This mill was known by all three names.

The Cogging Mill was the first and most impressive of the three rolling mills in the process of producing Billets or, Slabs.

It was controlled by a team of four men who worked in complete co-ordination with each other. If one made a small mistake, it could prove a disaster.



Main, Cogging or, Sack Mill

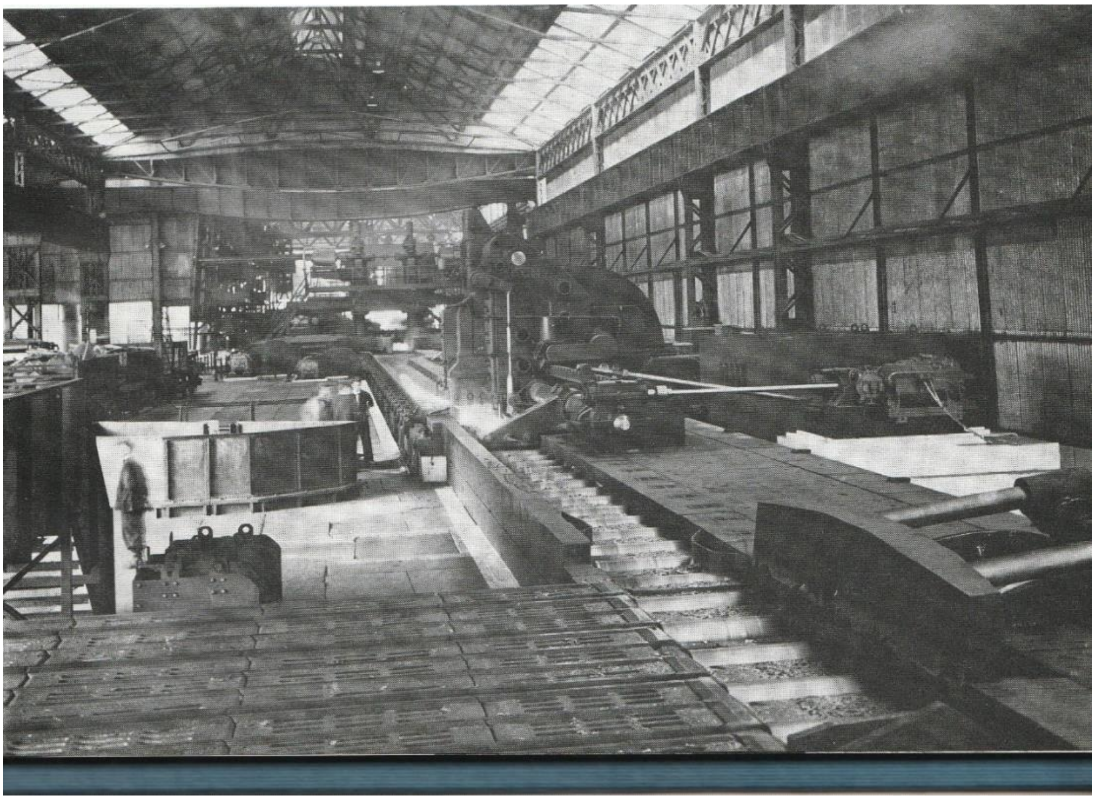
The Ingot would be brought to the mill by the Approach Rollers and enter the mill by the Entry Rollers. Its entry would be controlled by movable Guides to the Main Mill Rollers, which squeezed the steel reducing its section and increasing its length, with each pass. Its direction of rotation and speed could be controlled. The Ingot would enter the main roller on the left where it was passed through the rolls at its widest point; it would pass through and stop when the rolls were adjusted so that its reverse pass would roll it again. Once back it would be stopped, the main rollers lowered, the ingot tumbled over on its side, and another pass taken. The guide would move the ingot to the side to allow another pass to be taken at a different set.

This pattern would follow- pass through- stop- adjust the Screw Down of the main rolls- tumble the ingot- pass back- adjust the screw down – guide to the next pass and so on until the ingot was reduced to a desired size and was then call a Bloom.

For all this to take place one man operated the main rolls by a large lever to drive forward or reverse and adjusts speed. Another controlled the approach and entry rollers. Another operated the Guides and Tumblers. Another operated the Screw Down.

It was a fascinating thing to watch as it was perfection, they would do this all shift long and all the time there would be banter and jokes between them, but woe betide if one made a mistake. One of the First-hand operatives we called Little Llew, (as we had an electrical engineer we called Big Llew). He came down from Dowlas by bus every day, he was a small man compared to some of the big lads who worked with him, but the strength of his personality was substantial, and they all respected him. He was fierce in his complaints if a mistake was made.

The mill was powered by a 6,600 HP. RMS DC motor located in the Ilgner House. This intern was supplied by the Ilgner Set, a fuller description is given below. From here the steel was passed down the mill to be cut up by the Bloom Shear and passed to the Lamberton Mill or it continued on to the intermediate Mill.



Bloom Shear and Transfer bed to the Lamberton Mills

Intermediate Mill

There were two mills, a horizontal and vertical mill each powered by a large DC motor set in pits away from the mill and controlled by panels in a separate electrical control room.

Morgan Mill

The Morgan Mill was a continuous mill of six horizontal stands and one vertical that produced billets or slabs. The mill, stands one to five, ran at a fixed speed driven by a 6,000 hp 3.3 kV synchronous induction motor. The OV stand was driven by a separate DC compound motor. The main motor was massive and located in a separate Motor House. Starting this motor took about 15 minutes and was carried out in stages in order to move the enormous mass of the mill along with the drive shafts and gear boxes. The motor was started as an induction motor at a reduced voltage from an Auto Transformer, slowly at first so as to begin to rotate the mill, then gradually increasing voltage in stages allowing the mill to speed up. When the mill was running as fast as it could, the DC was switched on and the motor leapt into synchronism with the mains frequency. From this time onwards it kept a constant speed regardless of the load, which is essential for a continuous mill.

Between two stands there was a Twist Unit where the hot steel was twisted by 90 degrees so that the rolling process would take place on different faces of the billet. Each stand ran at different speeds starting slowly and each being faster than the previous one. The entry speed to the first stand was moderate but as the rolling process continued the billet got longer and thinner and therefore ran faster, the exit speed from the last stand was at high speed.

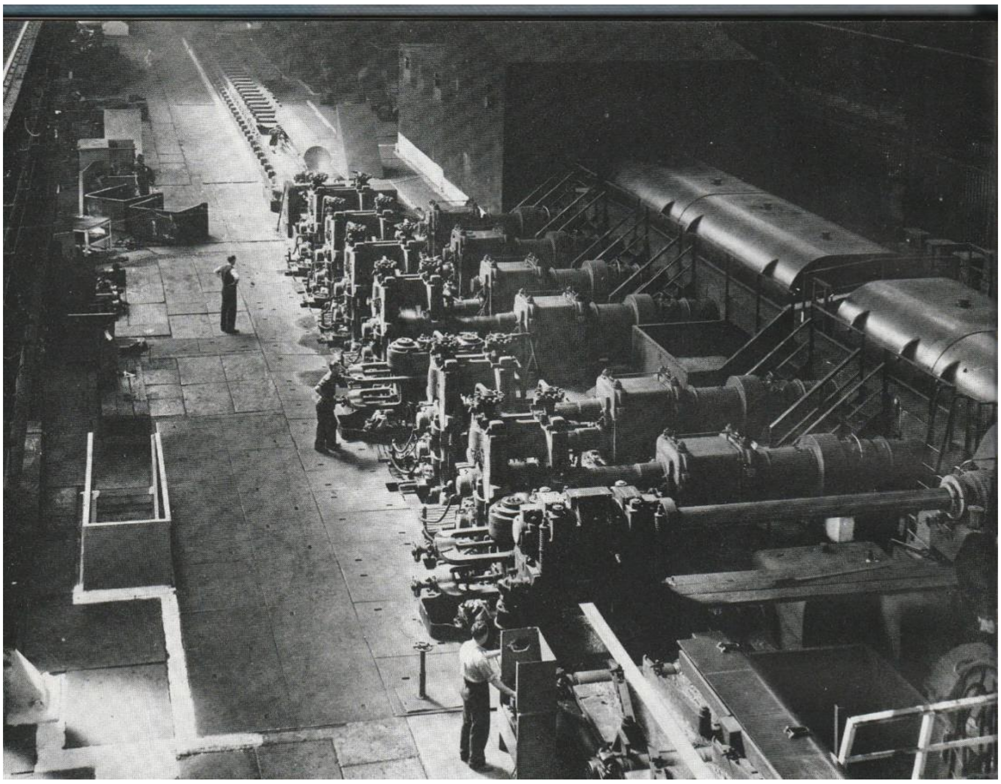
The setting up of the mill was a highly skilled process and the operators would occasionally adjust the roll setting by moving large threaded nuts by means of long handles whilst the mill was running. The mill was largely held in place by means of Wedges which required hammering into place with large sledge hammers. So, in operation, as the steel Bloom entered each stand it would hit in with a bang, the stand would move a little and then settle back.

When running on light load the mill gave out a rattling sound, then there would be a boom as each stand in turn came on load along with a growling sound as each gearbox took load, the sound getting quicker as the as the billet progressed. Then as it left the final stand there was a bang as it was cut by the flying shear and progressively followed by other bangs as the shear cut the lengths of the high speed billet. This was followed by a bang as each billet hit the stop by the cooling bed. This mill had its own unique sound that repeated itself with every rolling. You got used to this like a well-known piece of music; as long as each was identical then all was ok. If the sound changed, for any reason you would be alerted immediately, because of the speed the billet was running at, any mishap could be very dangerous. Sometimes, a “Cobble” would occur, if something went wrong with a stand, the red hot steel would bend and twist and bunch itself up within the stand or, leave the stand all together and fly across the floor. The shout would go out “COBBLE!” and you soon learnt to get away at high speed because if not, there would be no way of out running a flying billet. There was no way or, advantage of stopping the mill in these situations and the crew would coolly and calmly allow the mill to complete the roll to get most, or all the billet out.

The electrical system allowed for an emergency stop but it was only used once in my time when an operator got his arm pulled into the rollers. The men tried to pull him out but were unable, they then tried to open up the rolls by the large nuts I described, but this just allowed his arm to pull further into the mill, so they hit the emergency stop. This put DC onto the motor stator and the mechanical mayhem was unbelievable. The mill suffered considerable mechanical damage that took several days to put right. The arm was badly abrased and he lost a considerable amount of skin, but he was back in work the next day - apparently none the worse for nearly having his arm torn off.

I enjoyed my time in the Morgan Mill and became quite an authority in the control of the flying sheer circuits. This was a complex Ampladine controlled closed loop system, that I took a particular interest in. In fact, I think that only myself and a first class engineer named Bill Harnett really got to grips with it, but perhaps I'm kidding myself.

The Flying Shear was designed to cut the billet as it left the final stand at speed. It had two V shaped jaws top and bottom that ran in a guide frame which from standstill, (referred to as The Ambush Position), would run cut and retreat to Ambush with every cut. The time between each cut determined the final length of the billet. It was powered by 4 x 80 hp shunt motors; these were in turn supplied by two DC generators controlled by an Amplidine system. It first cut or "Crop Ended" the leading part of the billet, about 12 inches long, and in between it "Optimised" the length to give a length which best resulted in minimal waste. Similar to the first as the last cut crop ends were necessary because this part of the billet was poor quality steel.



Early Morgan Mill

Morgan Mill

Cooling Beds

Once the billets had been cut to length they ran on rollers to one of three Cooling Beds. A stopper could rise between beds 1 and 2 or beds 2 and 3, which would hold all the billets from the one original ingot. When all were resting against the appropriate stopper a straight edge would push them onto the cooling bed. This would continue until the bed was full and the next bed would be used. The red hot rolled billet or slab, would be left to cool until the temperature fell and until they took on a dark colour, but were still very hot.

A young man dressed in heavy clothing and a glove would mark the first and last billet in the roll with a special yellow chalk. This was done when the metal was still red hot. Shielding his face with his left hand he would quickly approach the bed and with his other hand, mark the billets and quickly retire. They once did some research on stress levels of workers throughout the works and found that this man's heartbeat rose to extremely high levels.

Once the heat had reduced, an overhead crane with the hoist fitted with 3 rectangular magnets along the length of the boom, would pick up about 6 billets and carry them to the Billet Handling section where they would be stored in a neat pile, about 20 deep, until cold. They were then taken to railway wagons to be dispatched or moved to the Handling Area, where they could be further worked on, depending on the quality control required.

The cooling beds, by their very nature, made it a very hot and uncomfortable location to work, especially in summer. In winter you had further difficulties because the heat would rise at a considerable rate from the beds and cold air would be drawn in from outside. So, you would experience a burning hot front and a freezing cold back.

Electrical breakdowns on the overhead cranes could often be extremely difficult to attend to because of the heat from the beds below. Often the crane broke down directly above the bed and the metal of the crane would be too hot to touch. We would have to gain access to the crane by walking along the top of the gantry, (which we should not have done, but often did), or get on another crane and get carried to the faulty crane and then climb off one to the other. Sometimes the crane could be pushed away from the bed by another crane but, if the hoist broke when lowered down to the billets, this would not be possible, so we would have to work on the control panels when over the beds. If you knew the circuits well enough you could often push a Contactor in by hand, using a small brush which we all carried, and raise the hoist to get it away. Rules and regulations regarding getting on a crane and working on it were often ignored, and while everyone knew it was so, the practicality of it gave no possible alternative. I often wonder that there were not many more accidents because of common practices like this.

East Moors steel would range from basic to very high quality steel. One of the special steels was the Brillo Pads order. This was special steel that was one furnace quantity where the steel was such that it could only be heated once i.e. where it could not be re-heated if a problem occurred in the rolling process. When rolling this order all the Mechanical, Electrical and Production Engineers would be in attendance.

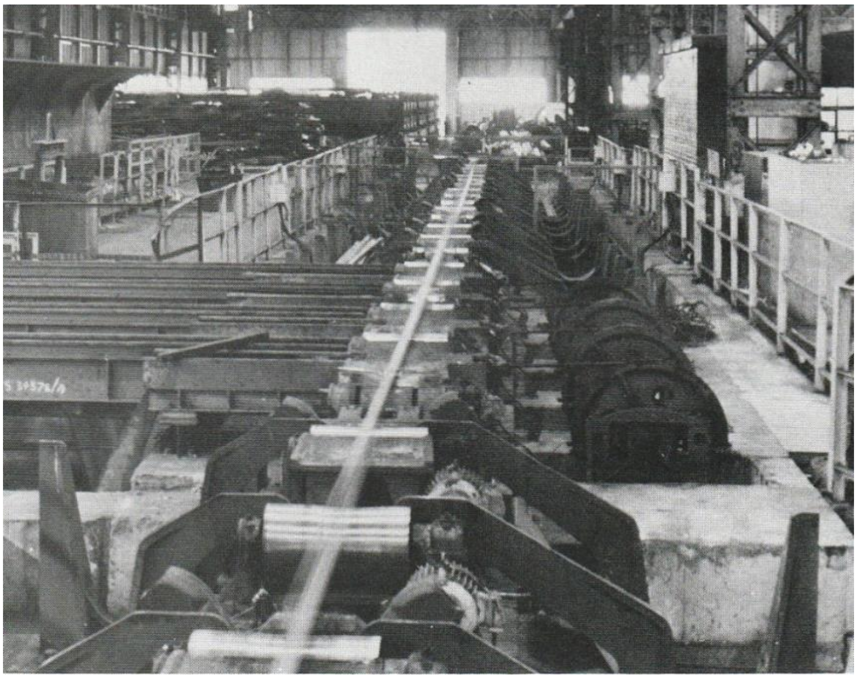
Billet Handling

During the war The Dowlais works could sell all it produced, this continued until the early 60's when world competition made quality more important. East Moors invested a lot in the final inspection of the billets to ensure the quality was as required.

Depending on the grade of finished steel, inspection of individual billets was required and surface faults could be removed by means of powered chisels. Later special plants were installed to speed up this operation and to give a deeper and more reliable outcome.

Four Face Wave Grinders

This plant utilised four high powered AC induction motors to grind a wave pattern from edge to edge along the complete length and on all four faces of each billet. This passed on triangular rollers so they could be inspected by two seated men so that they could inspect one face of the bar directly as it passed in front of them and another face by a mirror set below. If they saw a fault in the surface that continued through the wave it would indicate that the fault was a deep one and by pressing a button, the bar would be rejected and directed to a Pocket where it would be thrown off the rollers and land in a steel framework pocket. When the fault was identified one or, both operators would mark it with a French chalk line as it passed by. The billets in bunches would then be picked up by the overhead gantry cranes by chains slung underneath and taken to the Swing Grinders for processing.



Billet Inspection

Grit Blasting Plant

This was an alternative to the four face wave grinder to improve the quality of the billet inspection. In this case, each billet went through a grit blasting chamber which cleaned the entire billet to a high quality finish allowing it to be more closely inspected for faults. An Eddy Current inspection was added to this setup.

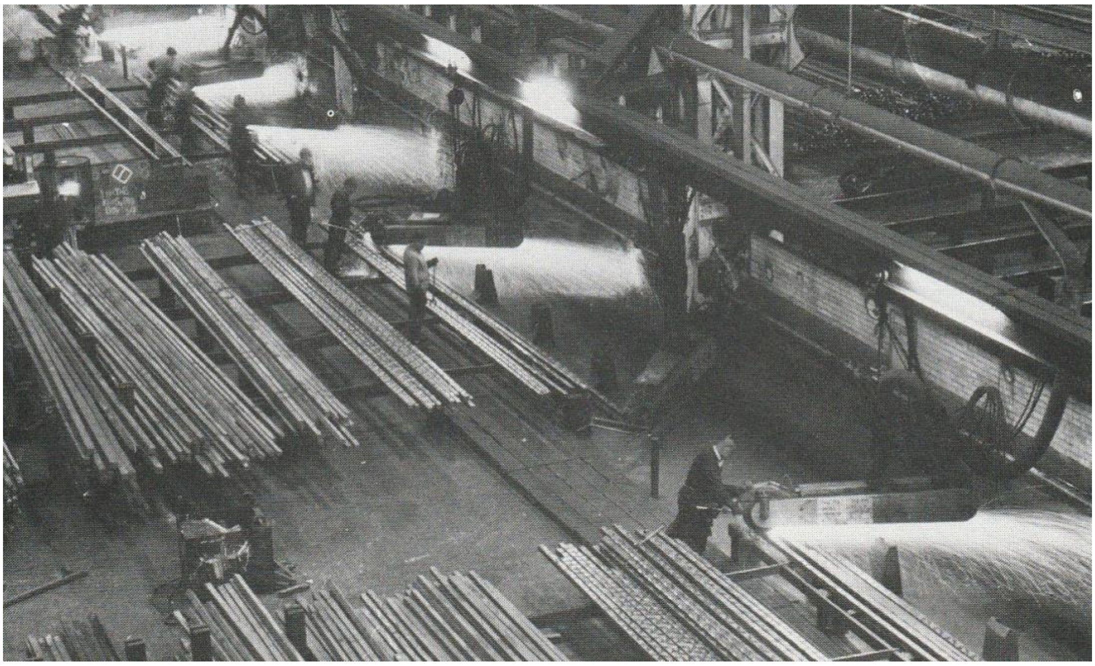
Eddy Current Machine

When an electrical conductor, such as a steel billet, is passed through a steady magnetic field, a corresponding steady electrical current would be induced in the billet. If the conductor has a fault, it changes the induced electrical current and this can be detected and identified by spraying the fault location with yellow paint. Faulty billets were sent to selected pockets, this time pushed off the rollers by Paddle Arms.

These two machines were of increasing importance to the sales of the works and were given high priority. It fell to me when I was put on shift work, to be allocated to be the electrician on B Shift. This was not made any easier by having an electrician's mate who was an alcoholic and frequently came in on afternoon shifts a little the worse for drink - and night shifts, completely drunk. It was understood that you would never report on your mate and would do all you could to protect him. I was very young and inexperienced at this stage, but even so, I liked him and we got on well together. Later on, he had a massive stroke and was partially disabled but still dragged himself to work every day when given an easy day job in the central workshops.

Swing Grinders

As I recall there were about 18 swing grinders in operation. These were heavy grinders driven by AC induction motors suspended by chains from a trolley that was able to move on overhead rails. Each was fitted with what looked like large motorcycle handle bars. The operation was such that one man controlled each grinder and was able to swing it and move it up and down the length of the bar by the suspended chains. Thus by putting his weight on the handlebars he could push the grinder down and grind deeply into where the fault was and remove it. The bar was turned over by large spanners and all four faces treated until all faults were removed or, the bar was rejected. The grinded dust was taken away by a piped ventilation system.



Swing Grinders

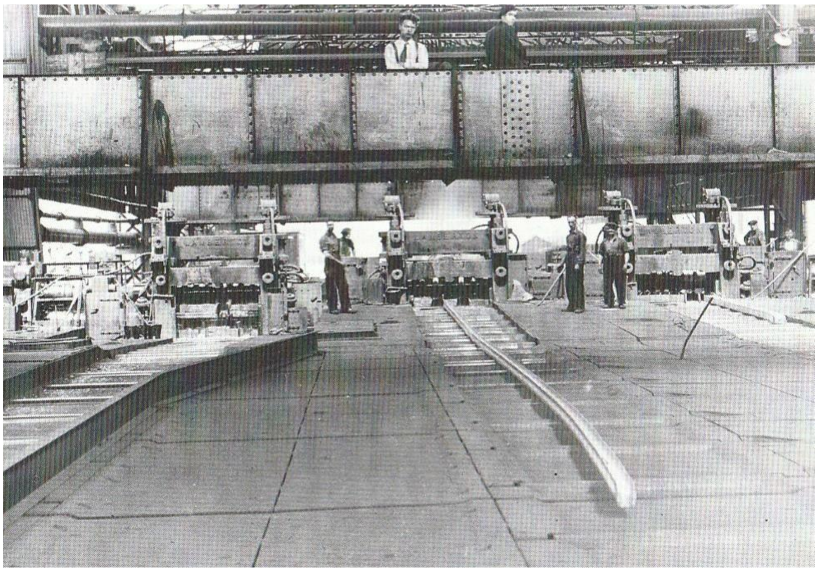
The Billet Handling area was very noisy and on occasions it was deafening. The constant noise of all the grinders working along with the crashing sound of billets being thrown into the pockets made for an uncomfortable working environment. No hearing defenders were supplied. In winter it was very cold as all the material was cold and you were in the draft pulled by the heat from the cooling beds nearby. My problem was that I found the plant quite simple and no problem and as it was given high production priority, I found it difficult to get away but after about 2 years I was moved to the Morgan Mill and was happy with that.

Lamberton Mill

The Lamberton Mills were quite incredible to watch; they were largely operated by hand by men working directly on and over the moving red-hot steel.

The mill consisted of three stands, roughing, intermediate and finishing. Two DC motors drove the stands: 1200HP the roughing and 1500 HP the intermediate and finishing stands. Movement between the stands was by electrically operated chains but the entry into the stand was by hand. A man would guide the bar using a large spanner fitted to a long steel pole, with a man on both sides of the mill. Each stand had a set of three rollers and a Rising Table on each side; a pass could be made on the upper and middle rolls, the table lowered, and a return pass made on the middle and lower rolls. Each roll had several different gauges so that a pass could be made several times, gradually forming the steel section. The movement between each pass on each stand was by hand, the operator guiding the steel between. The movement between each stand was by chain driven teeth. The two main motors ran continuously at a fixed speed and direction. The approach rollers and chain guides were controlled by young boys who sat in steel boxes on gantries above the mill.

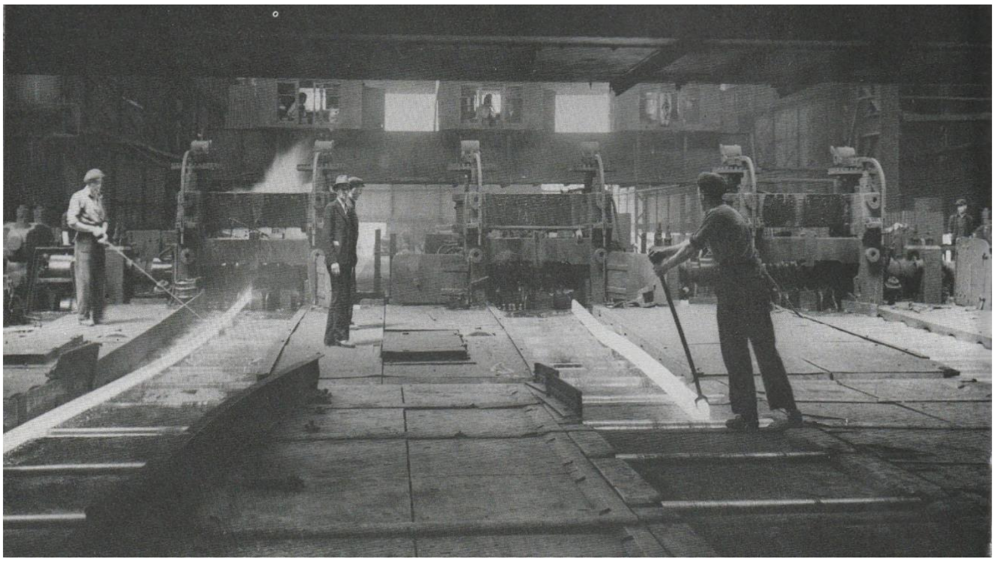
The Bloom taken from the Intermediate Mill was reheated in a furnace to a white hot temperature and was gradually rolled down to a smaller section so that it increased considerably in length. The speed of exit from the final pass of the finishing mill was considerable and quite alarming. Cobbles did happen on this mill and with men in close proximity it was every man for himself to get away quickly, as the steel was of small section and bent and whipped freely. The Lamberton Mill could roll RSJ (both H and I bar), Railway lines, Angle iron and various other section, as finished products.



Lamberton Mill (not Cardiff)

From The finishing stand, the section ran on rollers to the Hot Saw. This was a large saw fitted to a carriage so that it could run back and fore across the line. The blade of the saw was about 6 feet in diameter and was controlled by a boy who sat on a seat on the carriage. By operating a long leaver, he would cause the high-speed running blade and carriage to cut the steel with an ear shattering scream. Behind the saw was a brick wall to restrain sparks. Over a long period of time these sparks accumulated to form a huge bulge on this wall, which gave me considerable amusement.

The section would be cut to length by stops that that could rise and fall between the rollers. When cut to length the sections were run to cooling beds.



A similar mill to the Lamberton Mill (not Cardiff)

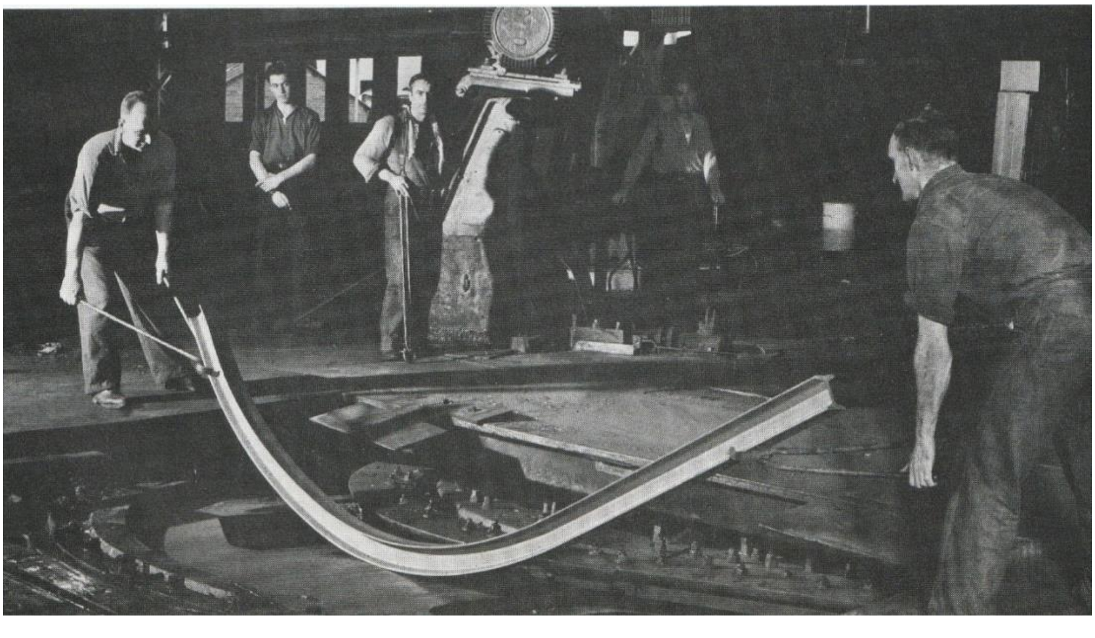
Lamberton Mill

The Lamberton mill was of a type common across the steel plants throughout Wales, but it was unique in that it survived later than most, and I found it both scary and fascinating at the same time.

Colliery Arch Plant

Of all the plants in the Rolling Mills Department, the Colliery Arch Plant was the most fascinating to watch. The amount of shear manual labour that went on there was incredible. The men who worked there weren’t muscle packed giants. In fact they looked surprisingly normal, early middle-aged men, but their work output was massive.

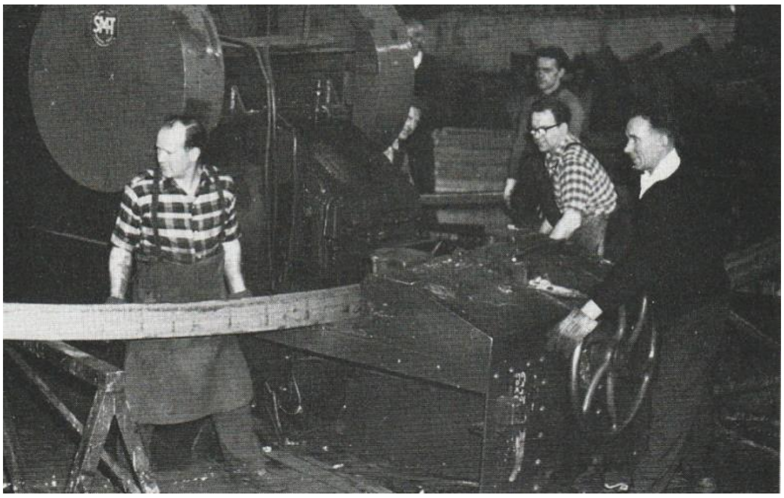
Colliery arch Plant



Lifting the finished RSJ from the press

The plant consisted of a reheat furnace where long lengths of RSJ were heated to red heat. These were pushed out of the furnace and fell on a line of Demag rollers, each powered by an AC three phases induction motor, running at high speed. They ran down to one of two presses in the shape of half of a colliery arch that was set flush into the steel-clad floor. Two men gripped the red-hot RSJ with tongs, lifted it from the rollers and then threw it across the steel floor, where it was picked up by two other men and lowered into the floor press. A young boy then operated a lever and the press closed on the arch pressing it into its required shape. Sometimes this took two or three attempts to get the finished shape. The press opened and the two men gripped the RSJ with their tongs, lifted it and threw it across the floor where is skidded to a halt. Two other men the gripped it, lifted it and carried it to the storage place where it was stacked one on top of the other until about twenty high and ten wide. Here they remained until cool when they were then taken by crane and stacked away from the working area.

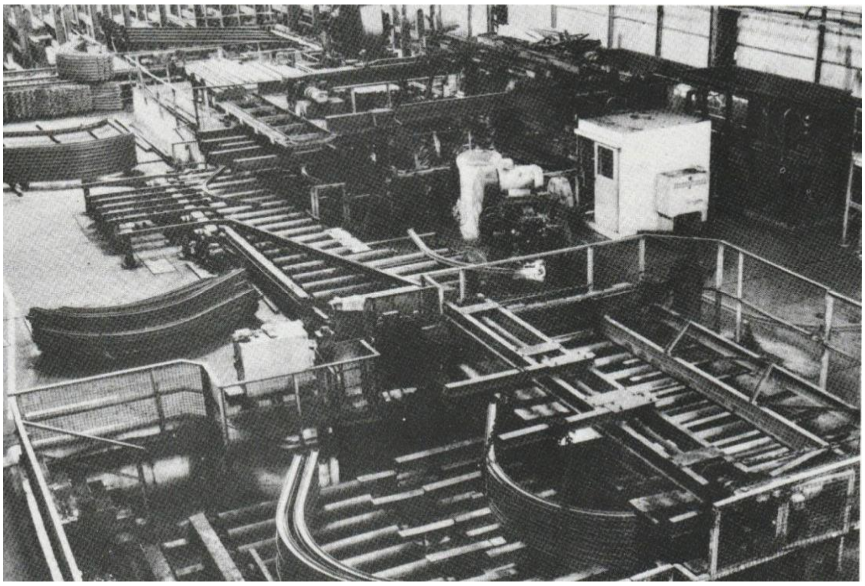
When cold they were lifted manually to a Punch Machine where holes were punched so that the arches could be bolted together using Fish Plates when being installed in position in the actual colliery.



Cold Punching

We didn't get a lot of electrical problems here as most of the work was manual and the press was hydraulic powered. The Demag motors which ran continuously were problematic as they never stopped when the plant was in operation and worked in very hot conditions. I found these men very friendly to us electricians, but believe me, no one fooled about with them.

The RSJ's and Fish Plates used were rolled in the Lamberton Mill only a short distance away. Eventually the Lamberton mill closed. The Arch Plant continued but was replaced with an automatic hydraulic system.



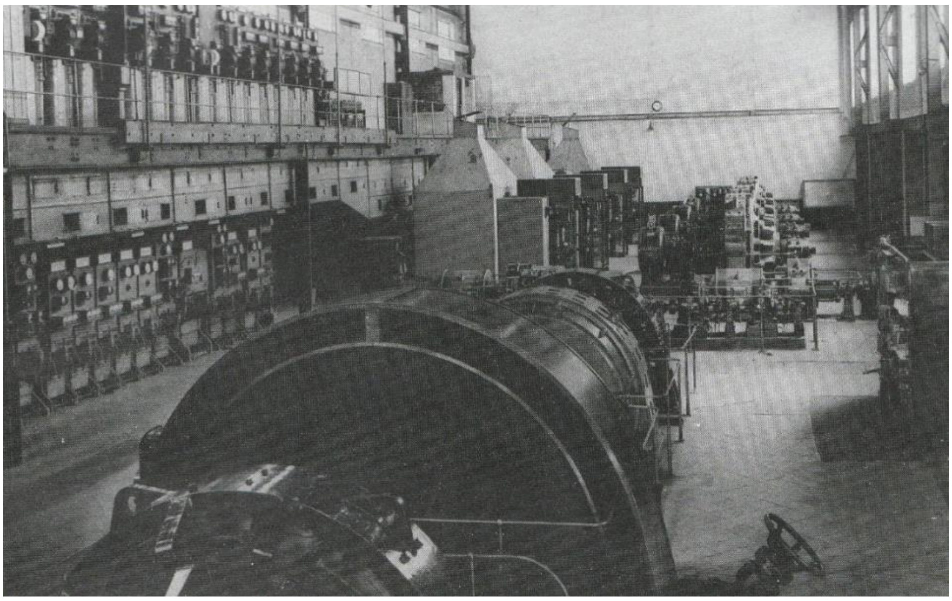
New Automatic Hydraulic Arch Plant

Here the bending was done cold with an automatic Electro/Hydraulic system with no manual labour required.

Initially, this system caused a lot of problems with relays and limits using uniselector controlled circuits, until the system was almost completely rewired by the works electricians and engineers - a testimony to their knowledge and skill.

When the works closed this plant was dismantled and shipped off to India.

Ilgner House



The Ilgner House contained the Ilgner Set, four Rotary Converters and the Silicon Rectifiers that largely replaced them, the Main Mill Motor, the control gear and all the necessary switch gear.

All the machines in this area were by their nature of large construction. On entering, the Ilgner Set dominated. This consisted of a 3,300 volt AC induction motor, three DC generators, a Bucking generator to provide DC excitation, and a massive Flywheel.

Ilgner Motor/Generator Set: 5,000 HP. Three phase, stator 3,300 volts, 50 C/S, 750 amps, Rotor 1550 volts, 1440 amps, 595/600 RPM,

Each of the three DC generators driven by the motor was:

- 1740 KW (RMS)
- 490 volts DC
- 3560 amps (RMS) 474/596 RPM.
- Separate excitation 118 volts.

Starting this motor was usually done on a Sunday night shift, to be ready to start rolling on Monday at 06.00. It was a lengthy process to move the considerable mass of a drive motor, three DC generators, a DC exciter and a massive flywheel. Firstly, you ensured that the oil pumps to the flywheel bearings had been running some time before starting and that the oil flow was satisfactory. It was not possible to move this mass with the main voltage directly and so, a water Resistance Starter was introduced into the Rotor Circuit to control its applied voltage. Then the main 3.3KV circuit breaker was closed and with all the Rotor resistance in circuit, the Set would start to turn. Slowly the resistance was reduced, increasing the Rotor voltage. After allowing time for the Set to speed up, resistance was reduced gradually, step by step. There was no set time between each step in this process; it was left to the operator to use his judgment. Eventually the Set was running at full speed and the DC Circuit breaker to the Main Mill Motor could be closed.

As a Foreman I had to carry out this “start-up” many times, but no matter how often I did it, I was always in awe of this machine; to be in charge of this massive piece of absolutely essential machinery was demanding. In addition, the Ilgner House was a very noisy place with all the rotating machinery; you had to shout loudly to converse with someone nearby, increasing the stress factor considerably.

These three generators connected in series fed the Main Mill Motor.

Main Mill Motor:

- 6, 650 HP (RMS)
- 1470 volts D.C.
- 3560 amps (RMS),
- Speed 0/62/150 RPM,
- Separate excitation at 220 volts.

This motor was housed in an annex to the Ilgner House. It stood on two pedestal bearings and was of massive construction. All the working parts were open to view. Memory can be deceiving, particularly after such a long time, but I think it stood about twelve foot above the floor with about eight foot below. The commutator was about three feet wide and again, from memory, it had 1180 com bars.

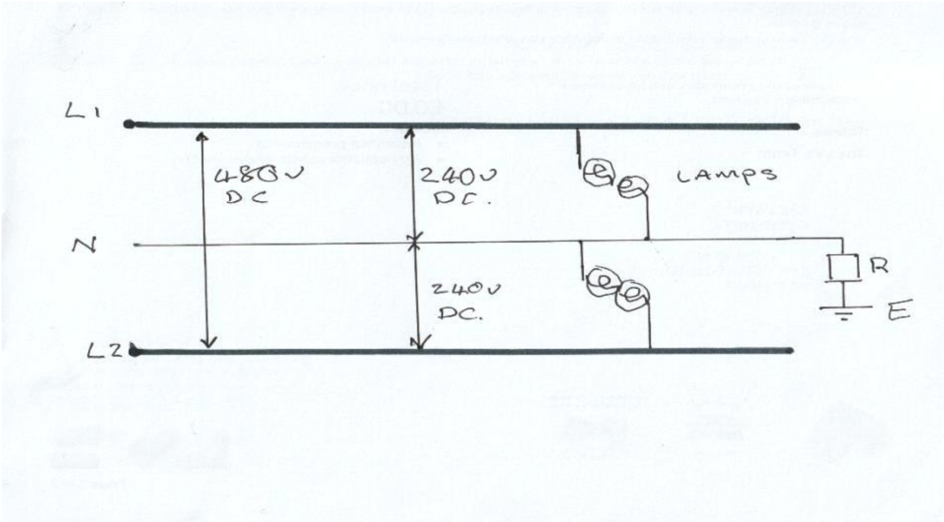
Rotary Converters:

There were four Rotary Converters in the Ilgner House. They provided the 480 volt DC around the plant. Later Silicon Rectifiers were added, but the Rotary Converters continued in operation until the plant finally closed.

These devices were a combination of a three phase AC synchronous motor and a DC generator, mounted on the same shaft. The main 11KV AC voltage was converted by a transformer from three phase to nine phase. The set was run up to speed by means of a DC pony motor fitted to the main shaft. Once underway at almost full speed the 11 KV is energised and a voltmeter and pulsing lights showed what the voltage was between the slip rings, by the pulses getting slower. When they momentarily showed zero, you quickly closed the copper knife blades and the machine was in synchronism. You could then switch off the pony motor and the Rotary Converter was ready for you to close the main DC circuit breaker and it then supplied the 480volt DC to all the works.

DC System:

The DC system worked on a 480 volt with a third earthed central wire. This gave 240 volts from each leg to the central wire and 480 volts across both wires. The very nature of the DC system meant that faults to earth were always a possibility. To keep the system operating in the event of an earth fault, the centre wire was connected to earth via a resistance such that the maximum earth fault current would not blow a fuse. However, if two faults happened in different locations from both lines, effectively a dead short on the system, could cause a major incident. Throughout the plant, in electrical workshops, indicator lamps were provided to show if the system had an earth fault on it. We became very skilled in looking at this and relating it to which piece of equipment was working and what the most likely cause was. For example, if the lamps went out then came back on, it would indicate the motor was being switched on and off. Then with all the staff looking, if the fault was on when a crane hoist was lowering and went off when hoisting, then this crane had a fault on its hoist circuit. It would be quickly taken out of service until an electrician could find and rectify the fault. Any delay could result in an unconnected fault on another machine and a serious failure to occur.



- Lamp normal brightness = OK
- One lamp off = earth on that line – fault action – find fault as quickly as possible, plant continues to work.
- Both lamps out = two faults -dead short on system action – shut down system and find fault.

Electrical repair Shop

This was where the motors, coils and other electrical equipment were sent for repair, mostly by way of being rewound. Most of the burnt-out plant motors would be repaired here but very large motors would be sent out to specialist repairers such as British Electrical Repairs Ltd (BERL).

This was a day work only workshop and all apprentices spent three months here. I learnt to rewind coils and assisted in the repairs to some of the larger DC and AC motors. It was very good and useful experience and gave a good understanding of the motors we were expected to maintain and repair when we became electricians in the main works.

As a day workshop, you worked with the same people every day, that had spent most of their working lives doing the same work, in the same place. As a result, they all got on well with each other, but the banter was never ending.

Electrical Installations

My three months with the installation gang was a useful learning experience, but I quickly decided it was not what I wanted to do. It was a group of about 20 electricians and mates with about 5 apprentices. We were sent to install electrical circuits to equipment all around the works. We mostly installed steel wire armoured (SWA) cabled circuits, from light gauge two core to very large double armoured cables, supplied on very large cable drums which took a whole gang of men to move around. Cutting and glanding swa cables became second nature. Cables at this time were imperial in size which was a complex and confusing system. Cables were given a size depending on the number of strands and it's CSA in each core. The smallest cable we used for power circuits was 7/029 which meant each core had seven strands of .029 square inch. As the cables got bigger the variation of core size and number of strands increased which meant it was almost impossible to know the cable capacity without reference to tables of cable data. Metrication in this field was a substantial improvement.

There was a continuous change of labour in this section as men from the contracting industry came and went as the contracting industry expanded and contracted. I was particularly fortunate that I was put to work with a cable jointer for two months. He was a Cornish man, Percy Bussell, a very pleasant man of short stature, and equally short patience. He "jointed" high voltage cables wherever it was required. This task required complete cleanliness to ensure a 11000 volt joint would not break down. Normally a trench was dug in the ground to expose the cable which Percy had to joint to another, a tent would be built to cover it and keep the rain or dirt off it. These cables were normally swa and lead covered, the cores were frequently paper in oil insulation. Cutting and exposing the cable required care to only cut what was required; jointing the core was usually by soldering. The heat for the soldering irons was provided by large and powerful paraffin blow lamps that were often problematic and didn't give the steady flame required to do the job. If Percy got into difficulty, he would throw the spluttering lamp out of the tent with a stream of curses while I and the mate tried to get another to work as quickly as we could. His mate Dewi was a quiet and intelligent man who previously had a senior management position but left after the stress got too much for him and wisely took the job as an electrician's mate with a considerable reduction in salary, but an increase in life expectancy.

Telephone Gang

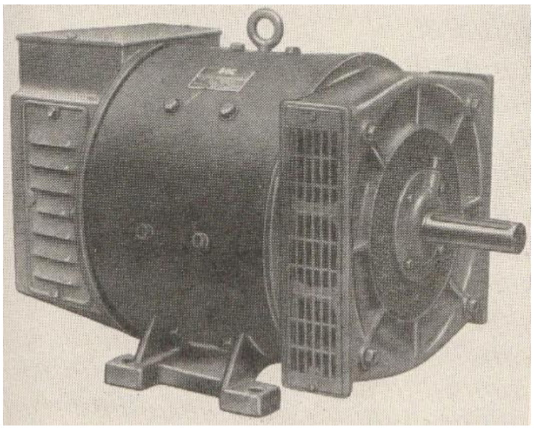
This was a small gang of 3 electricians and mates and one apprentice, maintaining and installing the internal telephone system. The works had its own PAX (private automatic exchange) system. We looked after the handsets and cabling from the "Uni-selector" exchange and the battery supply system. This covered the whole plant from the main office to the furthermost point of the Foreshore.

Working in the Mills

The primary responsibility of a shift electrician was to maintain and repair D.C. motors. Three basic types all at 480 volt DC:-

- Shunt - for requirements when a degree of accurate speed control was required such as the Flying Shear.
- Series - high starting power such as OH crane hoist and traction drives.
- Compound - a combination of series and shunt which gave good starting torque and high power, such as mill roller drives.

These motors were very robust and reliable but did require constant maintenance. All DC motors have a commutator, on which run carbon brushers which had to be checked to ensure they were free to move in their boxes, and replaced before they were worn too low. Carbon brushes cause carbon dust so, the inside of the motors had to be regularly blown out with compressed air.



Typical DC Motor

Motors out on the plant were fully enclosed with vents for cooling, motors within clean plant rooms were mostly open framed.

Within the steel works, almost every variation of motor drives was used somewhere, but the main method of DC motor control was Inductive Time lag control (ITL). This was where a series of contactors was set to operate in a sequence where the magnetism decay in the metal frame was controlled by an air gap in the metal and a capacitor, giving a gradual operation of each contactor was independent of the operator. The contactors were set to operate and increase the motor voltage in steps by shorting out a resistance in the Armature circuit. It was vital that the resistance was removed in a controlled manner, gradually. The operator would inevitably just throw over the controller to full speed, it was up to the ITL system to take over and apply the increase of the voltage gradually. This system required constant attention and maintenance by way of cleaning and replacement of worn parts. More than that it was a matter of pride that the equipment you were personally responsible for was in spotless and gleaming condition.

The Dowlais Works was one of the first in world to run a planned maintenance system. This was a system of different levels of planned work -

- Class A inspection, where the inspection of motor and control gear was visually inspected to ensure good condition, often on a daily basis.
- Class B Maintenance, where a full maintenance procedure was carried out with a full examination, cleaning and replacement of parts, often on a monthly basis.

- Class C test measurement of motor and all associated cables was measured with a 500volt Megger instrument. Measurements were recorded and sent to the head office, often on a yearly basis.

Each shift electrician would complete a daily shift report in a carbon copy book, one for each section. Here was recorded each breakdown, the action taken to correct matters and any time delay to production. This gave following shifts information on the problems of the previous shifts. Also, any preventative maintenance carried out in that shift and the results of tests taken. Each morning the top copy of the three shifts was taken to the head office, to be read by the section electrical engineer and the results noted and recorded. The carbon copy book was left in the electrical shop.

Shift electricians had always to be available to respond to a breakdown on any plant but particularly on the mill itself. A system of calls on the Tannoy was used, with one blast for fitters and two blasts for an electrician. If called, an electrician and mate would run to the mill landing where someone would tell him of the problem. Unless it was obviously a mechanical problem, the electrician would inevitably be called first. To understand how and why the electrical system worked as it did, you needed a good understanding of how the mechanical system worked, so it was frequently the case that the electrician would find the fault was a mechanical one and inform the fitters. It was rarely the other way around.

Permit to Work System

The permit to Work System was employed throughout the works; it was a safety measure that put a large amount of responsibility on the section electrician. If some person, or groups of persons, wanted to work on or near a piece of electrically operated equipment, he would apply to the section electrician for a permit to work and the electrician would isolate that particular electrical drive, most often remote from the drive. For example, if a fitter of greaser wanted to work on the approach rolls to the main mill, he would fill out the permit form stating the area he was intending to work. The electrician would date and counter sign the form, describing all the plant he decided, for safety, needed to be isolated. It could be that several different people would be working in the nearby area, each with his own permit. Each permit would be cross-referenced in all the relevant permits. The main switches to the relevant control panel in the control panel room would be opened and a permit Board with the permit number written in pencil on it would be hung on the isolated switches. All the permits had to be cleared before the supply to the plant was returned.

The system worked well, and I am not aware of any accidents caused by failures, but the system was full of faults that could easily happen in the high stress environment of a steel works. All the responsibility fell on the section electrician to ensure that everyone had completed the work and all the permits signed off before the electrical supply was restored.

Health and Safety

When I look back with the hindsight of current concerns regarding the health and safety of employees, I am astonished at the things we did and were expected to do.

Safety helmets were provided but seldom worn, I did not wear mine. The works sold safety boots at cost price and most of us wore them. They were made of heavy duty leather and when new were painful until worn-in but did last a long time.

Electricians frequently work near or on live electrical panels, but the practice that now I find almost unbelievable was gaining access to broken down gantry cranes. Each bay had several cranes, the main mill bay had about six. To get to a broken down crane we would climb the gantry ladder and walk the gantry to the broken down crane. Other cranes would be working normally in the bays alongside; we would simply stop alongside the girder that supported the roof until the cranes passed, and quickly slip past the girder and on to the next; climb onto the broken crane and climb down to the drivers cab. All this with an electrician, mate and frequently a apprentice; no hand rails and at a height of about 30 foot in the mills and considerably higher in the pitside. One man did get crushed between a crane and the girder, Wally Awan, he was badly injured and in hospital for months. He did return to work and was given a light job in the Ilgner house on my shift.

Week End and Stop Fortnight

The use of the Permit system was extensive during the weekend maintenance period of the final night shift on Friday, when production stopped, to the final night shift on Sunday, ready for production to restart on Monday morning at 06.00.

The last week of July and the first week of August were the Stop Fortnight when all production stopped, for the production staff to have their annual holidays. The maintenance staff were expected to work 12-hour shifts throughout this time. Overtime was paid, time and a half with double time for Sundays. This was the time that extensive dismantling of everything took place. The Mill drive shafts and gear boxes were dismantled; main motors were removed and sent to the central workshop or to outside contractors for overhaul. One of the most difficult and dangerous jobs was cleaning and checking the DC wires and Tee Rails for the overhead cranes, particularly the heavy cranes in the melting shop pit side and the rolling mill soaking pits and main mill bay. These cranes we supplied by rails in the shape of a Tee along the length of the bay supported at every 6 feet by porcelain insulators fixed to the main girder on which the crane ran. The collector gear ran against these Tee rails giving electrical power to the cranes. With the supply isolated, the Insulators had to be cleaned and checked individually. These bays we very high and an electrician, with a leather belt around his waist with a length of rope attached, had to lie on his stomach and lower himself over the edge until he could feel with his feet, the tee rail below then lower himself down and sit on the top rail. All that time, the only safety measure was the rope tied to a convenient place. He then worked himself along and cleaned the porcelain insulators, checking that they were all sound with no breaks or cracks. Faulty ones would be replaced, which was a difficult job in itself. I first did this when I was an 18-year-old apprentice. Not wishing to seem afraid, I did so, but I will freely admit that I was terrified. That moment when you lower yourself over the edge before you feel the rails with your feet was a real test of courage. Imagine that happing today.

By the end of stop fortnight, everyone was at the point of exhaustion and in need of a holiday, but we had to take our holidays on rota as replacements had to be arranged from the day staff to work our shifts. Our holidays would be from May to September with preference to married men with children given the school holiday times.

Promotion

During this period, I had taken a break from college but wanted to return to my studies for a HNC in electrical engineering. The understanding was that you first had to make time to attend college under your own efforts by changing shifts with another to get the time for a day-release course. The problem was the morning and afternoon shifts. I arranged for the man who would normally work the afternoon shift to work a double shift by working my morning shift, and I would pay him back by working a shift for him, normally working on from my afternoon shift to do his night shift, and so on. Once I had completed that year and got a Pass, the next year they gave me a day off with pay to attempt the second year, which I did successfully.

After about three years working as a shift electrician, I was told by my departmental engineer, Reg Keymer, to apply for a position as a shift charge hand on C shift with Albert Robinson as foreman. By this time, I was married with a small daughter. My salary was almost exactly £1,000 per year; the Steel works was never a big payer. So, the small addition to my pay was welcome indeed.

My job was to assist Albert as best I could whenever required. At first Albert was very cautious of me, being so young. And, with my qualifications being more than any other electrician, it was perhaps understandable. As it turned out Albert and I got on extremely well and my first experience in a supervisory position was most enjoyable. I would move throughout the mills when required assisting electricians when needed and socialising when time allowed. At first, I had some difficulty with my age but after a time, all was well. My only problem was they continued to refer to me as The Boy. After a couple of very enjoyable years with Albert, the position of Shift Foreman on D shift became available. This shift was considered a difficult one. The previous foreman had a very bad working relationship with the men and had suffered a breakdown. With considerable trepidation I applied and was interviewed by the Chief Electrical Engineer, Clem Dew and Reg Keymer, the mills electrical engineer. I was offered the job and after accepting, Reg took me to one side and said “take care with this shift, they are killers” Then Clem Dew stated I had been right to turn down his offer of a position as draughtsman when I finished my apprenticeship. I was officially welcomed to the “Staff” and given a white safety helmet showing my status as “Staff”, given a key to the staff toilets and the right of access to the staff canteen, where silver service was provided by young female waitresses. I never used the last two. The first few weeks were a little strained but we soon got on well and at the end I think we had the best shift of all. My charge hand was Connie O’Brian, who had played scrum half for Cardiff Rugby club.

I think was very fortunate with the men on my shift as I never had any significant problems with them and after time, we worked extremely well together as a team that I could rely on and who were always co-operative and helpful. One of my greatest regrets was to eventually leave them.

- Connie O'Brian.
- Paul Rantanen.
- Gwyn Ferris.
- Joe Mitchel.
- Graham Jones.
- Mark Toozer.
- Geoff. Polard
- Phill (the pill)
- Albert Sully.
- Wally Awan.
- Bob Morgan.
- Terry Burk

Pollution

The works being old produced high contamination of fumes, smoke and gasses. Some attempts had been made to improve where possible; for example the Precipitation Plant where smoke from the melting shop chimneys was passed through a chamber with several very high voltage electrodes. These electro-statically charged the metallic particles in the smoke which were attracted to the metal lining of the chamber charged to the opposite polarity. Every so often the plates were "Rapped" causing the particles to fall and be drawn out, bagged and put back into the furnace. It had some effect, but generally it was a dangerous, dirty, noisy and unpleasant place to live nearby.

Life after the steel works

In the early 1970s, it was announced that the works would be closed. To many this was a complete shock as the works was making a steady profit. The local Member of Parliament was Jim Callaghan. A "fight the closure" committee was set up and as a member of Plaid Cymru, I attended several of the meetings. An alternative plan was established with a proposal that electric arc furnaces would replace the melting shop, reducing overall costs etc, but to no avail. As I was married with two small children and a mortgage, I decided not to stay to the very end and get the substantial redundancy payment that most of my co-workers would do, but instead I would look for another job. Work was not easy to find then as coal mines and other large industries were closing over the whole country.

My first attempt was successful, and I obtained the post of site engineer with Mid Glamorgan County Council Architects Department, supervising contractors on various sites but centred on the expansion of the Polytechnic of Glamorgan, Trefforest, where incidentally I had studied as a student.

Leaving the steel works was a big wrench for me as it was the only thing I knew. As the day grew closer, I had severe doubts that I was doing the right thing. Everybody assured me I was, but I was full of trepidation. When the final shift took place the last thing I did before I said my goodbyes was to walk around the mills plant by myself for a last look at something that had been so important and formative for me. At the age of 28 I left the steelworks.

I did return for a visit several years later when the works was being pulled down as Connie O'Brian, my former charge hand and several of the men on my shift had set themselves up in a contracting company to maintain the overhead cranes and other plant necessary for use by the demolition contractors. I took the opportunity to salvage several of the big motors name plates and several of the schematic drawings.

The work with Mid Glamorgan was completely different from the engineering I was used to and it took some time to acclimatise. For example, the last major job I had to supervise was the replacement of a main hoist brake assembly on the 90-tonne crane over the Cogging Mill. This involved the electricians, fitters and riggers removing the old brake and transporting it to the repair shop. A replacement brake was in the motor store in a building some way away from the works. Checking to assure that is was a suitable replacement, arranging transport and having it delivered to site. Getting the riggers to hoist it up to roof level and lowering it to its location then the fitters and electricians fitted and connected it and set it to work. All this while the mill underneath us was working at full speed, and under the pressure that the crane was urgently needed straight away.

My Position with Mid Glam was largely in building services, and my first problem was on a new fire station in Tonypandy - to determine if a length of steel conduit was installed straight enough to be acceptable. I really wondered what I had done and doubted that I could cope with such trivia.

Working in an office with female staff and the procedures of everyday office life was a learning experience. The greatest stress they experienced was if the Tea Trolley Lady was early or late. However, there were substantial advantages to this new job - I was earning from day one, the same salary as I had as a shift foreman. But most of all, I could go to bed to sleep every night of the week and had every weekend off, so more time with my family. And I had clean clothes every day. Two things surprised me, firstly, I had to cut my fingernails regularly, and secondly, I stopped getting mouth ulcers. I and several others were continually plagued with these, and we struggled to find a cure. It had obviously been stress related.

My steel works experience was of little value in the architect's department where Building Services Design was the primary skill, but I did have the odd occasion to use my past knowledge. Once when I solved the problem that had caused a difficulty for several years by blowing fuses on a concrete crusher in the test lab of the construction dept. at the Polytechnic. It took me a few minutes to find that the mechanical interlock to the star/delta starter was missing. Something very basic, but it made my reputation, as most of the other engineers had never seen one.

On another occasion, I parked my motorcycle in the basement one morning and found all the senior electrical engineering staff in the main switch room trying to solve why the main fuses to the whole office block were blowing. They had been there all night and had failed to find the problem and were at the point of exhaustion. I walked in and removed a panel cover, shone a torch into the panel and found the fault immediately. I spotted the telltail sign of Blue Dust that was an indication of an occasional short circuit caused by the slight movement of cable when energised. They begrudgingly admitted I was the hero of the day. I immediately requested and received a promotion, but it really was a simple problem for someone with my experience of high current fault finding.

I worked for Mid Glam for 18 years rising to the position of Principal Design Engineer. I decided to leave there when I was told by the Chief Architect that I would never be the Chief Electrical Engineer as I didn't have a degree, this despite the fact that I had higher qualifications than the two previous chief engineers. My children were now grown up, my mortgage was paid, I felt the need to do something new whilst I was still in my forties. I applied for several jobs and in my first interview I was offered and accepted the position of Lecturer in Bridgend College of Further Education Something completely different and another challenge to overcome. I enjoyed my time in Bridgend College dealing with the more academic side of engineering. I particularly enjoyed my time with the young students, and the mature students in evening classes. I worked for Bridgend College for 15 years, when frustrated by the continual, increase in administrating duties and less class contact, I took early retirement.

Now in old age I can look back and understand how influential was my time in the steel works; it was supremely important in making me the engineer I became and the person I now am. I was so fortunate to have the opportunity to work on a large variety of equipment and to work with and learn from such outstanding engineers.

I consider it to have been a privilege to have shared the good times and the bad, the struggles and the laughs with such a outstanding group of workmen.

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