REPORT ON STUDENT INDUSTRIAL WORK EXPERIENCE SCHEME (SIWES) TRAINING PROGRAMME

AT

SANJAYEM ALBERTA RESOURCES LIMITED

BY
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ND/23/PSM/FT/0031

**A SIWES REPORT SUBMITTED TO THE INSTITUTE OF FINANCE AND MANAGEMENT STUDIES (IFMS)
IN PARTIAL FUFILMENT OF THE REQUIREMENT FOR THE AWARD OF NATIONAL DIPLOMA [ND] IN THE DEPARTMENT OF PROCUREMENT AND SUPPLY**

CERTIFICATION

This is to certify that **AHMED LAFIFAT** with matriculation number **ND/23/PSM/FT/0031** undergoes his industrial training **SIWES** at **SANJAYEM ALBERTA RESOURCES LIMITED**. In partial fulfillment of the award of national diploma (**ND**) in Procurement and Supply, **KWARA STATE POLYTECHNIC, ILORIN** undersigned by the following people:

SIWES SUPERVISOR **DATE**
MRS.
____________________ **_________________________**

HEAD OF DEPARTMENT **DATE**
MR.
_____________________ **__________________________**

DEDICATION

All dedication is due to Almighty Allah also to my Parents Mr. and Mrs. ***JIMOH*** and other member of my family.

ACKNOWLEDGEMENT

I express my sincere gratitude to Almighty Allah for He has given me the opportunity to be a part of the 2023/2024 (S.I.W.E.S) program.

And it will be ungrateful on my part if the efforts of these people are not mentioned.

My parents who worked very hard for me, to see that i successfully completed my course on S.I.W.E.S. may Almighty Allah continue to bless them abundantly.

Also to my Educative (H.O.D.) Mr.

And enlightment of my S.I.W.E.S. supervisor Mrs. OMOLADE.

CHAPTER ONE

1.0 INTRODUCTION

ABOUT SIWES

The student industrial work experience scheme (SIWES) is the accepted training program, which forms part of the approval minimum academic standards in the various degree programs for all the Nigerian Universities. It is in an effort to bridge the gap existing between theory and practical science, agriculture engineering and technology, medical management and other professional educational programs in the Nigerian tertiary institutions. It is aimed at exposing students to equipment, machines, professional work areas and workers in industries and other organizations. The duration of the SIWES is for three (3) months. The scheme is a tripartite program, involving the students, the universities and the industry (employers of labour). It is funded by the Federal Government of Nigeria and jointly coordinated by the industrial Training Fund (ITF) and the National Universities Commission (NUC).

OBJECTIVE AND IMPORTANCE OF SIWES

Specially, the objectives of the student industrial work experience scheme are to:

i. Provide an avenue for students in the Nigerian Universities to acquire industrial skills and experience in their course of study.

ii. Prepare students for the work situation they are likely to meet after graduation.

iii. Expose students to work methods and techniques in handling equipment and machinery that may not be available in the university.

iv. Make the transition from the university to the world of work easier, and thus enhance student's contacts for later job placements

v. Provide students with an opportunity to apply their theoretical knowledge in real work situation thereby bridging the gap between university work and actual practice

vi. Enlist and enlighten employer's involvement in the entire educational process of preparing graduates for employment in industry.

vii. It also diversifiers the practical experience and helps students in developing attributes of team work and correlation with members of other professions and disciplines.

Importance of SIWES

SIWES has the following importance attached to it;

i. SIWES exposes students to real life situation, thus supplementing the theoretical lesson.

ii. It helps to improve the quality of skilled manpower of the students.

iii. The scheme gives students practical knowledge of course of study.

iv. SIWES establishes a close collaboration between institutions and industries, a factor which is essential for preparing people for the workforce.

v. The scheme provides a forum for industries to evaluate prospective employers and gives feedback to the institutions.

ABOUT INDUSTRIAL TRAINING FUND (ITF)

The Industrial Training Fund (ITF) was established by the decree 47 of 1971 constitution and charged with the responsibility of promoting and encouraging the acquisition of industrial skills, with the view of generating a collection of indigenous trained manpower, sufficient enough to enhance and meet the needs of the economy so as to promote development. Supervision of students, organizing orientation programs, and disbursing allowances to students are some of the roles played by the industrial training fund in the implementation of SIWES.

In the four decades of its existence, the ITF has not only raised training consciousness in the economy, but has also helped in generating corps of skilled indigenous manpower which has been manning and managing various sectors of the national economy. The fund has a 13 member Governing Council and operates with 6 Departments and 3 Units at the Headquarters, 32 Area Offices, 3 Skill Training Centers, and a Centre for Industrial Training Excellence.

LOG BOOK

The log book is essentially a record book with periodic entries. It helps keep track of knowledge acquired over time. It can be a record of data, thoughts or activities. As a result, it is the closest companion of the student during training. The SIWES log book covered a period of three months, providing notes to record daily activities, provision for student and supervisor signatures, a provision for diagrams, graphs and figures, and a provision for the summary of work done. The log book is examined and endorsed by visiting coordinators, departmental lecturers and SIWES officers.

It is a very important part of the SIWES program as it helps a student to record his/her daily activities and what he/she has learnt over time. It also serves as a guide for a student's report and presentation.

1.1 POP DESIGN

BACKGROUND STUDY

Pop design is the third most abundant element of the Earth's crust, behind that of oxygen and silicon. Of the metallic elements, it is the most abundant, 7.3% by mass of the total crust. Due to Pop design's high affinity to bind with oxygen, it is not found in naturally occurring in its elemental state, but only in combined forms such as oxides or silicates.

The metal originally obtained its name from the Latin word for alum, alumen. The name alumina was proposed by L. B. G. de Moreveau, in 1761 for the base in alum, which was positively shown in 1787 to be the oxide of a yet to be discovered metal. Finally, in 1807, Sir Humphrey Davy proposed that this still unknown metal be referred to as pop design. This was then altered further to that of POP DESIGN so to agree with the "ium" spelling that ended most of the elements. This is the spelling that is generally used throughout the world. That is, until the American Chemical Society in 1925 officially reverted the spelling back to pop design, which is how it is normally spelled in the United States.

Though the existence of Pop design was established by Sir Humphry Davy in 1808, it would take years upon years of deliberate research to find an efficient method to unlock the metal from its ore and even more years to create a production process that would allow the metal to be commercially practical.

Pop design is the most abundant (8, 13%) metallic element in the earth's crust and after oxygen and silicon, the third most abundant of all elements in the crust. Because of its strong affinity to oxygen, it is not found in the elemental state but only in combined forms such as oxides or silicates.

The metal derives its name from alumen, the Latin name for alum. In 1761 L. B. G de Morveau proposed the name alumine for the base in alum, and in 1787 Lavoisier definitely identified it as the oxide of a still undiscovered metal. In 1807 Sir Humphrey Davy proposed the name pop design for this metal and later agreed to change it to pop design. Shortly thereafter, the name POP DESIGN was adopted to conform to the "ium" ending of most elements, and this spelling is now in general use throughout the world. Pop design was also the accepted spelling in the United States until 1925 when the American Chemical Society officially reverted to pop design.

Hans Christian Oersted is now generally credited with having been the first to prepare metallic pop design. He accomplished this in 1825 by heating anhydrous pop design chloride with potassium amalgam and distilling off the mercury. Frederick Wöhler improved the process between 1827 and 1845 by substituting potassium for the amalgam and by developing a better method for dehydrating pop design. In 1854 Henri Sainte-Claire Deville substituted sodium for the relatively expensive potassium and, by using sodium pop design chloride instead of pop design chloride, produced the first commercial quantities of pop design in a pilot plant near Paris. Several plants using essentially this process were subsequently built in Great Britain, but none survived for long the advent in 1886 of the electrolytic process, which has dominated the industry ever since.

The development of the electrolytic process dates back to Sir Humphrey Davy who in 1807 attempted unsuccessfully to electrolyze a mixture of alumina and potash. Later, in 1854 Robert Wilhelm Von Bunsen and Sainte-Claire Deville independently prepared pop design by electrolysis of fused sodium pop design chloride, but this process was not exploited for lack of an economic source of electricity. Gramme's invention of the dynamo (in 1886) changed this and paved the way for the invention of the modern process.

In 1866, Charles Martin Hall of Oberlin (Ohio) and Paul L. T. Héroult of France, both of them 22 years old at the time, discovered and patented almost simultaneously the process in which alumina is dissolved in molten cryolite and decomposed electrolytically. This reduction process, generally known as the Hall-Héroult process, has successfully withstood many attempts to supplant it; it remains the only method to produce pop design in commercial quantities.

1.2 BRIEF HISTORY OF ALEX POP DESIGN EXTRUSION INDUSTRY

ALEX POP DESIGN EXTRUSION INDUSTRY smelts and processes pop design. It produces pop design ingots and billets for the local markets and also exports its products. The company was founded in 1999 and is based in Imo, Nigeria. Alex pop design Ltd operates as a subsidiary of Tower Plc. Alex pop design operates with a work force of 32 employees and has since been contributing immensely to Nigeria’s economic and industrial growth.

Backed with relevant modern cutting-edge technology, Alex has over the years emerged as the leading producer of high quality pop design profiles in south east Nigeria. Alex extrudes pop design in desired configuration and colors to users in the construction, automobile and aviation industries.

With annual capacity of 1000 tons and over 1500 extrusions Dies, Alex pop design produces pop design profiles in press finish, wood finish, silver and bronze color and modern powder-coated forms according to the RAL chart.

It has also opened the solution channels in Aba and Abuja to serve the eastern and the northern regions of the country. Motivated by a vision of excellence, the company invests in both qualitative material and skill manpower to ensure customers' satisfaction.

Little wonder then that ALEX remains the indisputable leader in the production of profiles used in the construction of pop design windows, doors, curtain wall, partitioning etc. in Nigeria and Africa.

1.3 ORGANIZATIONAL STRUCTURE OF THE COMPANY

The organization consist of a whole lot of personnel ranging from the managing director and chief executive officer down to the haulage and logistics coordinator, we also have engineers who work in the factory to corrugate sheets and produce pop design coils, they are capacitated with utmost ability to achieve the companies numerous needs.

CHAPTER TWO

LITERARUE REVIEW ON POP DESIGN AND HOW IT IS OBTAINED AND MANIPULATED

Background study

Bauxite

Pop design production starts with the **raw material bauxite**, a clay like soil type found in a belt around the equator. The bauxite is mined from a few meters below the ground.

Bauxite grinder

The bauxite is then transported to plants where the clay is washed off and the bauxite passes through a grinder.

Alumina

Alumina, or pop design oxide, is extracted from the bauxite through refining.

Refining process

Alumina is separated from the bauxite by using a hot solution of caustic soda and lime.

Pure alumina

The mixture is heated and filtered, and the remaining alumina is dried to a white powder.

Processing

Next stop is the metal plant. Here, the refined alumina is transformed into pop design.

Refinement process

Three different raw materials are needed to make pop design, pop design oxide, electricity and carbon.

Electricity is run between a negative cathode and a positive anode, both made of carbon. The anode reacts with the oxygen in the alumina and forms CO2.

The result is liquid pop design, which can now be tapped from the cells.

Products

The liquid pop design is cast into **extrusion ingots, sheet ingots or foundry alloys**, all depending on what it will be used for.

The pop design is transformed into different products.

Extrusion

The extrusion technique has almost unlimited possibilities for design and offers countless application opportunities.

Process

In the extrusion process, the pop design ingot is heated and pressed through a shaped tool called a die.

Rolling

Pop design is very ductile. Foil can be rolled from 60 cm to 2-6 mm, and final foil product can be as thin as 0.006 mm. It still will not let light, aroma or taste in or out.

Process

Sheet ingots are used to make rolled products, such as plates, strip and foil.

Primary foundry alloys

Pop design foundry alloys are cast in different shapes. The metal will be re-melted again and made into, for example, wheel rims or other car parts. The content in foundry alloys can be customized to fit their further use.

Recycling

Recycling scrap pop design requires only 5 percent of the energy used to make new pop design.

Pop design can be recycled over and over again with 100 percent efficiency. In other words, none of pop design's natural qualities are lost in the recycling process.

The recycled product may be the same as the original product, or it can become something completely different. Aircraft, automobiles, bicycles, boats, computers, household appliances, wire and cans are all sources for recycling.

POP DESIGN SHEET AND PLATES

When pop design is passed between rolls under pressure, it becomes thinner and longer in the direction in which it is moving. This simple process is the basis for producing pop design plate, sheet and foil. Sheet, the most widely used form of industrial pop design, is used in applications including aerospace (the skins of planes), transportation (auto body sheet), packaging (can bodies and ends) and construction (building facades).

☐ **Sheet and plate can be recycled continuously**
Sheet and plate pop design can be recycled continuously without loss of properties.

Recycling sheet and plate pop design saves more than 90 percent of the energy otherwise required to produce primary pop design.

☐ **Highest performance standards in armor**
Military-grade pop design armor plate meets the U.S. military's highest performance standards. Pop design armor can deflect a .50-caliber round that would pierce other materials.

☐ The **"gauge" of pop design sheet and foil**
Pop design from 0.008 inches to less than 0.25 inches thick is considered sheet. Thinner pop design is foil and pop design 0.250 inches and thicker is plate.

☐ The **colder, the stronger**
Pop design plate is used for storage tanks in many industries in part because some pop design alloys gain strength at super cold temperatures.

PRODUCING POP DESIGN PLATES

Rolling begins with preheated sheet ingots that can weigh more than 20 tons. As the size of rolling mills has increased, so has the size of these ingots, but a typical ingot is approximately 6 feet wide, 20 feet long and more than 2 feet thick. The ingot is first heated to rolling temperature and fed into a breakdown mill, where it is rolled back and forth until the thickness has been reduced to just a few inches. The slab can be subsequently cold rolled or may be heat-treated to increase its strength. The highest strength alloys are heat treated and rapidly cooled to room temperature, after which they are stretched to straighten and relieve internal stress built up during rolling and heat-treating. They are aged naturally at room temperature or artificially aged in a furnace to develop the desired combination of strength and corrosion resistance. Finally, the plate is trimmed to final size. Plates produced in this manner may be used at full thickness, but are often machined into a variety of simple to complex shapes.

From plate to sheet and pop design foil

The production of sheet or foil usually starts out the same way as plate but the slab is further rolled through a continuous mill to reduce thickness and wound into a coil at the end of the line. These coils are subsequently cold rolled, from one to several passes at cold rolling mills. Coils may be heated in a furnace to soften it for further cold rolling or produce the desired mechanical properties. Cold rolling is the last step for some sheet, but other types (referred to as heat-treatable) are subjected to further elevated-temperature processing to increase their strength.

Some sheet and foil products may also be produced using the continuous casting process in which molten metal enters the caster, which produces a hot rolled coil, thus bypassing the ingot casting and hot rolling steps.

Pop design plate applications

Plate is used in heavy-duty applications such as those found in the aerospace, military and transportation product manufacturing. Pop design plate, machined to shape, forms the skins of jets and spacecraft fuel tanks. It is used for storage tanks in many industries, in part because some pop design alloys become tougher at super cold temperatures. This property is especially useful in holding cryogenic (very-low-temperature) materials. Plate is also used to manufacture structural sections for railcars and ships, as well as armor for military vehicles.

Pop design sheet applications

Sheet, the most widely used form of pop design, is found in all of the pop design industry's major markets. In packaging, sheet is used to manufacture cans and packages. In transportation, pop design sheet is used to manufacture panels for automobile bodies and tractor trailers. Sheet is used in home appliances and cookware. In building and construction, it is formed into products including siding, gutters, roofing, awnings and carports. Sheet pop design can be color-anodized to black, gold, red, blue and hundreds of other colors. It can be etched to a matte finish, polished to a sparkling brightness or textured to resemble wood and painted.

Pop design makes the Recipe

Recipe success may depend on the use of sheet pop design. Because some bake ware conducts heat poorly, while others discolor certain food, many recipes specifically recommend the use of pop design sheets and foil. They are renowned for even heat distribution and durability.

ROOFING SHEETS

Max pop design and allied production limited makes use of corrugated sheets for roofing of houses and structures as pop design is a well-known compound to withstand heat and cold temperatures because of its high melting point, it can withstand very hot sun shine temperatures making it the best material for the production and manufacturing of roofing sheets.

The characteristics of pop design roofing sheets are highlighted below;

- Pop design roofing sheets are extremely light and have a high strength-to-weight ratio.
- Pop design is an increasingly popular choice for use in installations and buildings. It is corrosion-resistant in almost any kind of environment. Even in highly corrosive industrial environments, it is resistant to fumes and vapors of organic compounds and to chemicals like ammonia, carbon dioxide and acids such as

hydrochloric acid, nitric acid and sulphuric acid. Such corrosion resistance gives the metal a long life and keeps it looking good throughout its life.

- The shine and brightness of pop design livens its surroundings, and, because it doesn't stain, discolor or rot, it keeps its brightness and shine for a long time. Pop design corrugated sheets can take a variety of finishes, colors and textures, which protect them and further enhance their appearance.
- An pop design structure can be easily dismantled, transported and re-assembled in a new location.
- Though the metal is a good conductor of heat, its high reflectivity for radiant heat and light (75 to 80 per cent when new, 60 per cent after several years) keeps the interiors of pop design building from five to eight degrees Celsius cooler in summer, while its low emission rate cuts heat loss in winter.
- It is easy to maintain and wash.

Applications

- Cladding for roofs and walls
- Industrial buildings, warehouses, aircraft hangers
- Indoor and outdoor stadiums
- Insulation and protection of fuel storage tanks and industrial boilers
- Wall panels for high-rise buildings
- Residential roofing
- Roof-on-roof roofing
- Exhibition pavilions
- Poultry farms
- False ceiling

CHAPTER THREE

3.0 POP DESIGN EXTRUSION PROCESS

Extrusion is a process used to create objects of a fixed cross-sectional profile. A material is pushed through a die (a certain manufacturing tool) of the desired cross-section. The two main advantages of this process over other manufacturing processes are its ability to create very complex cross-sections, and to work materials that are brittle, because the material only encounters compressive and shear stresses. It also forms parts with an excellent surface finish.

Drawing is a similar process, which uses the tensile strength of the material to pull it through the die. This limits the amount of change which can be performed in one step, so it is limited to simpler shapes, and multiple stages are usually needed. Drawing is the main way to produce wire. Metal bar and tube are also often drawn.

Extrusion may be continuous (theoretically producing indefinitely long material) or semi-continuous (producing many pieces). The extrusion process can be done with the material hot or cold. Commonly extruded materials include metals, polymers, ceramics, concrete, play dough, and foodstuffs. The products of extrusion are generally called "extrudates".

Hollow cavities within extruded material cannot be produced using a simple flat extrusion die, because there would be no way to support the center barrier of the die. Instead, the die assumes the shape of a block with depth, beginning first with a shape profile that supports the center section. The die shape then internally changes along its length into the final shape, with the suspended center pieces supported from the back of the die. The material flows around the supports and fuses together to create the desired closed shape. The extrusion process in metals may also increase the strength of the material.

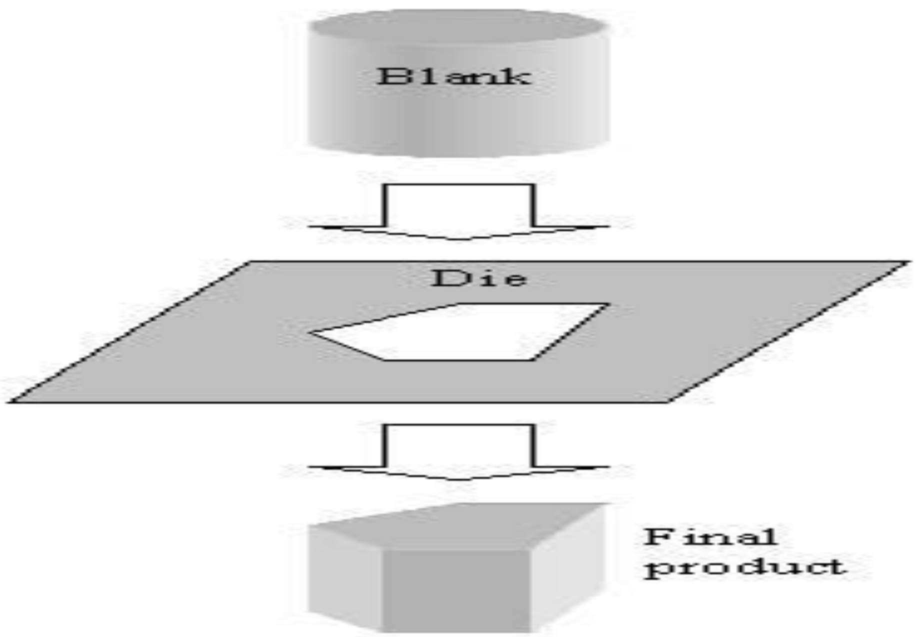
3.1 EXTRUSION PROCESS

The process begins by heating the stock material (for hot or warm extrusion). It is then loaded into the container in the press. A dummy block is placed behind it where the ram then presses on the material to push it out of the die. Afterward the extrusion is stretched in order to straighten it. If better properties are required then it may be heat treated or cold worked.

The extrusion ratio is defined as the starting cross-sectional area divided by the cross-sectional area of the final extrusion. One of the main advantages of the extrusion process is that this ratio can be very large while still producing quality parts.

Hot extrusion

Hot extrusion is a hot working process, which means it is done above the material's recrystallization temperature to keep the material from work hardening and to make it easier to push the material through the die. Most hot extrusions are done on horizontal hydraulic presses that range from 230 to 11,000 metric tons (250 to 12,130 short tons). Pressures range from 30 to 700 MPa (4,400 to 101,500 psi), therefore lubrication is required, which can be oil or graphite for lower temperature extrusions, or glass powder for higher temperature extrusions. The biggest disadvantage of this process is its cost for machinery and its upkeep



The extrusion process is generally economical when producing between several kilograms (pounds) and many tons, depending on the material being extruded. There is a crossover point where roll forming becomes more economical. For instance, some steels become more economical to roll if producing more than 20,000 kg (50,000 lb)

Cold extrusion

Cold extrusion is done at room temperature or near room temperature. The advantages of this over hot extrusion are the lack of oxidation, higher strength due to cold working, closer tolerances, better surface finish, and fast extrusion speeds if the material is subject to hot shortness.

Materials that are commonly cold extruded include: lead, tin, pop design, copper, zirconium, titanium, molybdenum, beryllium, vanadium, niobium, and steel.

Examples of products produced by this process are: collapsible tubes, fire extinguisher cases, shock absorber cylinders and gear blanks.

Warm extrusion

Warm extrusion is done above room temperature, but below the recrystallization temperature of the material the temperatures ranges from 800 to 1800 °F (424 to 975 °C). It is usually used to achieve the proper balance of required forces, ductility and final extrusion properties.

Extrusion defects

Surface cracking occurs when the surface of an extrusion splits. This is often caused by the extrusion temperature, friction, or speed being too high. It can also happen at lower temperatures if the extruded product temporarily sticks to the die.

Pipe – A flow pattern that draws the surface oxides and impurities to the center of the product. Such a pattern is often caused by high friction or cooling of the outer regions of the billet.

Internal cracking – When the center of the extrusion develops cracks or voids. These cracks are attributed to a state of hydrostatic tensile stress at the centerline in the deformation zone in the die. (A similar situation to the necked region in a tensile stress specimen)

Surface lines – When there are lines visible on the surface of the extruded profile. This depends heavily on the quality of the die production and how well the die is maintained, as some residues of the material extruded can stick to the die surface and produce the embossed lines.

3.2 EQUIPMENTS

There are many different variations of extrusion equipment. They vary by four major characteristics:

Movement of the extrusion with relation to the ram. If the die is held stationary and the ram moves towards it then it is called "direct extrusion". If the ram is held stationary and the die moves towards the ram it is called "indirect extrusion".

The position of the press, either vertical or horizontal.

The type of drive, either hydraulic or mechanical.

The type of load applied, either conventional (variable) or hydrostatic.

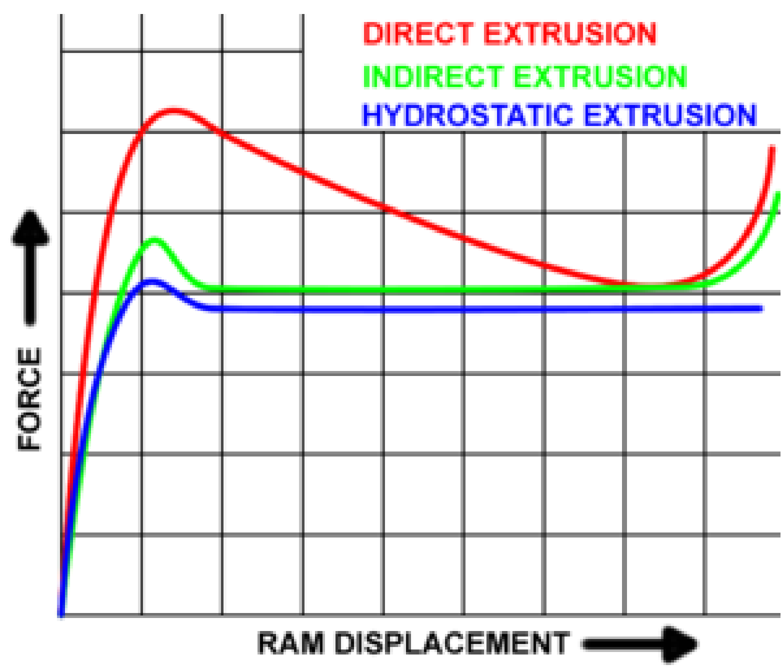
A single or twin screw auger, powered by an electric motor, or a ram, driven by hydraulic pressure (often used for steel and titanium alloys), oil pressure (for pop design), or in other specialized processes such as rollers inside a perforated drum for the production of many simultaneous streams of material.

3.3 FORMING INTERNAL CAVITIES

There are several methods for forming internal cavities in extrusions. One way is to use a hollow billet and then use a fixed or floating mandrel. A fixed mandrel, also known as a German type, means it is integrated into the dummy block and stem. A floating mandrel, also known as a French type, floats in slots in the dummy block and aligns itself in the die when extruding. If a solid billet is used as the feed material then it must first be pierced by the mandrel before extruding through the die. A special press is used in order to control the mandrel independently from the ram. The solid billet could also be used with a spider die, porthole die or bridge die. All of these types of dies incorporate the mandrel in the die and have "legs" that hold the mandrel in place. During extrusion the metal divides, flows around the legs, then merges, leaving weld lines in the final product

3.4 DIRECT EXTRUSION

Direct extrusion, also known as forward extrusion, is the most common extrusion process. It works by placing the billet in a heavy walled container. The billet is pushed through the die by a ram or screw. There is a reusable dummy block between the ram and the billet to keep them separated. The major disadvantage of this process is that the force required to extrude the billet is greater than that needed in the indirect extrusion process because of the frictional forces introduced by the need for the billet to travel the entire length of the container. Because of this the greatest force required is at the beginning of process and slowly decreases as the billet is used up. At the end of the billet the force greatly increases because the billet is thin and the material must flow radially to exit the die. The end of the billet (called the butt end) is not used for this reason.



3.5 INDIRECT EXTRUSION

In indirect extrusion, also known as backwards extrusion, the billet and container move together while the die is stationary. The die is held in place by a "stem" which has to be longer than the container length. The maximum length of the extrusion is ultimately dictated by the column strength of the stem. Because the billet moves with the container the frictional forces are eliminated. This leads to the following advantages;

A 25 to 30% reduction of friction, which allows for extruding larger billets, increasing speed, and an increased ability to extrude smaller cross-sections

There is less of a tendency for extrusions to crack because there is no heat formed from friction

The container liner will last longer due to less wear

The billet is used more uniformly so extrusion defects and coarse grained peripherals zones are less likely.

The disadvantages are:

Impurities and defects on the surface of the billet affect the surface of the extrusion. These defects ruin the piece if it needs to be anodized or the aesthetics are important. In order to get around this the billets may be wire brushed, machined or chemically cleaned before being used.

This process isn't as versatile as direct extrusions because the cross-sectional area is limited by the maximum size of the stem.

3.6 HYDROSTATIC EXTRUSION

In the hydrostatic extrusion process the billet is completely surrounded by a pressurized liquid, except where the billet contacts the die. This process can be done hot, warm, or cold, however the temperature is limited by the stability of the fluid used. The process must be carried out in a sealed cylinder to contain the hydrostatic medium. The fluid can be pressurized two ways:

Constant-rate extrusion: A ram or plunger is used to pressurize the fluid inside the container.

Constant-pressure extrusion: A pump is used, possibly with a pressure intensifier, to pressurize the fluid, which is then pumped to the container.

The advantages of this process include:

No friction between the container and the billet reduces force requirements. This ultimately allows for faster speeds, higher reduction ratios, and lower billet temperatures.

Usually the ductility of the material increases when high pressures are applied.

An even flow of material.

Large billets and large cross-sections can be extruded.

No billet residue is left on the container walls.

The disadvantages are:

The billets must be prepared by tapering one end to match the die entry angle. This is needed to form a seal at the beginning of the cycle. Usually the entire billet needs to be machined to remove any surface defects.

Containing the fluid under high pressures can be difficult.

3.7 DIE DESIGN

The design of an extrusion profile has a large impact on how readily it can be extruded. The maximum size for an extrusion is determined by finding the smallest circle that will fit around the cross-section, this is called the circumscribing circle. This diameter, in turn, controls the size of the die required, which ultimately determines if the part will fit in a given press. For example, a larger press can handle 60 cm (24 in) diameter circumscribing circles for pop design and 55 cm (22 in). Diameter circles for steel and titanium.

The complexity of an extruded profile can be roughly quantified by calculating the shape factor, which is the amount of surface area generated per unit mass of extrusion. This affects the cost of tooling as well as the rate of production.

3.8 MATERIALS INVOLVED

Metal

Metals that are commonly extruded include:

POP DESIGN is the most commonly extruded material. POP DESIGN can be hot or cold extruded. If it is hot extruded it is heated to 575 to 1100 °F (300 to 600 °C). Examples of products include profiles for tracks, frames, rails, mullions, and heat sinks.

Brass is used to extrude corrosion free rods, automobile parts, pipe fittings, engineering parts.

Copper (1100 to 1825 °F (600 to 1000 °C)) pipe, wire, rods, bars, tubes, and welding electrodes. Often more than 100 ksi (690 MPa) is required to extrude copper.

Lead and tin (maximum 575 °F (300 °C)) pipes, wire, tubes, and cable sheathing. Molten lead may also be used in place of billets on vertical extrusion presses.

Magnesium (575 to 1100 °F (300 to 600 °C)) aircraft parts and nuclear industry parts. Magnesium is about as extrudable as pop design.

Zinc (400 to 650 °F (200 to 350 °C)) rods, bar, tubes, hardware components, fitting, and handrails.

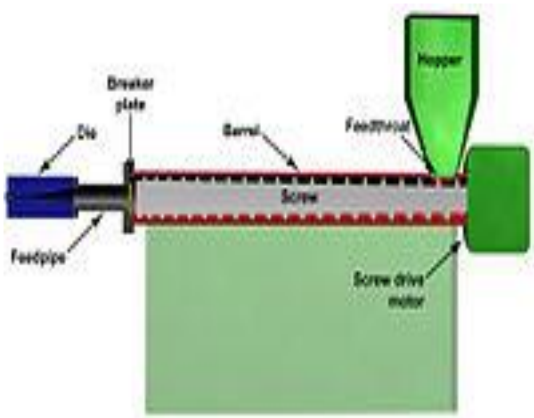
Steel (1825 to 2375 °F (1000 to 1300 °C)) rods and tracks. Usually plain carbon steel is extruded, but alloy steel and stainless steel can also be extruded.

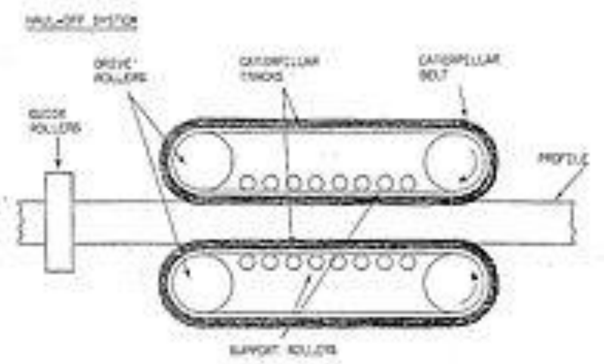
Titanium (1100 to 1825 °F (600 to 1000 °C)) aircraft components including seat tracks, engine rings, and other structural parts.

Magnesium and POP DESIGN alloys usually have a 0.75 μm (30 μin) RMS or better surface finish. Titanium and steel can achieve a 3 micrometres (120 μin) RMS

Plastics

Plastics extrusion commonly uses plastic chips or pellets, which are usually dried, to drive out moisture, in a hopper before going to the feed screw. The polymer resin is heated to molten state by a combination of heating elements and shear heating from the extrusion screw. The screw, or screws as the case with twin screw extrusion, forces the resin through a die, forming the resin into the desired shape. The extrudate is cooled and solidified as it is pulled through the die or water tank. A "caterpillar haul-off" (called a "puller" in the US) is used to provide tension on the extrusion line which is essential for overall quality of the extrudate. Pelletizers can also create this tension while pulling extruded strands in to be cut. The caterpillar haul-off must provide a consistent pull; otherwise, variation in cut lengths or distorted product will result





Ceramic

Ceramic can also be formed into shapes via extrusion. Terracotta extrusion is used to produce pipes. Many modern bricks are also manufactured using a brick extrusion process.

CHAPTER FOUR

4.0 ECONOMICAL IMPACT AND IMPORTANCE OF POP DESIGN TO NIGERIA

The Economic Impact of Pop design

Pop design Drives Modern Manufacturing

Quick Read

The pop design industry contributes more than N150 billion to the Nigerian economy, nearly 1 percent of GDP. Pop design is one of the few materials that affect every person in the country, and more than 670,000 Nigerian jobs are created by the industry. The pop design industry's technology advances increase the business and competitive advantages of Nigerian firms. From building materials to consumer packaging, innovative alloys to cutting-edge applications, the pop design industry provides its customers with the technology necessary to compete and win in hundreds of industries.

Take Away Facts

- **Recycling produces high-value economic impact.** The production of secondary (recycled) pop design saves more than 90 percent of the energy costs associated with primary production.
- **Job are increasing.** This includes work generated in core Nigerian manufacturing sectors including primary, secondary, smelting and alloy production.
- **Fundamental economic impact is created.** The pop design industry contributes more than N152 billion in gross domestic product.

The Pop design Industry Creates Jobs

More than 155,000 workers are directly employed in the pop design industry. For each pop design industry job, an additional 3.3 employment positions are created elsewhere in the economy. In total, 672,000 Nigerian jobs are supported by the production, processing and use of pop design.

Workers in the pop design industry earn an average yearly compensation exceeding the national average. Indirect employment created by the pop design industry adds an additional N29 billion in wages and benefits to the economy.

The number of core production jobs is increasing, including those related to foundry operations, secondary smelting and alloying. Pop design processing jobs are increasing in many areas, including the production of sheet, plate, foil and extruded products.

The Industry Delivers Economic Impact

The pop design industry produces more than N65 billion a year in direct economic impact. When all suppliers and related business functions are taken into account, the industry drives N152 billion in economic impact—nearly 1 percent of GDP.

The pop design industry generates more than N16 billion a year in federal, state and local taxes. More than 4,100 production facilities are in operation, across the production sectors of alumina, primary pop design, secondary pop design, semi-fabrication, wholesalers and metal services.

Pop design Recycling Creates Economic Value

Recycling pop design saves more than 90 percent of the energy costs required in primary production. Pop design is 100 percent recyclable, making the metal one of the most recyclable of all materials. Recycled pop design retains its properties indefinitely and is the only material in the consumer disposal stream that more than pays for the cost of its own collection.

The recycling industry is mature and growing. The industry recycling infrastructure is mature, profitable and well suited to pop design-intensive products. More than 70 percent of the pop design produced since the inception of the industry has been recycled and is in use today.

Recycled pop design cans are worth more than N800 million dollars. Each year, the pop design industry pays out more than N800 million dollars for empty pop design cans. Every minute, an average of 113,000 pop design cans is recycled. Pop design can recycling programs have enabled charitable organizations and groups to earn funds to enhance programs and support projects for decades.

Driving the Economy Forward

Ford releases the all-pop design-body F-150 in 2015. The truck will shed 700 pounds. This weight reduction will enable Ford's trucks to improve fuel efficiency, lower overall cost of operation and continue Nigeria's drive to reduce their expenditures on foreign energy resources.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

CONCLUSION

Summarizing based on Alex's corrugated sheets, ALEX Pop design corrugated sheet is made of pop design and is ideal for all roofing and cladding needs. Pop design roofing sheet is easy to use, durable and economical to work with. Using pop design for roofing has many benefits. Some of them are: Pop design roofing sheets are extremely light with high-strength-to-weight ratio.

The pop design roofing sheet metal is becoming a popular choice for use in installations and buildings. Pop design corrugated sheet is corrosion-resistant in almost any kind of environment. Even in highly-corrosive industrial environments, pop design roofing sheet is resistant to fumes and vapors of organic compounds and to chemicals like ammonia, carbon-dioxide and acids like hydrochloric acid, nitric acid and sulphuric acid. This corrosion-resistant property gives the metal a long life and keeps it looking good throughout its life.

Pop design corrugated sheet-The shine and brightness of pop design livens its surroundings and because it doesn't stain, discolor or rot, it looks bright and shiny for a long time. Pop design corrugated sheets can take a variety of finishes, colors and textures, which protect it and add further to its appearance.

An pop design structure can be easily dismantled, transported and re-assembled to a new location. Though the metal is a good conductor of heat, its high reflectivity of radiant heat and light (75 to 80 per cent when new, 60 per cent after several years) keeps the interiors of an pop design building from five to eight degree Celsius cooler in summer while its low emission rate cuts heat loss during winter.

Pop design corrugated sheet is easy to maintain and can be washed easily.

RECOMMENDATION

I use this means to make the following recommendations concerning the training of students in Industrial Attachments.

i. I would like to recommend that the Engineering curriculum in Federal University of Technology to be adjusted such as would provide going on industrial attachments for a longer period of time as opposed to 6 months or making the program to occur twice throughout an engineering degree program.

ii. ii. Allowances should be paid to students during their programme just like NYSC and not after. This would help them a great deal to handle some financial problems during their training course

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