

Evaluation by Shot Peening processes on Camshaft Sustainability with an Indigenous Foundry Modeling of Technology Transfer in Nigeria Using Computer Aided Engineering Software

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Abstract:- Foundry technology is one of the most challenging field of manufacturing industry which involves metal forming, foundry practice, fabrication and welding processes. As result of developing newly foundry units in west Africa nations technological development of an indigenous industry alongside bank of industry in Nigeria needs coordination, self reliance ,share holders and acceptance of locally produced camshaft components in the market by standardization. Some of this industry have less skilled workers with lack of practical knowledge about machine assembly, handling and fixtures with lack of theoretical background. While some industries lack mechatronic training and experts, instrumentation ,control engineers and technologist to design camshaft from the prophase wireframe modeling to the final phase of solid modeling with a photorealistic effect. The essence of shot peening on camshaft in this research is to detect and minimize unforeseen material thermal shocks, internal vibration, fissures, precision modeling of masses recrystallization point and design error without tolerance in design content in Nigeria indigenous product. It is advisable industries managers should purchase and mentor the staff on how to use software for computer aided engineering and graphics. Other areas are the prevention of failure in moving mechanical component due to induced contacts forces, stresses, corrosion cracking and molecular mass transfer, stress intensity factor determination, air porosity and creep within the camshaft surface at the casting stage locally from feasibility studies to a completion stage using international standard using computer aided engineering software to boast more aesthetic appearance of finished products for importing more with less than exportation target simply comparative advantage. This research enhances a better understanding of the principle of casting of camshaft, optimizing human centric skill on shot peening on a blue print and the use of computer aided engineering to revive locally designed product due to biomechanics condition due to a technological innovation and transfer for a continuous flow cycle demand utilization between local craftsmen and engineers.

Keywords:- Shot Peening, Camshaft, Sustainability, Indigenous Foundry, Computer Aided Engineering.

I. INTRODUCTION

Shot peening it is a process of increasing the value of any metallic material and it properties in such a way that the component transformation [1] undergoes cold working process. shot peening can be used to prevent material failure, scratch on metallic surfaces ,cracks and for the production of small packages of engine and assembled path by considering the point of deformation in material and it alteration by exciting the energies binding the intermolecular forces to exhibit compressive stress in the material which will proportionally increase the fatigue life in the material structural analysis and principal stresses. To sustain this critical design thinking with brainstorming idea for future design that will compensate flowchart of ore separation and dirt stains which affect the reciprocating chamber in cams and crankcase with the crankshaft at the combustion chamber between the firing valves and combustion intake valve suppliers. Camshaft blueprints has to be guided by the drafters, engineers and craftsmen for local sourcing, pressure [2] and temperature regulation in chilled iron casting at their molten stage constituent by sustaining the parent material tensile strength not to undergo excessive crystallization temperature at hardening condition failure due to excessive frictional reduction with heating loss on rotary surfaces which might be above the cast iron thermal conductive temperature resistance. At higher temperature and specifically pressure above 140 to 170 million atmospheric pressure non metal iodine becomes metal ceteris paribus. Camshaft is a rotating object made of metal with an appointed cams converting rotational motion to a reciprocal motion .But in an internal combustion engine (I.C.E) it facilitate an intake of fossil fuel, compression and exhaust valve intake to operate effectively to maintain the engine power band at revolution per minute (RPM) Firstly, low cost of strategies and poor logistic templates has an effect in organizational structure and function in local foundry units in Nigeria from technical or drafting stage of blueprints into the use of computer aided engineering to evaluate possibility synthesis for routine maintenance of moving path scheduling for reuse and algorithm software [3-6] upgrade which is needed to simplified the technician

detail drawing, sectioning accuracy about the maximum thermal conductivity in walls or composite units and slabs such as interference checking in assemblies vibration, tolerance that's climatic and weather condition affecting material linear, area, volume dimensions, scheduling, testing, material requirement selection, comparison of design misalignment, shearing stress and corrosive industrial attack ,analysis by finite element method, action by coolant [7] film concentration and profile of the loop and index of the bearing,

However, Bank of industry (B.O.I) try to merge the dream of small scale and medium industries to fit in and showcase product using 75 percent local content sourcing standard in line with standards for organization in Nigeria S.O.N directly to prevent the extinction of local industries , innovational skills and to boast the economy fiscal policy in any given nation as compared to local content production in Nigeria..The major constraints in accessing loans in the bank of industry (B.O.I) start from 5million naira as the first requirement capital based assurance and below 5 million will be based on matching fund platform [8] benchmark which is collaborated with the state governments at the bottom of the pyramid scheme which is operated through Micro finance banks in Nigeria. Solving problem in an engineering creates another challenge but using the design blue prints will assist in thinking critically the possible human desire of new technology in future simply tag as technology innovation transition. Major problem in Nigeria local foundry production are poor electricity, poor machining and finishing. For instance, huge taxes are fixed as an importation duties which affects the international trade policy. The local industries within Nigeria lack the digital resources to boast business scorecards analytic to check their country economic cash flow, competition, income and cross elasticity of demand alongside specialization feedback. Government revitalization on Strategic analysis for alternative power supply for powering machines or systems will attract foreign investors to unify agreement on harnessing alternative to energy through pyrolysis, geothermal, wind and hydropower supply which will cut supply and indirectly cut excessive deficit in capital expenditure on grid maintenance as a barrier for self driven catalysis for investor regarding on green energy to power steel and foundry technology business in Nigeria which directly promote trade term deals and currency[9] exchange rate survival at the parallel market. Computer aided engineering it is unrestrained usage of computer software to help in design task completion in the following given areas such as finite element analysis, computational fluid dynamics, multi body dynamics, durability and optimization .It also involves the integration of computer aided design and computer aided manufacturing .The local foundry craftsmen lack lots of practical skills on constructive solid geometry modeling, interpretation of stress strain loading constraints, mathematical inductive reasoning like complex design involving meshes poly mesh alongside surface modeling with primitive mesh charts .Camshaft is made from different sources like carbon, silicon that is from a chilled casting iron. But carbon content is about 2 percent and it is resistant to damage by

oxidation. The microstructure of carbon such as temperature , coating and thickness should be monitor due to it amorphous nature and Vander Waal forces. Between the structure in carbon to carbon chain that is carbon is non metal requiring two electrons to become stable to form a covalent bond with it electrons in pairs .At direct combustion of fuel the chills chemical compounds are used to increase the cooling rate and it has hard ledeburitic structure which can only take a metallurgist engineer services to predict such condition which could be very difficult then ignoring it is a negligence to avoid gating defects in pattern and core making in an indigenous industry production cycle. Foundry in Nigeria were known as jobbing in which the manufactures produce products in small quantities due to short demands by the consumers .For instance the Ajaokuta steel company(ASC) in few years ago has floating cost of 7 billion dollars due to buckling and depreciation of machines made by the company dormant for so many years. Other foundry sector in Nigeria are African foundries limited at ogiju in ogun state, Grand foundry, Delta steel company (DSC) and Engineering works limited. Most countries has good technological development towards analyzing past and future threats on design modification using human factor criteria simply ergonomics principle of design .Hence, Nigeria government should refurbish the local industries through technical and vocational training ,webinar, web 2.0 seminars, workshop on ethic engineering practices into technology innovation and sustainable **The** economic development.

II. COMPUTER AIDED ENGINEERING (CAE) PROCESS

In the first stage, the product is designed, typically by computer aided design (CAD), computer aided design drafting (CADD) and autocad software. Engineers and drafters should have skills on how to manipulate the parameters of the product being evaluated at the conception phase. These parameters should include the physical properties, geometry and the limitations under which the entity is being accessed such as corrosion attack and design empathy.

In the second stage, the entity is thoroughly evaluated using cell display processes like finite element analysis (, FEA) NVHA (noise, vibration and harshness by an Accelerometer), mechanical design modulation (MDA) and finite element method (FEM).

At third step, the results are shown to the engineering design team and the parameters of the product undergo simulations to get optimum results. The process is iterated till the desired benefits are achieved using the forecasting theorem and manufacturer competitiveness.

The foundry unit need a flow chart to aid casting processes with aesthetic value that is packaging. Packaging is an essential tool which differentiate products from others in the market alongside salvage value carrying logos.

Sustainable products are those products that provide environmental, social and economic benefits while protecting public health and environment over their whole life cycle, from the extraction of raw materials until the final disposal stage.

Sustainable product will be concisely be conversed by this two concept below:

- **Customer satisfaction:** any products or services that do not meet customer needs will not survive in the market in a long term.
- **Continuous improvement:** as the state of knowledge, technologies and societal expectation continually develop, sustainable products should also continuously improve with regard to social and environmental variation.

Nigerian Standards Council
The Nigerian standards council (NSC)

The mandate of the Organisation includes preparation of Standards relating to products, measurements, materials, processes and services amongst others and their promotion at National, Regional and International levels; certification of products, assistance in the production of quality goods and services; improvement of measurement accuracies and circulation of information relating to standards.

Most of the local foundry department still have limited knowledge of how to use software to test the molecular properties of substance surfaces and fitting measurement to minimize systematic error for equilibrium consideration. At times products are often design and constructed with an inferior material that discourage the

Foundry analysis

consumer taste and trust on local production industry. The industrial standards and ISO standard should seek for technology grants with the extra ties with foreign developed nations into partnership towards shared partnership in companies benefits where patent right are respected .With this new trend the innovation and development will cut off high unemployment rate and reduction of crime which is a hurdle for investors mostly in Africa nations where there is political instability and bandits. A framework should be initiated by the government towards reviving and giving out soft loans with zero or less interest to encourage youth to engage themselves to program simply tag as operation showcase technology blueprint (OSTB). Most evaluation for shot peening are practiced by international based industry to maintain element for gating system like sprue, ingates, risers and pouring cups to avoid prototype rejection in a competitive market and integrity .Great potential are available in Nigeria sectors. But the operational function is suffering especially the quality assurance units and transition from manual to computer numerical control procurement. For instance quality assurance needs computational tool to regulate utility and consumerism regulation.

Modeling for casting cams by arrangement which are listed below

1. Single overhead cam
2. Double overhead cam
3. pushrod

The Parameterization of valve float and variable timing using sensors has to be checked regularly by alarms during modeling using wireframe.

Steps	Description supply	Shift channel	Equipment	End users
Steel Melting Shop	2 Crane	1 Refractory ladles	ID fans	2 Transfer forklift
Continuous Casting Shop	1Turret	Mould & Deburring machine	Scale flushing system	Run out Table
Air Separation Plant	No Cryogenic air separation units	Pressure swing adsorption	Vacuum pressure swing adsorption	No membrane nitrogen generator
Foundry	1 plant single phase	Nil	Multi phase	
Maintenance Shop	Preventive	corrective	predictive	nil
Feeder Units	I unit	Nil	nil	nil

Hazards	control	app mechanism	marginal utility
Heat penetration in the body	Avoid getting near to the molten metal	Use CAD	High output
Chemical splash	Use goggles	Wear overall	Fairly output
vibration	Wear ear protective absorber	1 Accelerometer	High output
Molten metal	Distant from hot crucible	nil	nil
Deformity in kenesiology	Excessive depression	Metabolic disease	Fairly output
machinery	CNC software	CIM software	High output

III. COMPUTER AIDED ENGINEERING (CAE) PROCESS

Benefits of CAE

- Since simulating reality is less time consuming, CAE processes save on time and money
- CAE reduces the errors in design and drawing process
- The impacts of changing parameters on a system can be studied with more accuracy
- Robustness and performance of components and assemblies can be analyzed
- CAE allows for easy visualization and improves designs
- CAE aids ease of manufacturing

Indigenous technology transfer and removal of tariff tax barrier in a business scorecard progressive index phase

The indigenous foundry faces challenge from the importation of machines and refined raw products from its parent materials. Increase in tariff plan affects international trade and boost of business scorecards if the tax rate is regressive type. Business should be agreed upon on foundry and technology sectors to foster industrialization from small, medium and large scale industries both in the developed and developing nations. The local foundry men needs training on machine handling and operation to [10-11] effectively design and fabricate machines that can be used by different region due to tolerance, specification and organizational functions. Machine automation plays significant role in ensuring accident are prevented which could lead to loss of life or amputation of any vital organ during schedule production. Government should provide site that could accommodate investors manufacturing plan which is nearest to the raw material alongside good roads, electricity, health centre for continuous production without any set back. Graduate from vocational school or technical school should be merged together in the industry to share idea of using computer aided design drafting by transferring design blueprint into a service blueprint for a standard specification by symbol communication .For instance CNC lathes, CNC milling machine and CNC Camshaft grinders requires a practical skill to operate and directly basic theoretical and technical foundation is needed to calculate tooth chucks, threading, cutting, application of cutting fluid on metallic surface to annul over peening. Stress on fasteners should be enforced to regulate temperature increase in crane component deterioration when lifting scraps from steel melting shops into the feeders. Dust is a problem in steel industry during melting process, nostril facemask should be design to filter out air pollutant entry the nostril to prevent bacteria and other respiratory tract infections.

Environmental challenge on casting materials

Since metals and non metal are extracted from their ores. It is required to develop personal protective equipments such as eye wear, ultra violet glasses, non flammable and heat reflective clothing[12-13] and equipment ,foot wear meta tarsal safety shoes with heat resistant soles best suited for the operation to avoid molten metal splash, land and air pollutants such as noise, nitric acid, fine dust and sulphur with soot particulate. However,

foundry workers are mostly affected by infrared, ultraviolet (uv) radiation. Disposal landfill has become an issue, according to foundry industry survey about 9.4 million tons of non hazardous spent foundry is generated by united states annually. About 28 percent is used in construction fill as a component of concrete, asphalt, in construction or in soil mixture grading.

Molding process And Requirement In The International Market

when creating pattern on material the crystal lattice should be monitored to avoid hardening process that is billets and the chilled casting iron ratio should be properly mixed using the chvorinov principle of gating system. Molding requires skill but the accuracy depends on constant molding and the application of continuity equation. The 3D design and printing process saves time and reduce cost of production. The 3D design allows drafter to create impression on surface finishing on product thereby promoting trademarks. For automobile industry is challenging more software procurement is needed but also with hardware to survive competition in the industry. Most industries can not afford to use cad modeling ,prototyping and laboratory test always to attain the final design continuously .To save cash and time then computer aided engineering CAE is needed. Indigenous foundry units has concept but final design stage is challenging[14-16]were certain knowledge of material or assembly process will help in simulating testing effect before taking the design into the laboratory and back into virtual stage on model display.

Casting a camshaft

Casting it is a process of shaping a metal into any new form practically .The steps in casting are listed below as follows

- Pattern making
- Mould and core making
- Melting and pouring metal
- Taking the casting out of mould
- Cleaning or felting and Inspection

When casting a camshaft care is needed to create a pattern that would generally be accepted in the market. specific allowance is a determinant to allow perfect cams lobe at the intake fuel processing.

IV. CONCLUSION

This paper focuses on critical design thinking by linking the cadre of design processes and brainstorming concept on basic workshop practices and safety consideration on material failure possibility alongside maximum tensile strength with relief stresses computation. Drawing from the scratch is cumbersome such as creation, analytic three dimensional modeling like wire frame modeling ,surface modeling and solid modeling by boundary representation, modification and optimization using idea transformation by drafters, craft men, technologist to properly present a prototype to engineers with the help of simulation (Ansys engineering software and 3D design software) is challenging from technical

engineering drawing into complex drawing and prototyping. For this aim to be achieved the constraint is to be annul directly from the elementary school and higher learning environment to produce a graduate whose skill is beneficial in production line to provide solution on manufacturing chain demand and supply, forecasting and parameterization logistics starting from raw material extraction, packaging, local product acceptance, labor division and marketing. The rendering processes requires training by personnel in foundry units to brief the employer mostly in developing nation about new technological innovation on local to international needs on fiscal policy which is not properly harnessed on product sustainability in Nigeria steel companies. Machine handling, operation for core making and mould pattern making will also require training to produce product without systematic error in measurement and scaling. The foundry sector in Nigeria is not properly managed because of poor financial start up and return of interest rate for long term investment by the bank of industry, foreign investors of free market capitalism policy which is a regressive condition for neighboring countries to sign memorandum of understanding simply bilateral agreement on trade terms and comparative advantage for sight. If melting shops operators are trained by the foreign experts and by igniting subsidiary units in Nigeria and Africa it will promote free trading by lowering cost of importation of raw materials from one region to another. Such phenomenon will create jobs, justice, peace, education and technical skills to be classify into vocational, elementary studies and promotional training of youth into technical colleges within and abroad by investing on education.

RECOMMENDATION

Government should allow foreign investors to partly manage technical schools by signing a memorandum with the national universities commission (N.U.C) in Nigeria to regulate a pedagogy for teaching efficacy by catching the future potential engineer at early age. As from the age of eighteen a computer training should be given to school students to be acquainted to basic knowledge of classic two dimensional and three dimensional primitive shapes and their uses in constructive solid geometry.

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