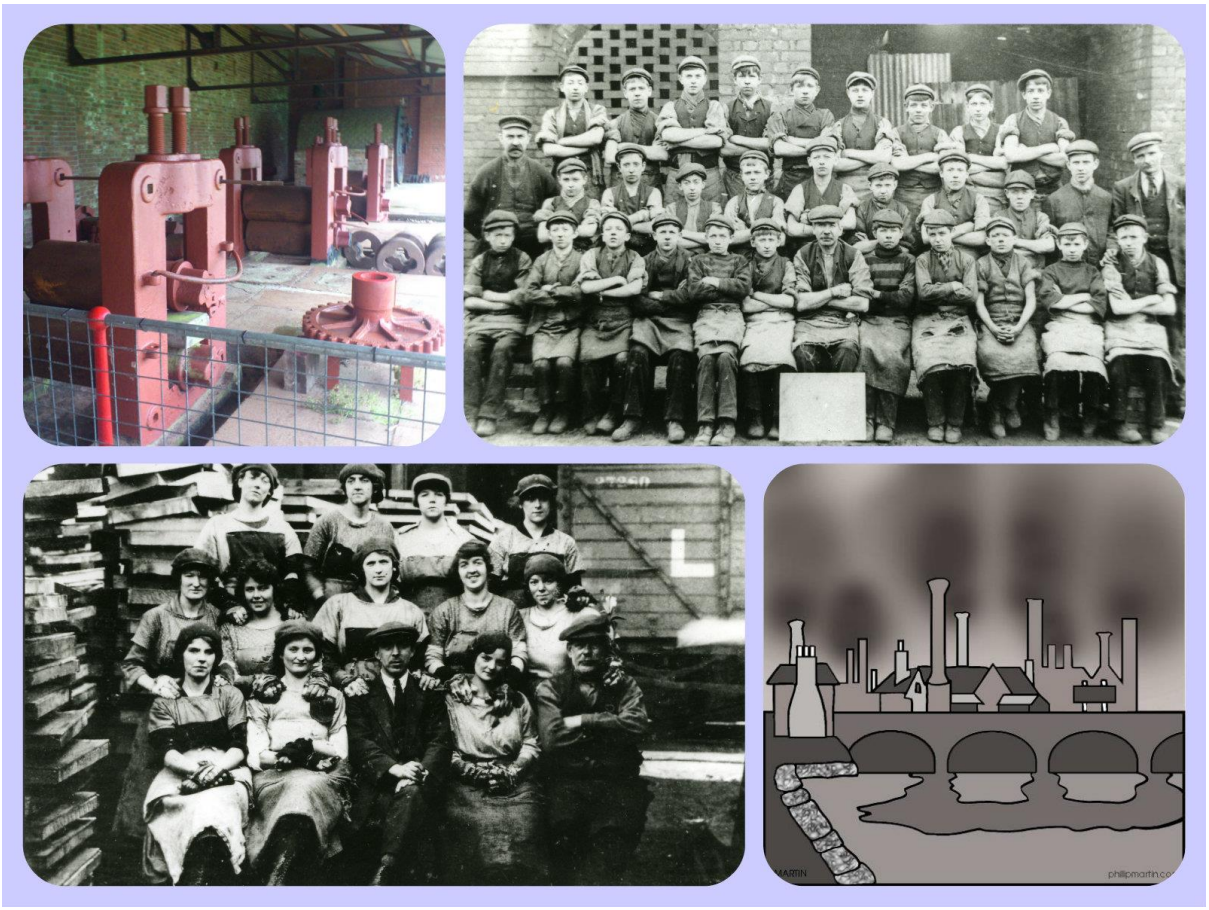
Kidwelly Industrial Museum Education Pack



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Photographs and Drawings
Kidwelly Industrial Museum has a wide range of photographs and drawings that can aid in classroom activities. Please contact the museum outlining your specific requests and we will attempt to match your requirements.

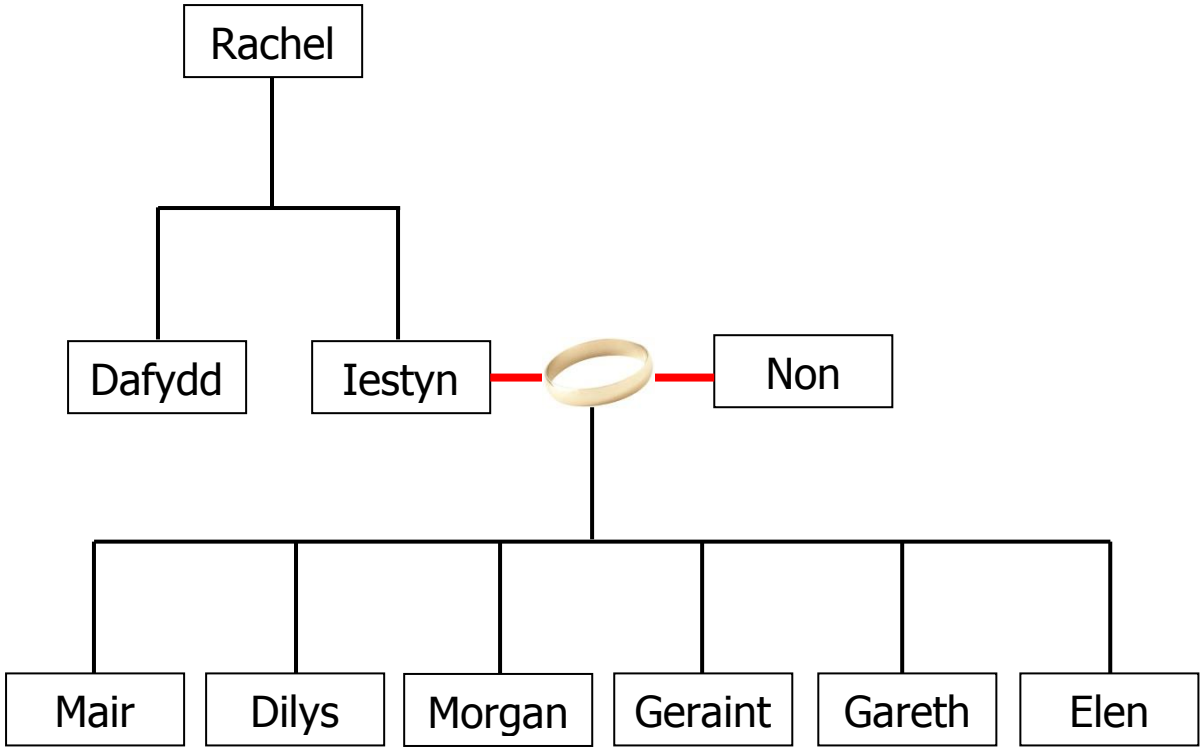
1. Background Information

(i) The life of Gareth Jones aged 10

The theme of the visit is a day in the life of Gareth Jones in 1881.

a) Gareth's Family Members

1) Gareth – 10 years old
2) Father – Iestyn - 37 years old
3) Brother 1 – Morgan – 18 years old
4) Brother 2 – Geraint – 16 years old
5) Uncle Dafydd – 35 years old (lives next door with his own young family)
6) Sister 1 – Mair – 20 years old
7) Sister 2 – Dilys – 19 years old
8) Mother – Non - 36 years old
9) Grandmother – Rachel – 52 years old
11) Sister 3 - Elen – 8 years old



Gareth, (10 years old)

This is Gareth and before he started work on his 11th birthday, he would have worn clothes that more than likely would be "hand me downs." This meant that they either had been previously worn by his brothers or were worn by neighbours' children. As Gareth grew, his clothes would be passed on until they were unfit to wear then they would be cut up into rags for Mam to use to clean the house. Gareth's shoes would be made to last as they were expensive items to buy. As the soles wore down a member of the family would "tap" them, which meant that they'd have broad headed nails tapped into the soles.

However these were unsuitable for the metal floors of the Tinplate works as metal on metal can cause sparks so wooden soled shoes or clogs would be worn.

Father Iestyn, (37 years old, Hot Roller)

The head of the family would have been the father and Gareth's father was called Iestyn. He worked in the tinplate works as a Hot Roller.

The area where he worked would have been over 100 deg.F. (38 deg.C) which is the same temperature as the Sahara desert in the middle of the summer, and it would have been very dusty and extremely smelly. The smell would catch the back of his throat and it would have been a stinging and burning sensation while working there. The noise would have been louder than anything you can imagine so much so that people would have to read each other's lips to be understood.

Gareth's brother **Morgan** was a Pickler which meant that he was constantly breathing in acid fumes and risking being burned by acid spilling on to the skin. Worst of all was the fact that the fumes from the acid would eat away at Morgan's teeth. He didn't have one tooth left in his mouth and he was only 18.

Gareth also had a 16 year old brother called **Geraint,** and he was an Annealer. His job was to place steel plates into the annealing furnace to be heated for between ten and fourteen hours and then remove them to let them cool for 2 days!

Once he took the steel plates out of the box in the furnace, he had a very hard job to do as the heat had made the steel plates stick together. To separate them, he would get a big sledge hammer and bash them apart.

Dafydd was Gareth's 35 year old uncle and he was a Tinner. This was when the finished steel plate would be covered with molten tin. Molten is another word for melted. The Tinner was one of the most difficult jobs to do so it was always carried out by a very experienced and well trained worker.

Gareth also had two sisters called Mair and Dilys and they worked here too. **Mair** was 20 years old and she was a Cold Roller. They were called the Cold Rolls because the steel plates were rolled when they were cold.

They rolled them in very large machines to make sure that they were completely flat without any bumps. Believe it or not, but this extremely hard work was considered women's work.

Dilys was 19 years old and she was a polisher. In Gareth's time the cleaning and polishing was done by hand and not by machine. After the steel plates had been coated with tin, Dilys' job was to shine them with sheepskin mitts so they'd be bright for the customer. This was very time consuming and hard work.

Gareth's **grandmother** and **mother** would have looked after the house and stayed at home as married women could not work in the industry until 1930.
She would have collected berries and mushrooms to sell in Llanelli market because she knew that her husband wouldn't be able to carry on working into his 40s.
Gareth's mother and grandmother would have earned extra money by selling home-made ginger beer to the workers which was called "diod faen." They thought that it was very good for keeping workers' throats and lungs clear in the fumes and dust of the works.

As it is now 1881, **Elen** aged 8, Gareth's little sister, would have to go to school by law and the family would have to pay, usually around a penny a day – which was a lot of money in those days.

b) Houses

When Charles Gwynn built his tinworks in 1737, he also built houses with gardens for his workmen on Bank Shintor, which was also called Sanctuary Bank.

As the success of the tinworks grew the population of Kidwelly and the surrounding areas grew too as more workers were needed. This meant that more houses needed to be built resulting in a boom in house-building.

1861 - 1,652 people
1881 - 2,510 people
1891 - 2,732 people

By October 1881 the new owner, Thomas Chivers, had completed forty, two-storied houses, with gardens, grouped in two parallel rows of twenty and separated by an alley on the outskirts of the town. They were built alongside the road leading to the works and were known as Gwendraeth Town or "The Forties." He also built ten cottages (Newtown) on Mynydd y Garreg, overlooking the works, four at the Siding, and five at Tycoch.

The Tin Works owners weren't completely altruistic in their purpose when building these homes as they also gained financially from the rents that they charged for their workers to live there. In order to pay the rent, sometimes large families would live in just two rooms and use the other rooms to take in paying lodgers.

Having gardens helped the families as they could grow their own food and keep chickens and sometimes would share the ownership of a pig with other families. They also had the advantage of having their own outside toilet that was usually at the bottom of the garden called a tŷ bach. Fresh water was usually collected from a single pump in the road.

Cooking and washing was centred around the fire in the kitchen/living room. As there wasn't a bathroom, bathing would take place in front of the fire in a large tin bath. The whole family would bathe in the same water, each person taking his or her turn in order of status in the family!

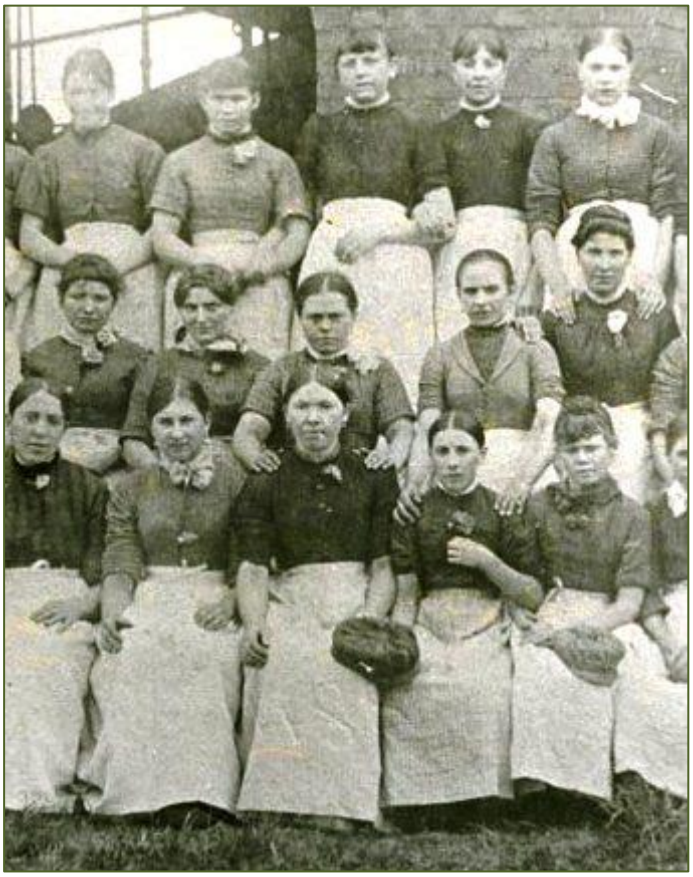
c) Clothes at work

The Tin Works owners did not supply any protective clothing to their workers as is done today so the workers had to buy everything themselves.

The men would wear:

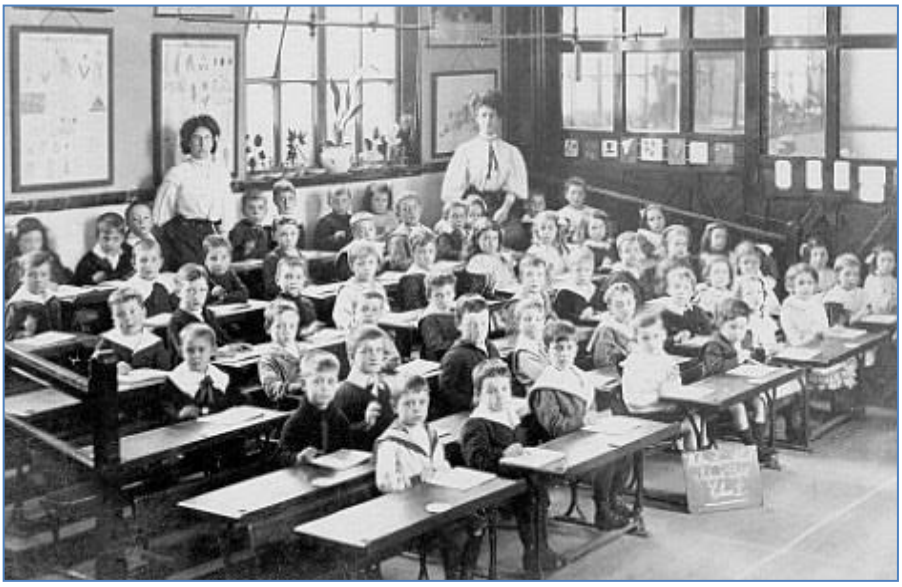
1) Knee length woollen stockings to protect the knee joints from the heat.
2) Trousers with a wide leather belt.
3) Wooden soled clogs with leather uppers with thick paper tied to the boot to provide extra protection from the heat.
4) Short sleeved shirt of Welsh flannel with no neck band or collar to chafe the skin. This was a short shirt and was worn outside the trousers to let the air circulate around the body. This was called a *crys bach (small shirt).* It was always blue in colour as it didn't show the dirt or sweat.
5) A perfectly laundered white sweat cloth around the neck, which was also used to protect the face.
6) A perfectly laundered ankle length white canvas apron although for certain jobs that needed extra protection, this would be a leather apron.
7) A peak cap to protect the face from the heat.

The women would wear:-



1) A flat cap like the men.
2) A perfectly laundered white linen apron.
3) Sturdy shoes or clogs.
4) A perfectly laundered neckerchief.
5) High buttoned blouse and long skirt.
6) Gloves or mittens to protect their hands from the sharp edges of the metal plates. The 'openers' also held a piece of lead in their gloves to help separate the tin plates after the rolling and doubling.

d) Education



School

It was not compulsory for children to go to school before 1870 so it's not surprising that at the start of the 19th century very few children went to school as it was not free. Most poor children worked, so if they went to school, their families would have lost the money they earned. During the early Victorian period it tended to be only the children of wealthy families that went to school or were taught by a governess at home.

Reformers campaigned for new laws to improve working conditions for children and give children the opportunity for schooling.
In 1870 Parliament said there had to be a school in every town and village and a law was passed that led to the setting up of 'Board Schools' in each area for children between the ages of 5 and 13. These 'School Boards' were made up of local people who built and ran these new schools.

By 1880, the law said that all children aged between 5 and 10 had to go to school, so that every child would receive at least a basic education. Unfortunately the families were obliged to pay for the education their children received. Families paid a few pennies a week to send their children to school, which caused problems for some poorer families.

It wasn't until 1891 that education was made free for all children.

e) Sunday School

As many of the schools were not free, for many, the only school available was the Sunday school.

In Wales there were clear links between the Sunday school movement - the Society for the Establishment and Provision of Sunday Schools - and the Circulating schools of Griffith Jones.

The first Sunday Schools were founded in London in 1780, and a few were established in Wales by 1797.

Thomas Charles was the chief benefactor in aiding the Sunday Schools in Wales, as it was he who built the structure of the Sunday School in Wales and was the chief agent in providing Welsh bibles. During the nineteenth century it was only through the medium of the Sunday School that the people of Wales learned to read in Welsh.

The nonconformist chapels also offered a range of social events for the workers which the Anglican Church did not. If you were a member of a chapel then you could attend meetings throughout the week as well as three services on a Sunday compared to the one in a church. These events and meetings would include a Band of Hope for the children, Eisteddfodau, penny readings, sisterhoods and choirs where participants learned to read music using a system called 'sol fah.' The annual Gymanfa Ganu was also a very popular event.

These Sunday Schools are considered to be the vital factor in keeping the Welsh language, its religion and culture alive during this time when industrial development in Wales was attracting immigration at an unprecedented scale.

Welsh was the language of the nonconformist chapels in Kidwelly and in 1851, the religious establishments were:

Kidwelly Parish Church -Thomas Griffiths, Vicar
"Remarks: [MS torn] . . . Lords day in this Town is but very little regarded as a day for spiritual worship [pub] lick houses are allowed to be open, and frequented during Divine Service. Publick [hou]ses are very numerous in this place, and even the Town Clerk keeps a . . . publick house. Often times on the Lord's day we are not only hear cursing and . . . once swearing in our streets, but frequently we see most brutal fighting, and . . . [n]otice taken thereof by the authority of the Town. This is the cause why places [of wor]ship are so little frequented and religion so little appreciated and professed at Kidwelly."

Bethesda (Welsh language Wesleyan erected in 1816)

Trinity Methodist Church (English language Wesleyan erected 1866)

Capel Newydd (Erected in 1830)

Capel Sul (Erected in 1787, re-erected and enlarged 1831)

Siloam Baptist (Erected in 1821)

Horeb (Erected in 1841)

The owner, Thomas Chivers, was a Wesleyan Methodist and was very involved in the erection of this church. W.H.Morris wrote,

"By 1865 it had become clear that Bethesda was too small to accommodate the membership and Chivers declared his intention of building, at his own expense, a more commodious chapel for the Society. In April 1866 he acquired from the Corporation the freehold of a cattle pound near the town bridge….
Work started on a small reading room, afterwards the schoolroom, in which services were held during the completion of the chapel. Both were designed by T. W. Angell Evans, a Kidwelly architect, who gave his professional services free. The construction was carried out by Francis Randall, a member of the Kidwelly Society. There was seating capacity

for 200 and a gallery was provided for the choir. The estimated cost was given as £650 and the estimated annual income as £18/10/0, according to the 13th Report of the Wesleyan Chapel Committee.
The Dedicatory Services were held on Friday, October 19th, 1866, and on the following Sunday. The Friday Service was conducted by the Rev. W. R. Rogers, Chairman of the District, and on Sunday by the Revs. Joseph Higham, Thomas Thomas (in Welsh), and John Philp of Carmarthen. Higham, an Englishman, had been appointed resident minister some six weeks before the completion of the chapel and had conducted services in the reading room. Chivers supplied him with a house and paid his salary. His appointment meant, however, that Conference had utterly rejected the compromise put forward by Nicholas and his group whereby the wishes of those who preferred services in Welsh might well have been satisfied by the stationing of Thomas Thomas at Kidwelly. A split now took place in the Society. The older members, in particular, resented English influences and were unable to give up their loyalties to the Welsh cause and the Welsh circuit to which they had belonged for forty years. They continued to worship in Bethesda."

Extracts taken from 'Wesleyan Methodism in Kidwelly.'
Trinity Methodist Church Centenary Brochure 1866-1966 by W. H. Morris

(ii) Process of making tinplate at the Kidwelly Works

a) Basic Needs:-

Iron and steel	Tinplate is made by rolling out iron or steel bars until they become very thin plates.
Tin	Once the bars have been rolled until they wafer thin, a very thin coating of tin is placed on each side of the iron. Tin was brought in ships from Cornwall.
Good transport	In order to import raw materials and export tin plate, good transport and communications are essential. First canals were used then railways and roads. Docks and harbours are also vital in order to import and export.
Water	A fast running river provides motion power and also steam. There is a great need for water in the process of producing tinplate.
Coal	In 1879, steam power came to the works, so like steam trains, coal needed to be burnt to heat the water to produce the steam to drive the engines. Local coal was always used from Gwendraeth Valley and Pembrey.
People	The tinplate industry depended on a large workforce and it was labour intensive. The people would be skilled and unskilled men, women and children who lived locally with some coming from other parts of Britain and abroad.
Money	Investment from businessmen was needed.
Land	Space near to water and good transport to build the Works.

b) Each Stage in the Process of making Tinplate

The production of tinplate in the late eighteenth and early nineteenth centuries was complicated.

Bars of wrought iron or steel were ordered from steel works in Llanelli and delivered to the works' shed by railway line.

Once arrived they would be cut to the required size in the cutting shed. These cut lengths were taken to the Hot Rolling mill. Initially, the unit was powered by water. Here at Kidwelly from at least 1879, the units were mainly powered by steam.

The **furnace man** placed thirty six steel bars in the bar furnace. These were heated to a 'blood-red' colour and then taken out in pairs.

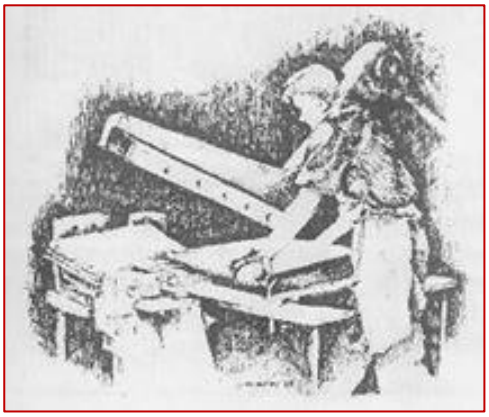
The scale and dirt were removed by a shock-dip in a bosh or container of cold water.

The **Rollerman** seized one bar with tongs then passed the first bar through the rolls, which were continually turning, powered by steam.

The man on the other side of the rolls, the **Behinder**, caught the bar with his tongs and passed it over the top, back to the rollerman, who in the meantime had inserted the second bar into the rolls.
This was repeated four or five times until the bars were rolled into thick plates called singles.

Then the **Doubler** grasped the hot single sheet with his tongs. He doubled it and squashed the fold with his boot. He then lifted it onto the table and flattened the fold with the squeezer. The doubles were re-heated and rolled to twice their length. Before the metal was doubled again.

A strip was then sheared off the open end of the pack. The man who did this was called a **Shearer**.

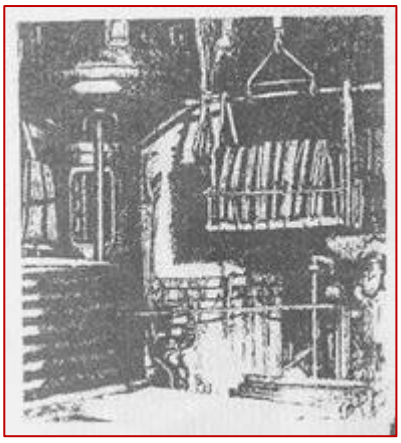


The next stage of the process was to open the packs and separate out the plates as during the rolling process the plates would often stick together.

1) The **Opener** stood the pack up vertically.
2) She used a small pad worn on the palm of the hand - made of leather with a piece of lead attached - to open the pack.
3) The sheets were then pulled apart by hand with a sweeping movement. Some plates had to be separated using a long sharp knife called a hanger or sword. Cuts and similar injuries were quite common. The openers discarded damaged plates and stacked the rest ready for the pickling process.

The plates now left the Hot Rolling Mill and were sent to another part of the works to be black pickled and then black annealed.

They were pickled in order to dissolve the scale on the plates.



Kidwelly Works used the Millbrook Rotary Pickling machine which carried three cradles. The plates were stacked in racks in a cradle then, as one sheet was in a tank of hot dilute sulphuric acid being plunged up and down, (to dissolve a thin oxide or scale layer formed on the plates) the second was plunged into a tank of cold water, (to rinse it) while the third was being unloaded of clean plates and reloaded with dirty plates.

Because of constant heating and rolling the steel's structure had weakened and become quite hard so, to remedy this, plates were heated to an intense heat. This process was called **annealing.** It made the sheets softer, more ductile and removed surface moisture and impurities.

The **Annealer** would:

1) Stack a pile of pickled plates onto a shallow metal stand.
2) This was covered by a steel box or pot called a bogie.
3) The pot and stand were sealed air tight with sand.
4) They were then put into the annealing furnace. They were heated for between ten and fourteen hours.
5) They were then removed and allowed to cool for forty eight hours. By now the sheets were stuck together and their surfaces were uneven and porous. First the sheets had to be separated. Often, this was done by shocking them with a sledge hammer.

The plates now went on to another part of the works called the Cold Roll Mills to remove any unevenness and to provide a better texture for tinning.

In the Cold Rolls the plates were rolled without heating to correct the unevenness and burnish the surface. The cold rolls were classed as women's work, although boys could also work here. As their pay was nearly the same as the girls, boys often started working in the industry in the cold rolls.

The Operator rapidly fed the sheets through the roughing, intermediate and finishing rolls one by one.

White Annealing

The sheets were now even, with closed pores, but were also hard again. This was corrected by white annealing. This was similar to black annealing but at a lower temperature and for less time.

White Pickling

White pickling followed. This was similar to black pickling but at lower acidity and temperature, and for a shorter time.

This involved soaking them in bran lees for twelve hours and, afterwards, in dilute acid, and then scouring or cleaning them with sand and water. The sheets, (now called black plates until they were ready for tinning) were kept in a bosh (large sink) of a lightly acid water. They would not rust even though they were allowed to remain there for a considerable time

The plates now went on to the next process, which was the Tinning.

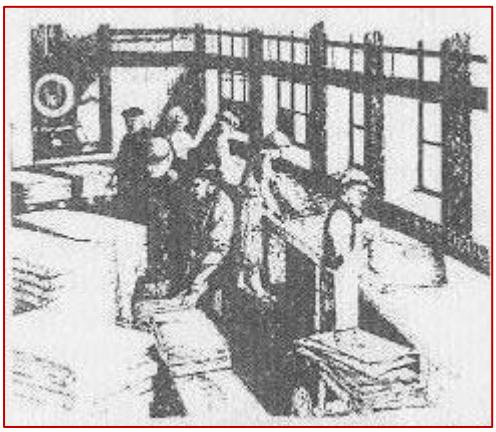
This job was highly skilled. Each tinning set or stack had two tinning pots, a grease pot, a cleaning and polishing machine and sometimes mechanical rolls to carry the plates.

The plate passed through a layer of flux (a chemical cleaning agent, flowing agent, or purifying agent) into the molten tin. The flux cleaned and prepared the steel plate's surface so the tin would stick. This was done at a very high temperature to heat the steel plate as well as cover it in tin.

The steel plate then went into the second tin pot with molten tin at a lower temperature.
From the second pot it was fed into the grease pot, containing hot palm oil. Here the tin was spread evenly and thinly. The tinned steel plate then went into a hot soda bath to remove the oil.

Next was the cleaning and polishing
Cleaning and dusting were generally undertaken by three girls. This occurred in a special machine equipped with cotton covered rolls. A stream of sawdust or cereal bran fell on to the cotton rolls absorbing the oil and cleaning the plates.

They were now moved to the Assorting Room to be sorted and graded



Assorting and boxing were the final parts of the process. It had taken about 150 hours to get from bar to boxed tin plate, ready for the customer.

This is what happened:

1) The plates were brought to the Assorting Room on trolleys from the tinning house.

2) Each sheet was very carefully but quickly examined.

3) It was weighed and graded by the men and women workers.

4) Poor quality or damaged sheets were recycled.

5) They were counted by the reckoner and then packed into boxes. Boxes contained 56, 112 or more often 225 sheets.

6) The boxes were then labelled and bound.

7) From the assorting room they were taken to the boxing room. Essentially this was a room where they were stored ready for dispatching to customers all over the world.

8) The doors in the boxing room opened on to a railway track. The doors were at the same level as the floor of the railway trucks, so that the boxes could be easily loaded. The track connected to a branch line serving the quarries in Mynydd y Garreg.

9) This then connected to the main line network at Kidwelly. The plate was soon on its way to manufacturing centres or ports for export.

c) Working Life at the Kidwelly Tinplate Works at the End of the 19th century.

The Tin Plate works was a major employer in Kidwelly. It employed 150 workers in 1871 and 350 workers by 1908. Although working conditions were harsh, there was great camaraderie and the people worked well together, even playing tricks on each other, e.g. potatoes were roasted around the edge of the annealing pot containing cooling metal sheets. Drinks in a stein (drinks container) were kept hot on the top of some of the machinery. Sometimes, an unsuspecting newcomer was persuaded to place his food or stein in a very hot spot so that when he returned to eat or drink, the whole thing had melted away!

When the works was in full production a family's income would be good - and higher than that of coal miners.
However, workers were paid on the amount of tin plate produced. They could be laid off if the market was poor or there was not enough water in the river to power the wheels. Production would stop if a roll broke which also meant that the workers would not be paid.

There wasn't any unemployment benefit so life without wages was hard for workers and their families. The community supported the families through these periods with hand outs and soup kitchens.

In 1871 workers in west Wales had formed a union called the Independent Association of Tinplate makers. In 1872 they asked for an increase in wages but the employers refused to negotiate.
They said,
"So long as tinplates continue to be manufactured in South Wales, the employers would endeavour to manage their works without the aid of trade union officers."

The Kidwelly men had asked for an extra halfpenny per box of tinplate produced. The owner, Thomas Chivers not only refused but also terminated their contracts and other employers followed suit resulting in the Works being idle for nearly four months. The owners formed their own association and resisted union demands. The Works were eventually re-opened, but the union was not recognised. A new wage structure was agreed between the owners and representatives of the workers and a structure for the amount a worker was paid was agreed upon. This was called the "1874 list" and it became the basis of wages until the 1950s.

In December of 1887 there was another stoppage, but not because of lack of trade or falling prices, but because the owner, Thomas Chivers was unable to pay his mounting debts.

The Mayor, Thomas Griffiths, issued an appeal on February 10th, 1888, for subscriptions to relieve the distress caused by the stoppage:

"The Relief of the Distress in Kidwelly.

In consequence of the sudden stoppage of the Tinplate Works in December last, whereby about 700 hands were thrown out of employment, the distress in Kidwelly is very great. The Board of Guardians have dispensed relief to the best of their ability but it is now up to the inhabitants to do what they can to alleviate the widespread suffering caused by the closing of so large a works in a small town at this inclement season and which works have, for many years, been the main support of the working population of the neighbourhood. A Public Meeting will be held and a Committee formed to collect subscriptions."

d) Working Conditions

TABLE 1: *Occupations of male workers, Kidwelly Tinworks*, 1881

Annealer	2	Apprentice	1
Assorter	2	Baller	3
Bar Roll Catcher	4	Boxer	2
Behinder	11	Carpenter	1
Brunner	3	Cold Rolls	6
Clerk	2	Doubler	6
Contracter	1	Engine Fitter	1
Engine Driver	4	Forgeman	2
Fireman	1	Furnaceman	11
Forge Foreman	1	Melter	1
Iron Worker	4	Pickler	7
Night Overseer	1	Puddler's Helper	3
Puddler	27	Riser	2
Refiner/Finer	5	Assistant Roller	2
Rollerman/Roller	20	At the Tin Rolls	3
Roll Turner	2	Shearer	2
Scaler's Helper	1	Shingler's Helper	1
Shingler	4	S[?orter] of Tin Boxes	1
Smith	1	Tinman at Tinworks	7
Superintendent Tin house	1	Watchman	1
Washman	10	At Tinworks/	
Weigher	1	Tinworks labourer/	
		Tinworks worker	80

Total — 251

A tinplate works was not a safe or pleasant environment to work in.

This was because:

- The work was heavy, noisy and unbearably hot.
- There was danger everywhere from hot furnaces, moving machinery, heavy weights and sharp metal edges.
- All the machinery was unguarded and continually moving.
- Burns and dangerous cuts were common injuries. Openers tried to protect their hands and arms with rags to avoid deep cuts.
- Picklers breathed in acid fumes and risked spillages.

- Men sweated profusely and needed to constantly drink liquids which could amount to 40 pints in one shift, which could last up to twelve hours.
- Working and safety equipment was not usually provided by the owners and managers.

Official reports describe the working conditions as,
"laborious and carried out in trying conditions of high temperatures".

TABLE 3: *Age Range of Male Employees at Tinworks* 1881

Age	Number	Age	Number
10-14	10	15-19	51
20-24	47	25-29	34
30-34	35	35-39	21
40-44	23	45-49	13
50-54	6	55-59	3
60-64	3	65-69	4
70-74	1		

TOTAL — 251

Men working in the Hot Rolling Mill

In the hot rolling mill the heat was over 100 deg. F. and the glare of the furnaces together with poor ventilation caused excessive fumes and dust.

The effort of swinging red hot metal sheets that weighed up to 40lbs at the end of a pair of tongs was exhausting. Team work was of vital importance and men would exchange jobs when muscles became too tired. Sometimes fatigue would begin to set in during the night shift, but was likely to be alleviated around 3.00 am when one team member would break into song and soon everyone would be singing which would boost their energy levels.

There were no old men in the mill as no-one lasted in the mill beyond the age of 45. These men were on piece work (paid by the amount you produced) and working to keep pace with the machinery.

The Role of Women in Tinplate Production

The tin plate industry employed a large percentage of women.
In 1881 there were 35 women and girls working at Kidwelly tinworks, mainly daughters of workers at the tinworks or elsewhere in the parish. This was 12% of a workforce of 287 and about the national average. However 80% were under 30 years and unmarried.

Mrs Margaret Ann Morgan, 93 years old, remembers working in Kidwelly Tinplate Industry.

"We were paid 10 shillings (50p in today's money but worth a lot more at the time) every fortnight – and worked like slaves seven days a week."

Mrs Morgan maintained a strong family tradition by following her father, three brothers and a sister into the industry, but the effects of the weak acid solution used to clean oxide from the tinplate led to her losing her teeth by the time she was 18 years old.
Mrs Morgan used to get up at 4am to walk to work by 6 o'clock and is nevertheless proud of the fact that she helped to make Kidwelly tinplate the *"best in the country."*

"It was hard and thirsty work – and we used to make gallons of ginger beer every day. I can't get over how women go to work in their Sunday-best clothes these days. I had to wear clogs or boots – and I didn't earn enough to buy a new pair."
Mrs Morgan believes it was harder learning the ropes back then, because now technology has made work at the highly-automated Trostre and Velindre plants "too easy."
"They only have to press a button nowadays," she insisted.

TABLE 2: *Age Range of Female Employees at Tinworks* 1881

Age	*Number*	*Age*	*Number*
15-19	21	20-24	3
25-29	5	30-34	2
35-39	0	40-44	1
45-49	2	50-54	1

TOTAL — 35

Women worked in a range of departments:-

1) Separating plates in the hot mill
2) Feeding plates into the cold rolls (corrolls)
3) Loading and unloading plates in the pickling
4) Cleaning and sorting plates in the assorting room.

The Role of Children in the Tinplate Industry

In 1881 there were 51 boys and young men working at the Works. There were also 10 boys aged between 10 and 15 employed. The first job of many boys was to ensure a supply of drink to the hot roller men – tea, water and ginger beer. Children would take food and drink to their parents and in winter, when it was cold, they would play around the warm buildings.

(iii) What is……?

a) Tin

- Atomic Number: 50
- Atomic Symbol : Sn

It is a soft metal with a shiny silver colour, and is very corrosion resistant in air and water.

Tin is a basic chemical element that actually exists on its own, in its pure form.

Physical Properties

- **Strength:** Tin is one of the weakest metals. You can, for example, bend or crush a tin can with your bare hands. This property does not allow tin to be used on its own as a structural metal.

- **Ductility:** Tin is a very ductile metal at room temperature, and is also quite malleable. When chilled below 55 degrees Fahrenheit, tin slowly changes from a form known as "beta tin" to "alpha tin," which is much less ductile. Tin is also much less ductile above roughly 392 degrees Fahrenheit. An interesting fact about tin's ductility is a phenomenon known as "tin cry." While tin is being bent, it emits a screeching nails-on-chalkboard sound. This occurs because the layers of molecules in the metal are sliding over one another and resolidifying, also known as twinning, allowing the metal to bend without breaking.

- **Conductivity:** Tin and some of its alloys are excellent electrical conductors. Over half of the tin used industrially ends up in solder for making electrical connections.

Alloys of tin include:

Bronze (combination of tin and copper)

Pewter
(combination of tin and lead)

Superconducting wire (combination of tin and niobium.) Superconducting wires are used in the manufacture of extremely powerful magnets.

Babbitt metal (combination of tin, copper and antimony), Babbitt metal is used for the surface of bearings.

Bell metal (combination of tin and copper and solder which is a combination of tin and lead).

History

Tin has been in use since ancient ages and it has played an important role in the history of the human race. Around 5000 years ago, humans first began mining and incorporating tin with copper to create bronze thus marking the beginning of the Bronze Age.

In fact, tin artefacts have been found in an Egyptian tomb of the eighteenth dynasty which dates around to 1580-1350 BC and it was traded around the Mediterranean by the Phoenicians who obtained it from Spain, Brittany and Cornwall.

It is argued that mining for tin and other minerals was probably one of the reasons for the Romans Conquest. The Romans were able to use advanced technology to find, develop and extract valuable minerals on a scale unequalled until the Middle Ages.

In the 19th century, Cornwall was the major producer of the metal, but then deposits were found in Bolivia and East Asia, and today China is the leading producer, followed by Indonesia and Peru.

At first, tin was probably obtained from finding bits of the oxide ore mineral cassiterite in sand which was also called as the placer deposits. It is believed that people used to extract it like the way one pans for flecks of gold in sand or gravel. The importance of tin grew rapidly when the ancients understood its potential for making everything from tools, to weapons, and even jewellery.

The first alloy, bronze, was discovered around 5000 BC. It consists of copper and 5-12% tin by weight, and revolutionized the way copper metal was used. The addition of tin makes bronze much harder and tougher than pure copper.

In the middle ages, tin was known as stannum, which is the origin of the modern atomic symbol, Sn.

In the 19th and 20th centuries, many different applications for tin emerged. Electroplating was first developed around 1850 and is used to protectively coat metals that have better physical properties than tin. An example of this is the modern food can, although most of them are actually made today from less-expensive aluminium.

Uses of Tin

Tin is most commonly used in alloys, and in tin plate which is a thin sheet of steel with a protective coating of tin.
In the 1950s, Sir Alastair Pilkington invented a process in which molten glass is floated on top of molten tin, creating an incredibly flat glass surface for windows.
Tin resists corrosion so does not rust, which makes tinplate suitable for containers of food and drink and many other uses.
Tin is also used for wrapping food, and, although it has been replaced by aluminium foil, this product is still often known as 'tin foil'.

Tin in the Marketplace

ITRI, a tin industry advocacy group, reports that 340,000 short tons of tin are consumed globally each year. According to ITRI research, the top applications for tin are in solder and as plating, accounting for approximately 60% of global tin consumption.

b. Tinplate

Tinplate is a thinly rolled sheet of iron or steel coated with tin. This process can be applied to many types of base metals, including steel, iron, and copper.
Tinplate manufacture is now carried out at Trostre Steel Works in Llanelli.

Perhaps the best known application for tin plating is in the creation of cans used for storing food. Tin plate is used for food cans because it is not reactive to the acids present in food.

Tinplate also serves as a common material for making pots, pans, and other cookware.

This plating technique is used to prepare metal for use in construction, such as with metal roofing or siding. It is also applied to electronics components and other parts used in manufacturing.

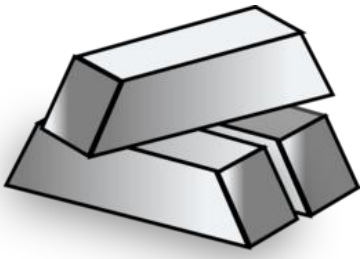
Tin-plated toys were considered among the finest in the world from the mid-1800s to the 1950s, until plastic toys entered the market and took over!

There are two processes for tinning to create tinplate:
1. Hot-dipping
2. Electroplating.

Hot-dipping
This was the system used at Kidwelly Tin Plate Works by cold rolling steel or iron, pickling or remove any scale, annealing to remove any strain hardening, and then coating it with a thin layer of tin.

Electroplating
In electroplating, the item to be coated is placed into a container containing a solution of one or more tin salts. The item is connected to an electrical circuit, forming the cathode (negative) of the circuit while an electrode typically of the same metal to be plated forms the anode (positive). When an electrical current is passed through the circuit, metal ions in the solution are attracted to the item. To produce a smooth, shiny surface, the electroplated sheet is then briefly heated above the melting point of tin. Most of the tin-plated steel made today is then further electroplated with a very thin layer of chromium to prevent dulling of the surface from oxidation of the tin.

c. Iron



Properties:

Atomic Number: 26
Atomic Symbol: Fe

Characteristics:

Pure iron is a silver-coloured metal that conducts heat and electricity well. Iron is too reactive to exist alone so it only occurs naturally in the earth's crust as iron ores, such as hematite, magnetite and siderite. One of iron's identifying characteristics is that it is strongly magnetic. Exposed to a strong magnetic field, any piece of iron can be magnetized. Scientists believe that the earth's core is made-up of about 90% iron. The magnetic force produced by this iron is what creates the magnetic North and South poles.

World production exceeds 700 million tonnes a year.

Iron is also an essential element for all forms of life. The average human contains about 4 grams, a lot of which circulates as haemoglobin in the blood, the job of which is to carry oxygen from our lungs to where it is needed. If the diet does not contain the 10 - 18 milligrams of iron needed each day, anaemia will eventually develop. Foods such as liver, kidney, molasses, brewer's yeast, cocoa and liquorice contain a lot of iron.

Iron is rarely found in its purest form as iron becomes oxidised when it comes into contact with atmospheric oxygen. This is why most of its ores in the surface of the earth are in the form of iron oxides.

Rust

Iron's most troublesome characteristic is its tendency to form rust. Iron rusts easily in damp air yet is the most important of all metals. Rust (or ferric oxide) is a brown, crumbly compound that is produced when iron is exposed to oxygen. The oxygen gas that is contained in water speeds up the process of corrosion. The rate of rust - how quickly iron turns into ferric oxide - is determined by the oxygen content of the water and the surface area of the iron. Salt water contains more oxygen than fresh water, which is why salt water rusts iron faster than fresh water.

History

Iron was more than likely discovered and extracted as a result of wood burning on top of iron containing ores. The carbon within the wood would have reacted with the oxygen in the ore, leaving a soft, malleable iron metal.

Iron smelting and the use of iron to make tools and weapons began in Mesopotamia (present day Iraq) between 2700 and 3000 BC. Over the following 2000 years, iron smelting knowledge spread eastward into Europe and Africa during a period known as the Iron Age.

From the 17th century on, until an efficient method to produce steel was discovered in the mid-19th century, iron was increasingly used as a structural material to make ships, bridges and buildings. The Eiffel Tower, constructed in 1889, was made using over 7 million kilograms of wrought iron.

Uses of iron

It is the second most abundant metal element in the earth's crust and is primarily used to produce **steel,** one of the most important structural materials in the world.

Iron is the most useful of all metals. It is also the cheapest available metal. Most is used to manufacture steel, used in civil engineering (reinforce concrete, girders etc.) and in manufacturing.

Iron is a strong metal that's comparatively cheap which is why it is used in the manufacture of machine tools, cars, hulls of large ships, machine parts and even building parts.

Iron is also common in many different tools, surgical equipment and appliances.

Iron was once the primary structural material, but it has long been replaced by steel in most applications. Nevertheless, cast iron is still used in pipes and to make automotive parts, such as cylinder heads, cylinder blocks and gearbox cases. Wrought iron is still used to produce home décor items, such as wine racks, candleholders and curtain rods.

d. Steel

Steel is an alloy of iron and various other metals, which are used to enhance the properties (strength, resistance to corrosion, tolerance of heat etc.) of iron. Changing the type and amount of the elements alloyed with iron can produce different types of steel. This process is carried out in furnaces in huge steel works.

The most common steels are:

1. **Carbon steels**, which contain between 0.5-1.5% carbon. These are the most common steels and are used for auto bodies, ship hulls, knives, machinery and all types of structural supports.
2. **Low alloy steels**, which contain between 1-5% other metals (often nickel or tungsten). Nickel steel is able to withstand high levels of tension and is, thus, often used in the construction of bridges and for making bicycle chains. Tungsten steels keep their shape and strength in high temperature environments and are used in impact, rotary applications, such as drill bits.
3. **High alloy steels**, which contain 12-18% of other metals are only used in specialty applications due to their high cost. One example of a high alloy steel is stainless steel, which often contains chromium and nickel, but can be alloyed with various other metals as well. Stainless steel is very strong and highly resistant to corrosion.

Uses of steel

Most large modern structures, such as stadiums and skyscrapers, bridges, and airports, are supported by a steel skeleton. Even those with a concrete structure will employ steel for reinforcing.
Other uses are in the production of cars, bolts, nails, and screws, fridges, washing machines, computer casings, office furniture, steel wool such as brillo pads and tools. There are many more!

Production of steel is now carried out at Tata Steel Port Talbot.

(iv) How can we……?

Preserve Food

Canning

In the early days, food was put into a steel canister, and then a steel plate would be welded on top of it. Over time, the word 'canister' got shortened to 'can.' While steel cans are easy to transport, the food reacts with the steel producing rust which isn't good for the stomach.

The way around this was to coat the steel can in a metal that did not rust, which was tin.

Today, the food is boiled in the can to kill all the bacteria and it is sealed (either before or while the food is boiling) to prevent any new bacteria from getting in. Since the food in the can is completely sterile, it does not spoil. Once you open the can, bacteria enter and begin attacking the food, so you have to "refrigerate the contents after opening."

History of preserving food in tins

- In 1795 the French military offered a cash prize of 12,000 francs for a new method to preserve food. Nicolas Appert suggested canning, and the process was first proven in 1806 in tests conducted by the French navy. Appert was awarded the prize in 1810 by Count Montelivert, a French minister of the interior.
- Based on Appert's methods of food preservation, the tin can process was allegedly developed by Frenchman Philippe de Girard, who came to London and used British merchant Peter Durand as an agent to patent his own idea in 1810. Durand did not pursue food canning himself, selling his patent in 1811 to Bryan Donkin and John Hall, who were in business as Donkin Hall and Gamble, of Bermondsey. Bryan Donkin developed the process of packaging food in sealed airtight cans, made of tinned wrought iron.
- Initially, the canning process was slow and labour-intensive, as each large can had to be hand-made, and took up to six hours to cook, making canned food too expensive for ordinary people. The main market for the food at this stage was the British Army and Royal Navy.
- By 1817 Donkin recorded that he had sold £3000 worth of canned meat in six months.
- Throughout the mid-19th century, canned food became a status symbol amongst middle-class households in Europe, becoming something of a frivolous novelty.
- Early methods of manufacture employed poisonous lead solder for sealing the cans, which may have worsened the disastrous outcome of the 1845 Franklin expedition to chart and navigate the Northwest Passage.
- Increasing mechanisation of the canning process, coupled with a huge increase in urban populations across Europe, resulted in a rising demand for canned food.
- A number of inventions and improvements followed, and by the 1860s smaller machine-made steel cans were possible, and the time to cook food in sealed cans had been reduced from around six hours to thirty minutes.

- Canning provides a shelf life typically ranging from one to five years, although under specific circumstances it can be much longer.

- A freeze-dried canned product, such as canned dried lentils, could last as long as 30 years in an edible state.

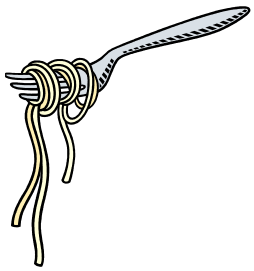
- In 1974, samples of canned food from the wreck of the *Bertrand*, a steamboat that sank in 1865, were tested by the National Food Processors Association. Although appearance, smell and vitamin content had deteriorated, there was no trace of microbial growth and the food was determined to be still safe to eat.

- In 1824 Sir William Edward Parry took canned beef and pea soup with him on his voyage to the Arctic in HMS Fury, during his search for a north-western passage to India.

- In 1829, Admiral Sir James Ross also took canned food to the Arctic, as did Sir John Franklin in 1845. Some of his stores were found by the search expedition led by Captain (later Admiral Sir) Leopold McLintock in 1857. One of these cans was opened in 1939, and was edible and nutritious, though it was not analysed for contamination by the lead solder used in its manufacture.

- Captain Scott took many tins of food with him when he led his expedition to the Antarctic in 1910.

Drying



Water is usually removed by evaporation (air drying, sun drying, smoking or wind drying). Bacteria, yeasts and moulds need the water in the food to grow, and drying effectively prevents them from surviving in the food.

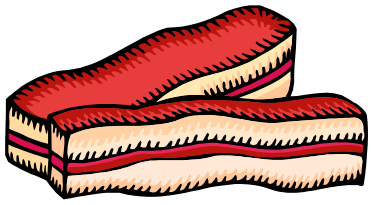
Examples: pasta/peas/fruit

Freeze drying

Freeze-drying works by freezing the food and then reducing the surrounding pressure to allow the frozen water in the material to sublimate directly from the solid phase to the gas phase.
This process was developed during World War II as a method of preserving blood plasma for battlefield emergencies without requiring refrigeration or damaging the organic nature of the plasma.

Examples: Instant coffee/cat food/milk/ice cream for astronauts

Salting



Salt was essential for drawing all the moisture from meat and fish before drying and/or smoking. Meat and fish immersed in barrels or tubs of brine were used to feed Nelson's navy. It tasted disgusting and was very unhealthy. Only the best meat was salted, hence the expression 'not worth its salt'.

Examples: bacon/fish

Pickling / Bottling

Storing food in an acidic liquid such as vinegar.
This system was used a lot, before canning became popular. Fruit and vegetables are cooked in brine, vinegar, brandy or oil and then sealed in bottles.

Examples: pickles / beetroot pickles, chutneys/ eggs

Chemicals

There are three classes of chemical preservatives commonly used in foods:

Benzoates (such as sodium benzoate)
Nitrites (such as sodium nitrite)
Sulphites (such as sulphur dioxide)

If you look at the ingredient labels of different foods, you will frequently see these different types of chemicals used. All of these chemicals either inhibit the activity of bacteria or kill the bacteria.

Another common preservative that you will commonly see on food labels is sorbic acid.

Examples: All food stuffs

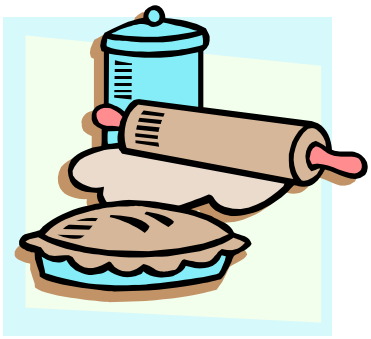
Lowering the surrounding temperature and Freezing

Since early times, farmers, fishermen, and hunters have preserved their game and produce in unheated buildings during the winter season. Freezing food slows down decomposition by turning residual moisture into ice, inhibiting the growth of most bacterial species. We use fridges and freezers today.

Examples: All food stuffs

Potting

This process involves cooking meat and fish under a solid topping of butter, pork or goose fat or a surround of pastry in a pie will keep a filling of cooked meats or fish safe to eat for several days.



Examples: Potted meat / pasties /pork pies

(v) Why should we……?

Recycle to preserve the planet

Your Dustbin:

- Up to 60% of the rubbish that ends up in the dustbin could be recycled.
- The unreleased energy contained in the average dustbin each year could power a television for 5,000 hours.
- The largest lake in Britain could be filled with rubbish from the UK in 8 months.
- On average, 16% of the money you spend on a product pays for the packaging, which ultimately ends up as rubbish.
- As much as 50% of waste in the average dustbin could be composted.
- Up to 80% of a vehicle can be recycled.

Energy

- 1 recycled tin can would save enough energy to power a television for 3 hours.
- 1 recycled glass bottle would save enough energy to power a computer for 25 minutes.
- 1 recycled plastic bottle would save enough energy to power a 60-watt light bulb for 3 hours.
- 70% less energy is required to recycle paper compared with making it from raw materials.

How Long Will Litter Last?

Glass bottles.	1,000,000 years
Plastic jug.	1,000,000 years
Aluminium cans.	500 years
Disposable nappy.	500 years
Tin soup can.	80 - 100 years
Rubber boot sole.	50 - 80 years
Leather.	50 years
Plastic bags.	10 - 20 years
Cigarette butts.	1- 5 years
Wool sock.	1 year
Orange and banana peels.	3- 4 weeks

2. POST VISIT – Project Ideas linked to the National Curriculum:

a) Recycling craft ideas with tins

Here are some ideas that we have seen on the internet. Maybe you have your own ideas? Make sure that all edges are checked for sharp edges before allowing children to create!

www.spoonful.com

www.pinterest.com

http://www.preschooluniverse.com

Lovelylittleturtle.blogspot.com

www.thinkcrafts.com

www.modernparentsmessykids.com

b. Creative Writing

Task

Design a **poster** or **leaflet** that will help encourage more people to visit Kidwelly Industrial Museum.

Class Discussion

1) After the visit, list all the important features of the museum.

2) Discuss why adults/children would want to go to there.

3) What makes it different to other museums that the children have been to?

4) Discuss what the poster or leaflet will try to tell people to make them want to visit?

5) Getting people's attention:- Catchy slogan, alliteration, pun, humour, font colour and size, pictures, adding a border.

6) The writing on a poster or leaflet is just as important – needs to be easily read. Why not make the information multi-lingual?

More examples of writing frames can be seen on the following website:-
http://www.primaryresources.co.uk/english/englishD10.htm

We found this website helpful if you wish to complete this task on the computer.
http://www.dare.com/kids/pages/play_this/Content_Pages/Poster/index.htm

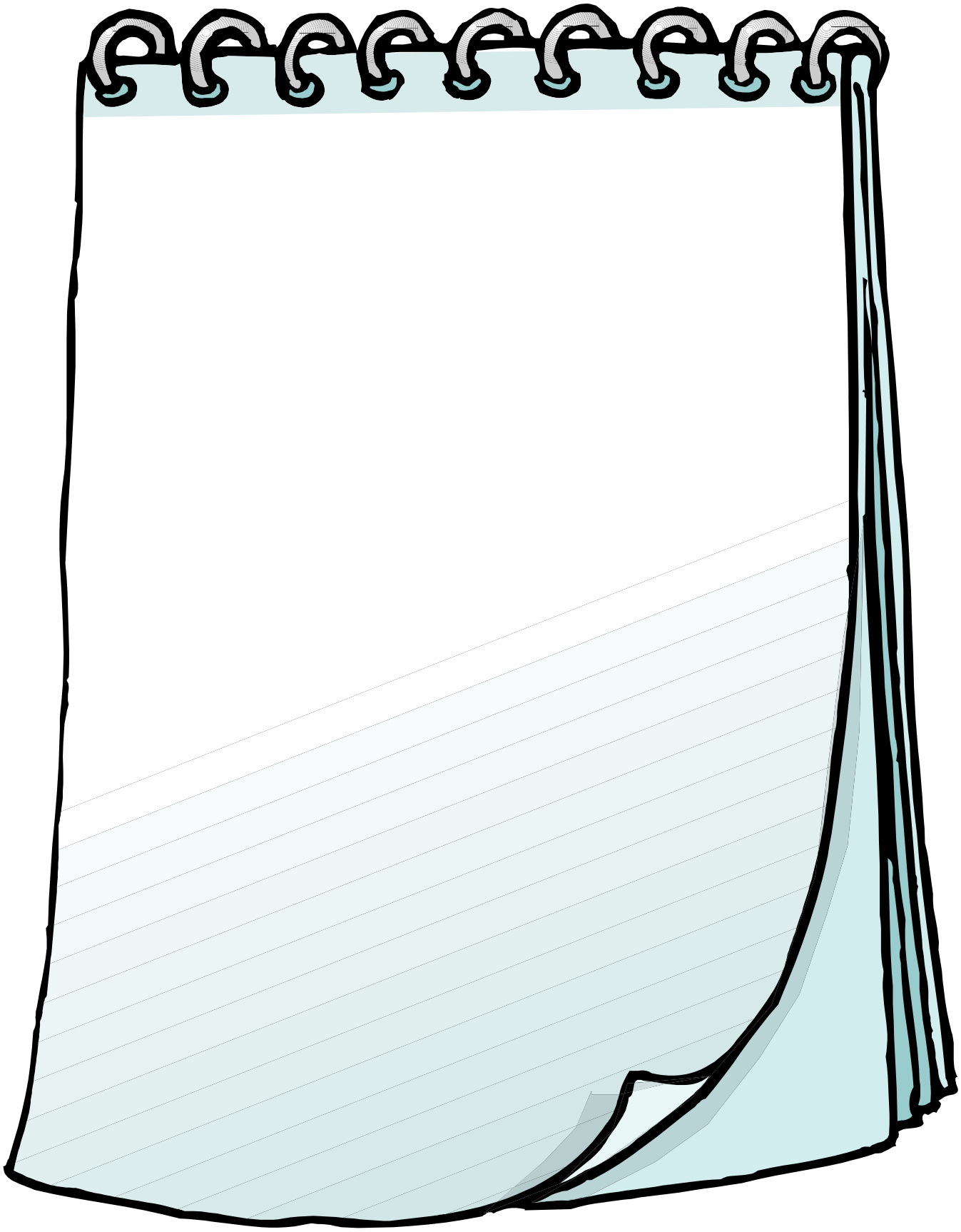
My visit to Kidwelly Industrial Museum

Name …….

Date of visit ……

 I saw ……	 I heard ……
 I felt ……	 I liked ……

Write and sketch your ideas of your visit to Kidwelly Industrial Museum.



Name .....

Imagine that you are a Kidwelly Tinplate worker in 1881. Look for a picture of a worker at Kidwelly Tinplate to inspire your writing.

This is what I see	**This is what I hear**
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
This is how I feel	**This is what I do**
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

LEARNING OUTCOMES

Developing classroom projects linked to your visit to Kidwelly Industrial Museum, offers excellent opportunities for cross curricular study, as it can touch all subjects at various levels.

Language skills

There are opportunities for discussion, learning new vocabulary, listening to talks, research and creative writing and interpretation. It also develops skills of analysis of evidence and argument.
Creating a list of the different processes in tinplate production aids in helping reading skills and analysis.

History

Developing thinking skills through historical enquiry and coming to conclusions. The children can learn to use sources of information critically, to detect bias and prejudice, and to construct an argument or interpretation of events based on evidence.
Placing the Tinplate workers lives in the context of local historical events. Creating a timeline of events for Gareth's life in 1881 and placing them within an historical context. Studying different modes of power and transport – then and now.

Mathematics

Looking at timelines to become more chronologically aware.
Looking at measurement and calculation. Working with scale drawings and geometry.

Design, Technology and IT skills

There are opportunities for studying different types of machinery and their uses. Using the computer to compile data bases and designing graphics for displays. Use of the internet for research.

Art

Creating works of art from recycled metal cans. Looking at different styles of writing through the ages. Studying photography such as people and buildings in the nineteenth century and comparing them with people and buildings of today.

Geography
The study of countries by following the path of the tinplate trade routes. Finding the coal mines in the area by studying old maps.

Science
The environment can be studied through looking at different kinds of metals and minerals in the area. Preservation of foodstuffs.
Ask questions such as, why was there a need for tinplate? The effect of working in the tinplate works on the health of the body.

Personal and Social Skills
There are opportunities for group work, structuring and taking responsibility for a project. Creating an opportunity for children to move from concrete to abstract; simple to complex; personal to the 'big picture'; familiar to unfamiliar; and supported to independent and interdependent. It also contributes to personal and social education by developing skills of enquiry and critical thinking; their understanding of different views and interpretations of people and events; and of the way in which people have affected their environment in the past. It gives learners an historical context in which to set their lives.

Curriculum Cymreig
Here is an opportunity for children to make local and Welsh history a focus of the study and helping them to learn and understand the factors that have shaped Wales and other countries today.
Finding out local stories, songs, sayings, beliefs and traditions.

Careers and the world of work
This study provides an awareness of careers and the world of work. Children increase their understanding of the factors that have shaped the world of work in the past; some of the important economic, social and industrial changes which have occurred; the scale of the changes across different periods and within the same period; major economic, social and technological changes that happened over the centuries.

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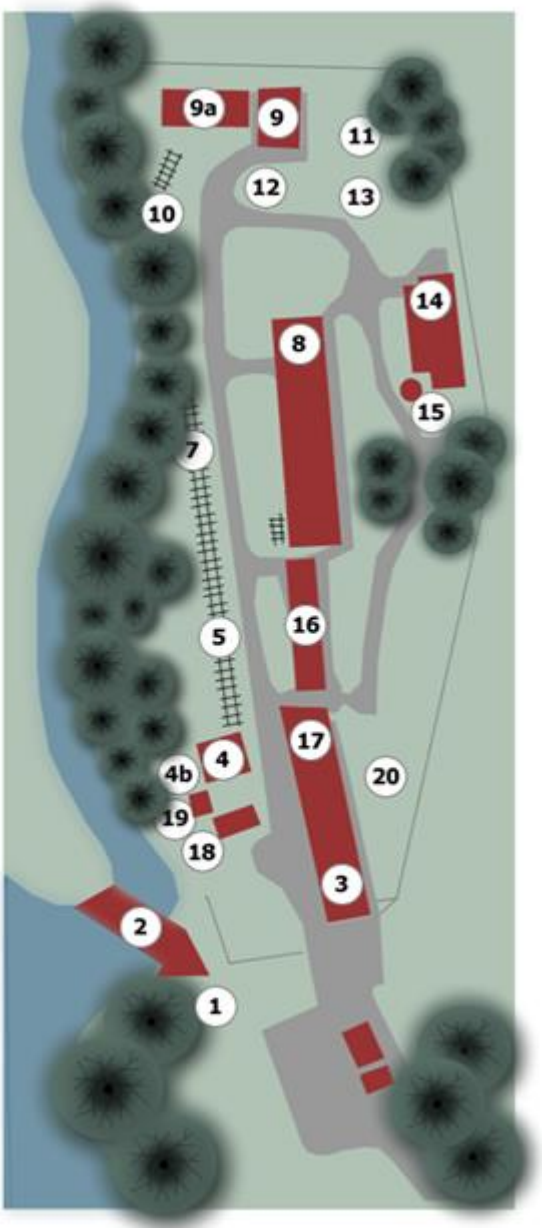
http://www.primaryresources.co.uk/english/englishD10.htm
www.peoplescollectionwales.co.uk

Photographs and Drawings
Kidwelly Industrial Museum has a very wide range of photographs and drawings that can aid in classroom activities. Please contact the museum outlining your specific requests and we will attempt to match your requirements.

Map of Kidwelly Industrial Museum



1) Water powered works
2) Dam / Sluces
3) Boxing Room
4) 'Leaf' Saddle Tank Engine
4b) Museum workshop and stores
5) Barcley Diesel Locomotive
7) Bar Cutting
8) Hot Rolls
9) Morlais Coal Complex
9a) Colliery Winding Gear
10) Brynlliw Saddle Tank Engine
11) Brickworks
12) Pickling Area
13) Annealing Area
14) Cold Rolls
15) Chimney
16) Tinning Line
17) Assorting Room
18) Mess Room
19) Blacksmiths Shop