

ELEMENT

Your Guide to Foundries in Pakistan
3RD QUARTER 2019



PAKISTAN
FOUNDRY ASSOCIATION
PFA for Development of Foundry Industry

Industrializing Pakistan دنیا ہماری منڈی



OMEGA SINTO FOUNDRY MACHINERY

New Harmony >> New Solutions™

www.ofml.net

1994
SPARTAN I

1984
OMEGA 2

1978
OMEGA 1 HIGH
SPEED MIXER

1998
SPARTAN II

2005
SPARTAN III

2018
SPARTAN IV



OMEGA

40 YEARS OF TECHNOLOGICAL
DEVELOPMENT

Omega Mixers – Setting the pace in foundry sand mixing



MOSH INTERNATIONAL
44-C, 11th Jami Commercial Street, D. H. A. Phase - VII
Karachi - 75500, Pakistan.
T: 021 3531 1014 & 5 M: 0300 287 5262 F: 021 3531 1016
E: shamshadali@engineer.com W: www.moshpakistan.com



OMEGA

OMEGA SINTO FOUNDRY MACHINERY LTD
Morley Way, Peterborough, Cambridgeshire,
PE2 7BW, United Kingdom.
T: +44 (0)1733 232231 F: +44 (0)1733 237012
E: sales@ofml.net W: www.ofml.net



PAK THERM

The Fastest Heating Solution



Mr. Misbah-Ud-Din

**MANUFACTURER OF
INDUCTION MELTING FURNACES
CAPACITY 50 KG TO 25 TON**



CORE FEATURES

- Lowest power consumption.
50-60KWH/Ton steel electricity saving.
- More production with less MDI
- Flash Track Model
- More lining heats
- Fastest after sale service.



POWER SUPPLY SYSTEM



MELTING CRUCIBLE



TRANSFORMER



11KM Sharakpur Road Sagian Moti fouji Road Near Al-Mugni Trust Nain Sukh Lahore.

Tel : +92 42 37934233, Fax : +92 42 37934236 Mob : +92 321 4473308

Email : Paktherm@gmail.com Website: www.paktherm.com.pk

PRESIDENT MESSAGE

All of us at PFA are deeply moved with sudden demise of PFA Secretary Mr. Abdul Rashid in June, this year. We acknowledge his hard work and dedicated service to Pakistan foundry Association for more than 10 years. He organized five successful International Foundry Congress & Exhibitions and added great value to our quarterly magazine ELEMENT. His hard work and dedication will always be remembered.



I welcome Mr. Pervez Iqbal Mughal, Ex GM Production-KSB Pumps Co Ltd who replaces Mr. Abdul Rashid as Secretary PFA and wish him success in achieving the objectives of PFA.

This year, 38 participants from foundry and steel sector from Pakistan attended world biggest foundry exhibitions by the name of GIFA, METAC, THERMPROCESS and NEWCAST 2019, held together on 25th-29th June at Dusseldorf, Germany. This event has the highest visitors and exhibitors' participation of more than 120 countries. New technologies were learnt and new international customers were contacted by PFA members. The new export oriented economic growth outlook of Pakistan

government was conveyed to the international foundry community. Beside exhibition, PFA members also participated in China day celebrations organized by China Foundry Association, and Indian hour organized by the Indian Foundry Association.

Working on the government's vision of up grading of manufacturing facilities for export markets, PFA organized seminar on Aug 27, 2019 at our Foundry Service Center, on refractory related products by senior technicians of Qingdao Dralon Refractory Material Ltd-China. This session was well attended by PFA members. We will also be conducting an information session by Engineering Development Board on global business potential for foundry industry, in the upcoming month.

It should be our endeavor to organize lectures and participation in exhibitions locally and abroad to broaden the horizon of PFA members for reaching out to the global market. My best wishes to the members for future success.

Sikandar Mustafa Khan
President-PFA

Content

- 04 Benefits of Physical Safety Measures to Minimise Worker Injuries from Typical Hazardous Scenarios in Indian Foundries
- 12 Challenges Associated with Producing Impellers through Sand Casting Process
- 17 Some effects of harmful elements in cast irons
- 22 Cast Quiz
- 25 Energy Saving opportunities in a foundry by optimizing compressed air System
- 31 Trained workers are the pre-requisite for performance improvement and enhanced productivity in any business.
- 36 Howrah Foundry Cluster

Chief Editor

Fahad Iqbal

Joint Secretary
Pakistan Foundry Association



Editor / Publisher

Pervez Iqbal Mughal

Secretary
Pakistan Foundry Association
Foundry Service Center,
University of Engineering & Technology,
(Opposite Gate # 5, U.E.T) G.T Road, Lahore, Pakistan
Ph:+92-42-36851559, Cell: +92-0321-4603000
E-mail: pakistanfoundryassociation@gmail.com/
info@pfa.org.pk, Web: www.pfa.org.pk



Benefits of Physical Safety Measures to Minimise Worker Injuries from Typical Hazardous Scenarios in Indian Foundries

AKHILESH SHAH, PRINCIPAL CONSULTANT
PRORENER Engineering Consultants Pvt. Ltd. Ahrnedabad

Abstract

Foundry operations are inherently hazardous as it involves working with hot molten solids. Moreover, the industry is labour intensive and still depends largely on manual operations of most of its processes. Hence, there is always a high risk for serious injury and/or fatality of workers. The hazards mostly emanate due to wet material charging, exposure to toxic metal fumes and sand dust, metal splash, bridging causing explosion, electrocution and failure to follow SOP during any operation. This paper attempts to assimilate various methods and techniques being implemented or being discussed in literature that would prevent, control and mitigate hazardous scenarios in foundry industry. The author has also provided recommendations that may be helpful in bringing awareness to acknowledge the present safety conditions in foundries across India and the pressing need to implement these protection measures.

Introduction

Working with hot molten metals comes with

plenty of hazards. In absence of adequate protection layers, these hazards could quickly transform into undesirable consequences for personnel, environment and assets. The foundry industry in India is still heavily dependent on manual labour for most of its processes.

This leads to very high susceptibility of personnel exposure to foundry process hazards. Besides, in most foundry clusters throughout the country these workers are either hired on daily wages or are on contract. Hence, there is very poor reporting of incidents and accidents, which in turn creates an atmosphere of neglect towards worker's health and safety. Moreover, the regulating authority for Safety and Health also does not have classification of injury/fatality data particularly for foundry industry. Hence, the data on exact number of injuries/fatality for this sector is not recorded anywhere in the system, which again creates a huge gap in understanding the root causes and unsafe practices being followed for foundry operations.

However, based on various research carried out either privately or by different universities in India, does have highlighted some of the most

common causes of hazards prevalent in Indian foundries (Shrivastava, 2009) (Majumder, et al., 2016) (Sharma & Singh, 2015). In brief, the causes of major hazards are wet material charging, exposure to toxic fumes and dust, metal splash, bridging causing explosion, electrocution and failure to follow SOP during any operation.

The identification of these hazards and their risk assessment is also described by number of authors (Allavudeen S. & Sankar S.P., 2015) (Pareek, et al., 2012). However, there is not much discussion available on safety measures or layers of protection that are either prevalent or could be implemented in Indian Foundries.

Hence, the paper aims to discuss the design and benefits of such physical safety measures. Some of these measures such as making completely enclosed system, centralised ventilation, automation of manual activities, etc. are already prevalent in industrialised world.

However, these may not be practical for Indian set-up. The reasons may be due to high cost of installation and maintenance and probably lack of awareness towards these technologies and their importance in reducing injuries and fatalities. Hence, this paper attempts to simplify and discuss these solutions so that they are relatively easy to follow and implement.

Water Metal Explosion Hazard

The premise of foundry operation is to melt the metal so that it could be casted in desired shape. Hence, hot molten metal is the primary fluid during the process. However, when such hot molten metal encounters water it leads to rapid steam generation and potentially water vapour explosion (Lowery, 2014). The root causes of such incidents are mainly water or dampness in scrap metal being loaded in furnace, wet concrete surface of casting or maintenance pits, dampness in pouring ladle, or insufficient drying time of pit walls after application of refractory cement during maintenance operations (Ministry of Sustainable Development, 2006). One of such incident of water vapour explosion in the foundry casting pit due to dampness in the walls is described by Li et al (Li & Ji, 2016). Similarly, Lowery et al (Lowery, 2014) describes

various incidents of molten metal water explosion due to wet concrete walls of casting pits and maintenance pits. One of the OSHA reports (OHS, 2014) describes internal water leak from water cooled jacket of arc furnace as also one of the major sources of explosion. Other sources of water ingress in the furnace area includes leaking roof, windows or plumbing. Usually, SOPs, and routine maintenance should be adequate to avoid such incidents. However, these procedures being carried out manually are prone to human error and hence requires a much robust solution.

Lowery et al (Lowery, 2014) recommends use of special coatings on the pit surface that would produce non-condensable gases on contact with molten metal. This would avoid trigger shock when molten metal encounters the wall and thus would prevent explosion. Alsoufi et al (Alsoufi, et al, 2016) recommends pre-heating of ladles to dry the inner surface to avoid explosion during pouring of molten metal. Similarly, pre-heating the charge material itself would remove any trapped humidity and would also have added advantage of burning of dirt and oil, and thus reduce slag in furnace.

Toxic Fumes and Dust Hazard

Typically, foundry activity involves generation of metallic vapours due to very high temperatures required to melt the metals. Moreover, it also generates very high concentration of dust, from use of sand, which is used in moulding. Both pollutants together create an atmosphere which is unsuitable for any efficient human activity. Usually, most of the foundries work in an enclosure to conserve heat of the furnace. This leads to poor heat dissipation and very high temperatures near the furnace and pouring areas. Besides sand being ubiquitous during foundry operations, the ppm levels of particulate matter remains unusually high in the enclosed space. Song et al (Song Gaoju, et al, 2014) have evaluated that the PM 2.5 concentration inside foundries can reach up to 33 times the respirable limits during sand filling operations. Continuous exposure to such high concentration of dust may lead to respiratory diseases such as silicosis (Morteza, et al, 2013). Similarly, exposure to toxic metal fumes during transfer and pouring operations also pose health hazard for foundry workers (Cyril, 2016). As shown in Fig 1, many foundries

have designed high ceilings with top mounted ventilators, to prevent dust and vapours accumulation at ground level. However, the air changes and fan capacity usually are not sufficient to maintain the ventilation rate. The industry understands permanent exposure to dust, hot fumes and hot metallic gases have led to occupational injuries to workers. (Cyril, 2016) (Morteza,

et al, 2013). However, many studies have evaluated the effectiveness of ventilation system, which, if designed properly, have the potential to control the dust and metallic vapour accumulation. A study carried out by Morteza et al (Morteza, et al, 2013) shows the comparison of dust levels before and after the application of local exhaust ventilation. The study concluded that the use of such system may lead to 59 to 79% reduction in dust concentration. Singh et al (Singh, et al, 2015) also recommends using turbo ventilators for rapid removal of fumes and dust during pouring and moulding processes. Similarly, Cyril et al (Cyril, 2016) proposes

installation of fume collection systems near melting areas and use of gas masks as one of the better preventive measures to reduce exposure to metallic vapours. Hence, providing exhaust ventilation system would help remove any toxic fumes and dust generated during foundry operations. Particularly, a provision of simple vent extractor and blower system at potential locations of dust and vapour generation would effectively ventilate the gases and thus minimise the exposure hazard.



Fig 1 : Typical foundry atmosphere, high ceilings

Spills and Splash Hazard

Spills in foundry occurs mainly during charging

of metals in the furnace, opening cupola bottoms to salvage the coke and during molten metal pouring and transport operations (Choi & Shin, 2014). Molten metal splash and burn injuries are serious hazards in foundry industry. Moreover, uncontrolled spillage and seepage of molten metal in surrounding areas may also lead to splash hazard and product loss. Improper layout and planning may also lead to longer travel distances and increase in risk of exposure to workers working in different areas (Singh, et al, 2015). Alonso-Pena (Alonso- Pena, et al., 2015) has discussed serious burn injuries caused through molten metal splash that would run down along the pants and downwards to the feet. Many methods are prevalent in industry to protect workers from these hazards, either through PPEs or adopting techniques that would reduce human exposure during such processes. Hsia et al (Hsia & Huang, n.d.) has used Theory of Inventive Problem Solving (TRIZ) and have proposed a recommendation to use a control devise as shown in Fig 2. The use of this devise would automate the pouring process and eliminate any splash hazards to workers during this activity.

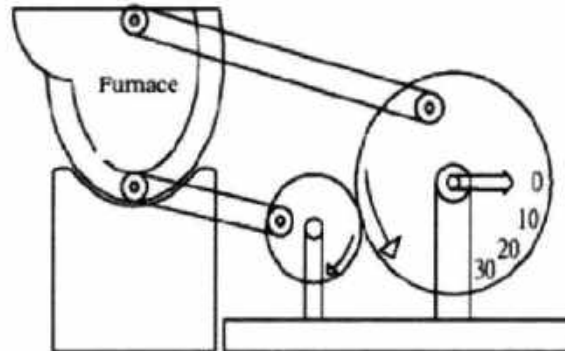


Fig 2: Directing the furnace mouth to the mouth of the casting mould with an angular control device installed lateral to the furnace.

(Hsia & Huang, n.d.)

Similarly, Pareek et al (Pareek, et al, 2012) have discussed a semi-automatic method of transferring molten metal from furnace to die casting. The technique involves a variable speed pouring system which is controlled through Programmable Logic Control (PLC). The filling and pouring operations starts and stops based on proximity sensors and load cells. The transport arrangement includes use of mould boxes that would travel on track lines. Manual interface is only required to set the pouring flow rate and to move filled-in mould boxes on track lines. The arrangement would eliminate

proximity of workers during the filling and pouring operations and thus minimise risk of splash hazards. Also, Singh et al (Singh, et al, 2015) describes how proper layout can help reduce travel time and isolate workers working in different areas. Proper layout would minimise the unnecessary exposure of workers who are not part of pouring or transfer process. Moreover, it is also recommended to provide bunds or dikes surrounding the cupola bottoms to control and contain the furnace contents. A SOP could also be developed to mandate workers to remain outside the dikes during opening of cupola bottoms. This would not only minimise exposure of workers but also eliminate seepage of any molten metal to other areas.

Adequate Personnel Protective Equipment (PPE)

There is always a risk that any design safeguard could fail, whether it may be ventilation system or automatic pouring systems. Hence, the last line of defence to protect the workers is to don appropriate PPE. Various authors (Alonso-Pena, et al, 2015) (Majumder, et al, 2016) have described effect of hazards such as splash, spills, heat stress prevalent in the foundry industry and corresponding ailments and injuries caused during exposure to such hazards, particularly due to inadequate PPEs. They have also suggested appropriate PPEs that could be helpful in protecting themselves in case of any incident. Alonso-Pena et al (Alonso-Pena, et al, 2015) have described that the feet are most susceptible to burn injuries as any splash on the cloths would fall down towards the feet. Moreover, any spills would first affect the leg region. Hence, Alonso-Pena et al (Alonso-Pena, et al, 2015) recommends using safety boots to prevent any direct exposure to molten metal. Moreover, flameproof jackets are also proposed to avoid ingress of any hot molten metal to the inner clothing. Shirish et al (Shirish, et al, 2016) describes the effect of heat stress and how it increases risk of injuries, burns and accidents in the foundry. Heat stress leads to many adverse physiological conditions, such as increased heart rate, increase in core body temperature etc. All these conditions not only leads to decrease in worker efficiency but also make

them prone to errors in highly hazardous atmosphere. Shirish et al (Shirish, et al, 2016) have suggested using of Personnel Cooling Garment (PCG), which can provide a microclimatic condition of 25°C for the wearer. The PCG is found to reduce the skin temperature by up to 5°C as compared to normal habitual clothing. During the experiments conducted by Shirish et al (Shirish, et al, 2016) the PCG was found to be successful in maintaining a stable heart rate. However, the experiment was only conducted for 90 min and hence its effect during full work hours still need to be studied before implementation.

Conclusion

Some of physical safety measures discussed in the paper can be summarised as follows :

- Dampness or humidity in the feed material has the potential for water metal explosion. Hence, it is recommended to pre-heat the charge material by means of hot air or direct flame to remove any trapped humidity. Moreover, use of special coatings on the pit surfaces also helps avoid exposure to dampness trapped in the walls.
- Exposure to metal fumes from heavy metals, dust and silica can cause variety of fatal diseases. Hence, providing ventilation hoods would help remove any toxic fumes and dust generated during any foundry operation.
- Spills and molten metal splash cannot be fully avoided and hence it is necessary that a containment is provided at all locations of potential spillage. The containment or dykes would not only prevent any spread of liquid metal in the operating areas but also help contain liquid metal splash within the walls of the dyke.
- Isolation of workers either through physical means by providing control and observation booths or through SOP would be helpful to minimise their exposure to heat and metal splash. Physical isolation during pouring operation would eliminate any hazard related to exposure to sparks or falling liquid metal splash. Moreover, developing a SOP or work permit system to restrict any worker movement in process areas other than the operators assigned for the task would eliminate the risk of exposure to other workers. The work areas may be defined such that there is no overlap of operations or operating tools for workers working in different areas.

- Finally, the last layer of protection is PPE and coveralls. Besides, for foundry workers, it is suggested to wear coveralls along with flame-proof aprons to avoid any burn injuries during molten metal splash incidents.

- The paper has tried to highlight the importance of these measures and their prevention, control and mitigation effects in minimising injuries/fatalities from typical hazardous scenarios in the Indian foundry industry.

Recommendations

Following are couple of recommendations that might contribute in focusing efforts to raise awareness about prevalent safety culture in the Indian foundry industry:

It is recommended to perform a Hazard and Operability (HAZOP) study to identify various causes which may lead to hazardous incidents. It would also help highlight safeguards available in existing design to prevent and mitigate such scenarios. Such semi-quantitative method of risk assessment for foundries is already described by Allavudeen et al (Allavudeen S. & Sankar S.P., 2015). The method is based on hazard identification and evaluating risk based on pre-decided risk criteria. Another such risk assessment method known as Failure Mode and Effect Analysis (FMEA) is described by Pareek et al (Pareek, et al, 2012), which determines hazard occurrences due to various failure modes of equipment and foundry processes.

Implementation of above recommendations would bring awareness on the quality and quantum of incidents occurring in the industry. Besides, it would also help focus on root causes of such incidents, which is a critical information for deciding and justifying any protection measure.

Moreover, the Industry should also take the lead and report near misses and incidents occurring in its facility; this would channelise the efforts to adopt measures in preventing their repeated occurrences.

References

1. Allavudeen.S. S. and Sankar S.P., 2015, Hazard Identification, Risk Assessment and Risk Control in Foundry. *International Journal of Industrial Engineering*, 2(3), p. 1-4.

2. Alonso-Pena, D. et al., 2015, Feet Sunk in Molten Aluminium: The Burn and its Prevention. *Burns*, Issue 41, p. 1122-1125.

3. Alsoufi, D. M. S., Yunus, D. M. and Asadullah, M. M., 2016, Economical and Technical Way of Ladle Pre-heating by the Use of Flameless Oxyfuel (HSD/LPG) Gas in the Steel Industry, *Elixir Mech. Engg.*, Volume 95.

4. Choi, S. J. and Shin, W. C., 2014, The Status of Accident and Prevention Measures for Ladles, *J. Korea Saf. Manag. Sci*, 16(3), p. 201-207.

5. Cyril, O., 2016, Health and Environmental Protection in an Industrial Plant: A Case Study of Ajaokuta Steel Company Limited (ASCL) Foundry Shop, *International Journal of Swarm Intelligence and Evolutionary Computation*, 5(3).

6. Gandhewar, V. R., Bansod, S. V. and B. Borade, A., 2011, Induction Furnace - A Review, *International Journal of Engineering and Technology*, 3(4), p. 277-284.

7. Hsia, T.-C. and Huang, S.-C., n.d., Using the Theory of Inventive Problem-Solving (TRIZ) to Implement Safety Improvements in Foundry Engineering Pouring Procedures, s.l.: s.n ..

8. Li, G. and Ji, T., 2016, Severe Accidental Water Vapour Explosions in a Foundry in China in 2012, *Journal of Loss Prevention in the Process Industries*, Volume 41, p. 55-59.

9. Lowery, A. w., 2014, Preventing Explosions in Maintenance Pits Under Furnaces, *TShe Minerals, Metals & Materials Society*.

10. Majumder, J. et al., 2016, Comparison of Workers' Perceptions toward Work Climate and Health Symptoms between Ceramic and Iron Foundry Workers, *Indian J Occup Environ Med*, Volume 20, p. 48-53.

11. Ministry of Sustainable Development, 2006, Explosions involving Water and Molten Metal, ARIA 31881- 15/05/2006 - 08 - VIVIER-AU-COURT, 15 5, p. 15-18.

12. Morteza, M. M. et al., 2013, Designing, Construction, Assessment, and Efficiency of Local Exhaust Ventilation in Controlling Crystalline Silica Dust and Particles, and Formaldehyde in a

a Foundry Industry Plant, Arh Hig Rada Toksikol, p. 123- 131.

13. OHS, 2014, Occupational Health & Safety of Foundry Workers, Foundry Review.

14. Pareek, P. K., Nandikolmath, T. V. & Gowda, P., 2012, FMEA Implementation in a Foundry in Bangalore to Improve Quality and Reliability, International Journal of Mechanical Engineering and Robotics Research, Volume 1, p. 81-87.

15. Sharma, R. and Singh, R., 2015, Work-Related Musculoskeletal Disorders, Job Stressors and Gender Responses in Foundry Industry, International Journal of Occupational Safety and Ergonomics, 20(2), p. 363-373.

16. Shirish, A. et al., 2016, Effectiveness of a Cooling Jacket with reference to Physiological Responses in Iron Foundry Workers. International Journal of Occupational Safety and Ergonomics.

17. Shrivastava, A. K., 2009, Health Hazards of Foundries and Forges, s.l., s.n.

18. Singh, M. D. et al., 2015, Overall Productivity Improvement in Casting industry by Using Various Industrial Engineering Techniques, International Journal of Innovative Research in Science, Engineering and Technology, 4(1), p. 18713-18721.

19. Song Gaoju, et al., 2014, Measurement and Analysis on the Concentration of Dust of Various, Applied Mechanics and Materials, Volume 651-653, p. 455-459.

20. Tiwari, P., Kothawale, R. & Yadav, P. P., 2017, Semi Automatic Pouring System, International Research Journal of Engineering and Technology, 4(4), p. 2834-2837.

RASTGAR

AIR COMPRESSORS

 **CompAir**
Air Compressors

High Quality Casting



*Terms And Conditions Apply

RASTGAR & CO

Darul Uloom Plot # 9, Shahrah-e-Darul Uloom, Sector 28,
Korangi Industrial Area, Karachi-75180, Pakistan

Tel: +92 21 35123114-7 | Email: ko@rastgar-co.com | Web: www.rastgar-co.com

KARACHI

LAHORE

ISLAMABAD

• SALES • SERVICES • SPARES • SOLUTIONS



Servo Manufactures All types of Greases & Lubricating Oils for Industrial & Commercial Use



SERVO INDUSTRIAL OILS

- ◆ Servo Gear Oil
- ◆ Servo Hydraulic Oil
- ◆ Servo Spindle Oil
- ◆ Servo Heat Transfer Oil
- ◆ Servo Cutting Oil
- ◆ Servo Quenching Oil
- ◆ Servo Compressor Oil
- ◆ Servo Gas Engine Oil
- ◆ Servo Petrol Engine Oil
- ◆ Servo Diesel Engine Oil
- ◆ Servo Brake Oil



Servo Greases

- ◆ Servo Lithium Grease
- ◆ Servo Non-Drop Grease
- ◆ Servo Calcium Grease
- ◆ Servo Graphite Grease
- ◆ Servo Lithium Complex Grease
- ◆ Servo Polyurea Grease

Servo Motor-Oil (Pvt.) Ltd.

8-C/1-B, Industrial Estate, Multan-Pakistan.
Phone: 061-111-913-913 Fax: 061-6538731
www.chicagogroup.com.pk

FOR INDUSTRIAL SALES PLEASE CONTACT:

Engr. Kamran Bashir Cell #: 0300-8736352
e-mail: kamranbashir@chicagogroup.com.pk

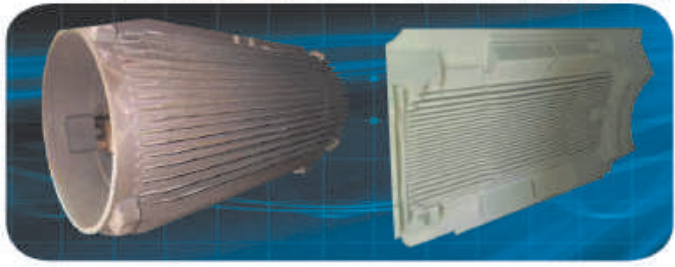
**consistent quality
increased productivity
wide accessibility
prompt technical backup**



forace Industries



forace polymers™



Providing Customized Solutions

Forace Group is a name synonymous with reliability. As the largest producer of Foundry Consumables in India, we offer a wide range of solutions to our ever increasing clients across the globe. Backed by robust infrastructure, a state-of-the-art fully automated manufacturing unit, R & D and Quality control centres, Forace Polymers delivers customized solutions for Binders, Coatings, Foundry Consumables, Phenolic-Liquid and Powder Resins.

Binders

Shell resin system (solid / liquid / regular / NF)
Two part no bake acid cured system
Two part no bake ester set system (steel, SG, NF)
Phenolic urethane self setting system (steel, Iron, NF)
Phenolic urethane gassing cold box
Hot box system for ferrous & non ferrous
Furan no bake (steel, SG, CI, NF)
CO₂ cured phenolic
Inorganic no bake system

Coatings

Zircon spirit/water based
Graphite spirit/water based
Alumino-silicate mix refractory spirit/water based
Magnesite spirit based
Graphite water base for metallic trough
Bismuth base coating
Coating for lost foam process
Tellurium base coating
Sulphur blocking coating
Chill Coat

Other Foundry Consumables

Thinners
Pattern cleaning agents
Release agents
- Release agent for green sand mould
- Release agent for alkaline phenolic no bake system
- Release agent for cold box
- Parting agent for shell (water / solvent based)
- Aluminum based release for no bake system
Core joining paste
Mould sealing rope

Surface hardner for green sand mould
Sealing compound for mould and core
Silicon carbide, zirconia foam filters
Ceramic sand
Chromite sand
Sand Additives (Sphereox) of Chesapeake Specialty Products, USA
Furnace & refractory cleansing fluxes of ASI International, USA
- Redux EF40L briquettes
Additive for thermal reclamation of alkaline phenolic no bake resin
Anti Veining solution from John Winter & Co., UK

Non Ferrous Foundry Consumables

Forace die coatings

- Graphite based die coatings
- Silicate based die coatings
- Aluminium based die coatings
- High pressure die coatings
- Zircon water base dressing
- Graphite based lubricant (plunger lubricant)

Forace degasser

- Forace degasser N2 (nitrogen based)
- Forace degasser CF (chlorine free)

Forace grain refiner (powder & tablet)

Forace cover fluxes

Forace modifier

Forace mastic

Forbral

Forbruss

Master alloys

Shell Resin Coated Sand

Forsand AC (for anti cracking grade)

Forsand LN (for steel casting with low nitrogen)

Forsand GP (for heavy section iron casting)

Forsand NF/AL (for non ferrous casting)

For more information contact:

Challenges Associated with Producing Impellers through Sand Casting Process

T S Srinivasa Rao
Head-Product/Process Development (Casting),
Armstrong Fluid Technology, Peenya Industrial Area, Bengaluru
Courtesy; Indian Foundry Journal

Abstract

Impeller is an important part of pumps. The performance of the pump mainly depends on the quality of impeller casting in terms of geometry and casting integrity. In this paper, challenges associated in producing impeller casting through sand casting process are discussed.

1. Introduction

Impeller is an important part of any power absorbing machines like pumps. It is considered to be a heart of the pump. The pump discharges the fluids by centrifugal action. The performance of the pump mainly depends on the quality of impeller in terms of geometrical accuracy and soundness of the casting. There are different configurations or types of the impellers employed in pumps like open type, closed type, with clearing vanes, single suction and double suction type.

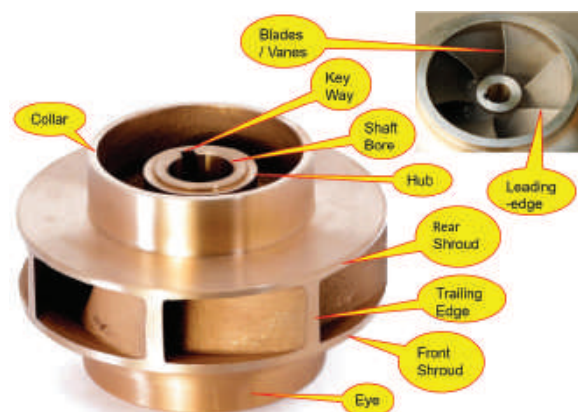


Table-1 : Composition of Tested Liquid Iron

A typical impeller casting with nomenclature is shown in Fig 1. Open type and closed type impeller castings are shown in Figs 2 and 3.



Fig 2: Open type impeller casting



Fig 3: Closed type impeller casting

Processes involved in the production of Impeller casting

The performance of impeller mainly depends on exit width accuracy, surface roughness in hydraulic pathways, vane position and hydraulic dimensions accuracy. This substantiates the criticality involved in producing the sound impeller casting through sand casting process. The process of producing sound impeller casting involves different stages. They are categorised as the following :

Tooling stage

The factors which are challenging at the tooling stage are contraction allowance and

draft angles. Tool manufacturing needs special attention to address contraction allowance as this is not constant for all configurations of impellers. Surface roughness of the tool is the key to ensure good surface quality of impeller casting. The tool material should be rigid for ensuring consistent geometry. The draft angles should not exceed the draft given in 3D model for vanes. Least possible draft angles should be employed while ensuring the release of mould and core without damage. Larger draft angles affect the volume of fluid to be discharged. The gating has to be integrated in the tooling. The gating design should ensure laminar flow and the highest yield. There are thin sections in the components which are to be filled accurately. The gating design has to be validated with simulation software before integrating in the tooling stage. The part number and provision for incorporating heat number are to be taken care of in tool manufacturing.

Mould and Core making stage

The challenges in moulding process start with availability of quality sand. Controlling chemical additions, LOI (Loss on Ignition), compaction, curing time, stripping accuracy, retaining identifications legibility, handling and storage are the key factors which need attention to achieve good quality impeller casting. These factors vary with change in size and configurations of the impellers to be cast.

Core making is the key process which will influence hydraulic pathways accuracy and surface roughness. Often imported sand is used for core making in cold box core making process to ensure good surface condition and geometrical consistency. Other influencing factors are resin addition, shooting and gas purging, handling gas emission which is hazardous. The core extraction is another area which requires special attention along with the cleaning and handling of core. The photograph of a typical core of impeller is shown in Fig 4.

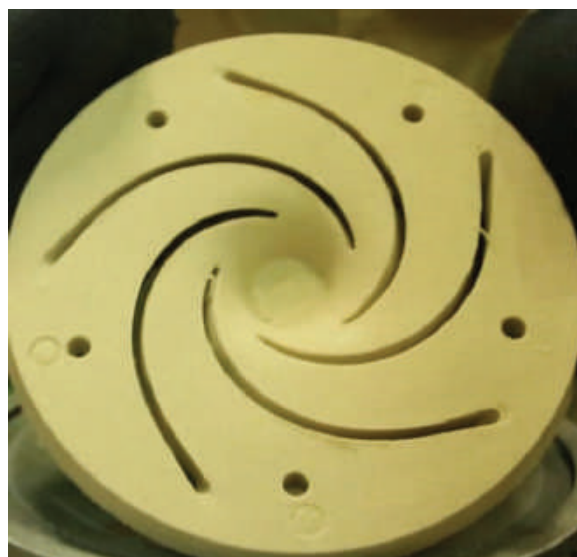


Fig 4: Core of an impeller

The mould and cores are to be given special coatings. These are coated with special coats. The coating should ensure dimensional accuracy while ensuring easy de-coring from the casting. The coatings should not fill lettering/identifications provided on the cavity of casting. The coating of mould and cores should be of uniform thickness. Drying the moulds and cores is another important factor which has an impact on the quality of the casting. The moulds and core assembly requires special attention. Precision in assembly is very important to maintain geometrical integrity. The retention period of mould and core assembly is a factor which requires attention.

Melting and Pouring stage

The melting and pouring process determines metallurgical quality of the part. Careful selection of raw material, charge-mix, melting, de-slagging and degassing are the key factors in preparing good quality of liquid metal. Tests that are to be conducted before pouring are chemistry, temperature, sink test, fracture test and bend test. The mould and core assembly is to be clamped properly to take care of buoyancy force of liquid metal. Skilled manpower is required to be engaged for pouring of impellers due to their complex geometry. Handling fumes and unsafe conditions/acts are the challenges for any foundry.

Post Pouring stage

Post pouring stage includes fettling, cleaning, shot/abrasive blasting, finishing and machining process. The post pouring activities at foundry level is considered as hazardous in terms of product safety, effect on environment and human safety. Not much of research is done in this segment for automation and hazard reduction. Acute shortage of skilled manpower for fettling is reported from all regions of foundry industries. Shakeout is considered as dirty process in foundries, which needs attention to make these areas clean and safe. Product needs to be taken care of from physical damages during shakeout and de-coring. The burnt sand cannot be discarded as it is. This sand has to be reclaimed and reused for moulding purpose. Discarding excess used sand is sensitive to environment. 100% reclamation is possible in thermal reclamation process, but this is expensive process and hence small/medium scale foundries need assistance from Government bodies for funding capital investment. Maintaining casting integrity at the post pouring stage is a challenging one in the production of impeller casting.

Post pouring stage at machine shop level is final machining of impeller casting. The machining process plays a major role in achieving geometrical consistency and smooth finish which will have direct impact on impeller performance. Machining shroud profiles with combination of lines / arcs in 2D machining is a challenge. Careful separation of different materials needs special attention to avoid mix-up. Inspection and balancing are the critical processes for certifying impellers to the print. Inspecting the geometrical dimension and tolerance need special measuring instruments like CMM. Higher the process capability, lower the unbalanced mass. Special gadgets like Boroscope have to be employed for inspecting hydraulic pathways to detect blockages, if any. Care is to be taken in handling, packing and transport to ensure that the customer receives parts in good condition.

Summary

Impeller castings are very complicated components having different sizes and intricacies. The final components consist of both casting and machining surfaces. The casting surface requirement is very stringent. The performance of impeller mainly depends on the integrity of casting surfaces. The geometry and soundness of components are very crucial. Therefore, at every stage of casting manufacturing, wide variety of factors requires stringent monitoring.





QADIR ENGINEERING

Provides Best Quality Products

**Manufactures and Assemblers of
Aluminum High Pressure Die-Casting
& Sheet Metal Parts**



www.qadirengineering.com

Company Profile

"Qadir Engineering" is Lahore based company has a covered area of over 252000sq.ft. as unit in glamour adda near Sundar Industrial Estate Lahore. Qadir Engineering was found in 1995. Qadir Engineering is an ISO 9001-2008 certified company.

Qadir Engineering is famous for high pressure aluminium die-casting. Qadir Engineering specializes in the manufacturing of motor-cycle auto parts like clutch cover, crank cases, front and rare wheel hub, front and rare brake panel plate, brake shoe and different kind of service line material for Sui Northern Gas Pipelines Limited Lahore and Sui Southern Gas Company Limited Karachi.



Main Head Office Address:

Plot No.6, Opp: Amir Road, Ring Road, Bhamma, Shadbagh, Lahore.

Tel: +92-42-37604970-71 Cell : +923222221783

Postal code : 54010

Personal Email: wahaj.rana@yahoo.com

Official email: wahaj@siwagenuineparts.com



Amir
0337-4535992



H.B.

Engineering (Pvt) Ltd.



“Manufacturers & Assemblers of
AUTO PARTS”



Differential Sub Assembly



Axcel Set



Propeller Shaft



Front Wheel Hub



Die-Casted Wheel Hub



Brake Caliper Set



2Pieces Disc-Brake Drum



Double Disc-Brake



Singel Disc-Brake



+92 42 3760 5626



+92 321 446 1714



info@hbengineering.com.pk



www.hbengineering.com.pk

Samanzar Colony, Near Hajvery
Mosque Shad Bagh, Lahore.



Some effects of harmful elements in cast irons

By Dr John Pearce
Courtesy; Metal Casting Magazine

Introduction

Many small iron-foundries continually encounter metallurgical and other problems due to insufficient control in the use of scrap and foundry returns in their charge materials. Lack of attention to the removal of damaging materials from bought-in scrap results in the pick-up of undesirable harmful elements during melting. The most damaging of these elements include aluminium, antimony, bismuth, boron, chromium, lead, and titanium. The deleterious effects, especially on graphite morphology, of some of these elements can be much more damaging when dissolved hydrogen is also present. Hence, problems, such as pinholes, unpredictable chill formation and inferior mechanical properties due to degenerate graphite forms, often arise during the rainy season in S.E Asia due to the high humidity levels and, in many cases, due to the charging of wet and rusty scrap because of inadequate protection of charge materials out in the stockyard. Wet or oil covered scrap can not only give rise to metallurgical problems but also increases melting costs and creates excessive fume in the melting shop.

The gradual replacement of cupolas by induction melting over the last 50 or so years has increased the need for iron foundries to develop improved knowledge and practical understanding of the effects of all trace elements in their melts. This has led to continuing R&D efforts into how such elements can influence both microstructural development and the occurrence of casting defects [e.g. 1-5]. This short review focuses on the effects of harmful subversive elements on graphite forms in grey and ductile irons.

Harmful Elements in Grey Cast Irons

In flake graphite irons contamination with lead (Pb) or bismuth (Bi) coupled with the presence of above normal amounts of dissolved hydrogen can cause the formation of "Widmanstätten" and/or "Mesh" type graphite in microstructures resulting in significant reductions in mechanical properties [6-9]. Antimony additions can also cause Widmanstätten and spiky graphite [10]. During foundry production of unalloyed irons Pb content may vary from 0.0001 to 0.01% and Bi up to 0.02% depending on charge materials and melting practice. Both elements can be picked up from free-cutting steel scrap in the form of old components, off-cuts or machining swarf. Lead contamination is more common since it can also arise from lead-coated steel sheet, lead-based paint or vitreous enamel coatings on steel or cast-iron scrap, and from balance weights in wheels, etc. In cast iron engine scrap lead may be picked up from engine deposits and from bearing materials which have not been removed. Foundries also must be aware of the health and safety issues involved in melting charges that potentially could contain lead.

Widmanstätten graphite, as illustrated in Figures 1 and 2, appears as sharp, plate-like forms growing out from the sides of graphite flakes and as concentrated regions in which very thin straight graphite plates have formed in a parallel manner. Mesh type graphite which forms as a connecting network, as in Figure 3, can be due to the presence of Pb or Bi, or due to excessive sulphur content. Early

studies [6, 7] showed that in both grey and austenitic flake graphite irons Widmanstätten type graphite was only observed when extra hydrogen was also present, e.g. when using wet charge materials, inadequately dried refractories, and in castings from greensand rather than dry-sand moulds. It is more likely to form in heavier rather than lighter sections. Mesh type graphite tends to be found in thinner sections. Contamination with aluminium from charge materials or from excessive addition of Al-bearing inoculant promotes hydrogen pick-up and hence increases the deleterious effect of any lead that may be present as well as the tendency for pin-hole defects. It has also been found that the presence of calcium together with lead and hydrogen also increases the likelihood for Widmanstätten graphite depending on cooling rates during and just after solidification [11]. This work suggested that

preferential segregation of these elements occurs at the surface of graphite flakes such that some graphite formation is delayed until after solidification is completed. This leads to the solid-state precipitation of thin graphite plates along preferred crystallographic planes in the austenite matrix.

In Grade 220 grey iron the formation of Widmanstätten graphite reduces tensile strength from 230MPa in uncontaminated iron to 45-155 MPa in Pb-contaminated irons and also spoils machined surface finish [8]. Contamination with lead has also been associated with unpredictable chill formation in grey irons and surface tear and shrinkage porosity defects [8]. In alloy irons such as flake austenitic and ferritic 15%Si irons the combined effects of Pb contamination and dissolved H are more damaging with much of the graphite being in Widmanstätten



FIGURE 1. Widmanstätten graphite in grey cast iron present as localized areas and as individual platelets attached to graphite flakes, x150. [6-9]

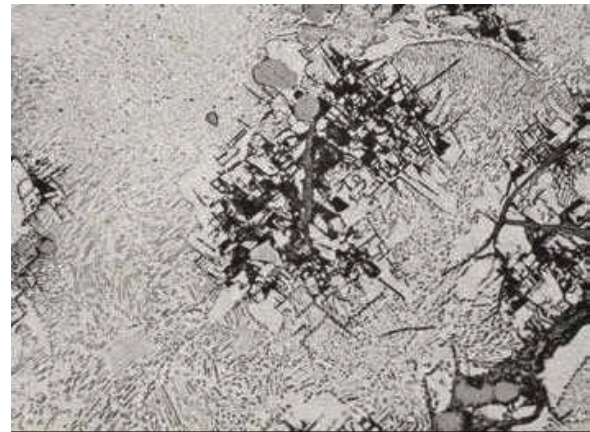


FIGURE 2. Local area of Widmanstätten graphite in grey cast iron showing thin parallel plates of graphite, x500. [6-9]

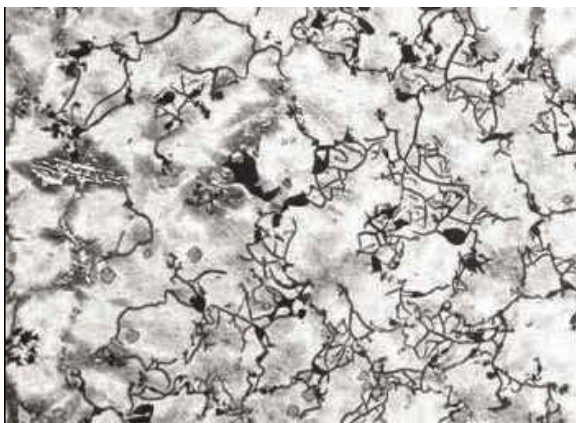


FIGURE 3. Mesh form of graphite in grey iron, x150 [9]

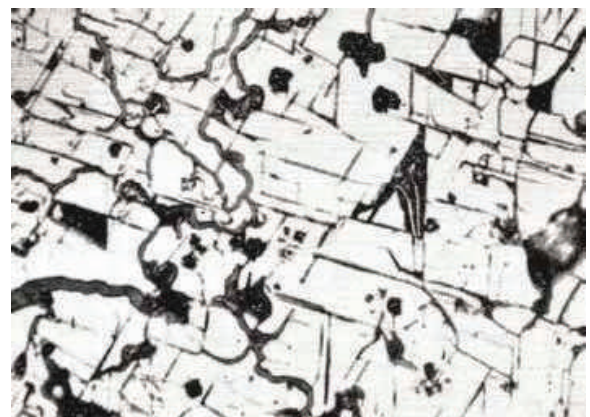


FIGURE 4. Widmanstätten graphite in austenitic grey iron, x800 [6,7]

form [6,7]. Austenitic irons can dissolve more lead than grey irons: Figure 4 shows the nature of Widmanstätten graphite found in a 75mm cast section of an austenitic iron containing 0.03%Pb that had been poured from a ladle having a damp refractory lining [6, 7]. In producing austenitic irons lead can be picked up from Monel (nominally 70%Ni-30%Cu) scrap in which some grades also contain 2%Al [8].

In recent years, mainly as a result of increasing use for automotive body parts, the amounts of galvanized and micro-alloyed sheet steel scrap and clippings in the scrap supplied to foundries has increased. Although melting of zinc coated steel scrap requires extra environmental protection against the fume generated, the presence of zinc, in amounts up to 0.15% the maximum level normally experienced in foundries, does not appear to give rise to degenerate graphite but does give some coarsening of flake graphite [12]. Zinc acts as a graphitizing agent: it

decreases chill depth and increases ferrite content in the matrix of pearlitic irons but the latter effect can be offset by pearlite forming elements. In nodular graphite irons normally only up to 0.06%Zn is retained in the iron and this does not appear to adversely affect graphite form or mechanical properties.

The main concerns over the use of micro-alloyed steel scrap is contamination of the iron with strong carbide forming elements such as B, Cr, Mo, Nb, Ti and V [13]. These elements tend to segregate to intercellular regions promoting the formation of eutectic carbides especially in ductile irons. In grey irons contamination with Ti, which may also be introduced via enamel and paint coated scrap or from compacted graphite iron scrap, promotes the formation of undercooled graphite and an associated free ferrite matrix [14]. Although it can combine with nitrogen to prevent N fissure or blowhole defects, in the presence of aluminium Ti can itself cause pinhole defects.



FIGURE 5. Flake graphite formed in a pearlitic ductile iron containing lead and antimony, x500. [8]

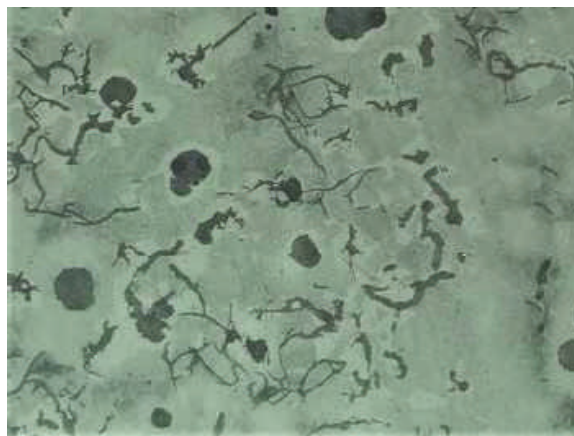


FIGURE 6. Flake graphite formed due to titanium contamination in Mg-treated nodular iron, x150. [15]

Harmful (Subversive) Elements in Ductile Irons

In ductile irons impurity elements that prevent the formation of well-shaped graphite nodules leading to undesirable graphite forms that reduce mechanical properties are termed “subversive” elements [2, 15-16]. The most harmful impurities when considered as individual elements are lead (>0.001%), bismuth (>0.002%), antimony

(>0.004%) and titanium (>0.1%). When combinations of these elements are present the danger % levels may be lower due to their synergistic effects. As for grey irons under the slower rates of cooling in heavier-section ductile iron castings the presence of these harmful elements is much more likely to result in sub-nodular and undesirable forms of graphite including flake, quasi-flake, spiky, chunky and exploded graphite [17-20]. The presence of such elements arises from the use of “impure” charge materials containing

steel scrap or contaminated returns. Fortunately, if the level of contamination is not too high, these damaging effects can be prevented by the addition of small amounts of Ce (around 0.005-0.01%) with the Mg nodularising treatment [1-3]. Ce is included in several commercial Mg-ferrosilicon treatment alloys or is added separately as Ce-mischmetall.

Without sufficient counteracting Ce addition in the treatment of melts based on impure charges subversive elements can cause sub-nodular graphite forms as shown in Figures 5 and 6. In the microstructure shown in Figure 5 regions of flake graphite have formed in a pearlitic nodular iron containing 0.02%Pb and 0.1%Sb even when 0.02%Ce is also present [8]. In Figure 6 contamination with Ti has resulted in flake graphite in an iron Mg-treated without the presence of Ce [16]. The subversive effect of Ti has been used in the development of commercial Mg-Ti-Ce treatment alloys for the production of compacted graphite irons (CGI). However, because of the chance of CGI returns contaminating FC and FCD iron production plus some other disadvantages alternative treatment processes which do not involve the use of Ti are preferred [21]. Subversive elements tend to segregate with carbide forming elements such as Cr and Mn to intercellular regions. This effect is shown in the microstructure of a ferritic ductile iron (Figure 7) in which such segregation has resulted in the formation of degenerate flake graphite and pearlite [15,22].

In the presence of Ce some “subversive” elements can have beneficial effects on the microstructures of ductile irons. For example, additions of Bi can give up to 5 times increase in nodule number in thin and medium cast sections and, when used in combination with late inoculation, can also give similar increases in heavier sections up to 300mm [23,24]. Increases in nodular number reduce the severity of intercellular segregation and hence the formation of intercellular carbides. Some subversive elements can be also used to prevent the formation of “Chunky” graphite. As shown in Figure 8, chunky graphite forms as an interconnecting

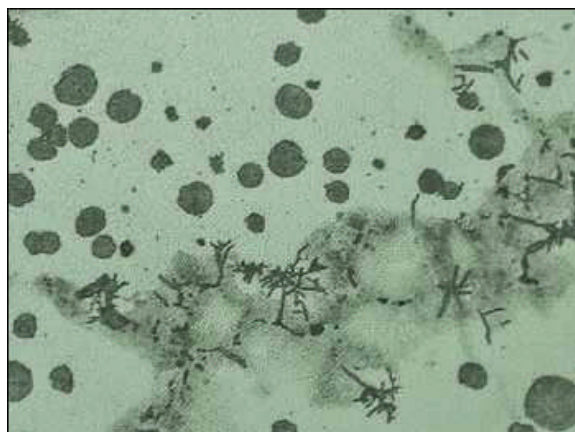


FIGURE 7. Degenerate flake graphite due to subversive elements in the absence of cerium, x150. [15]

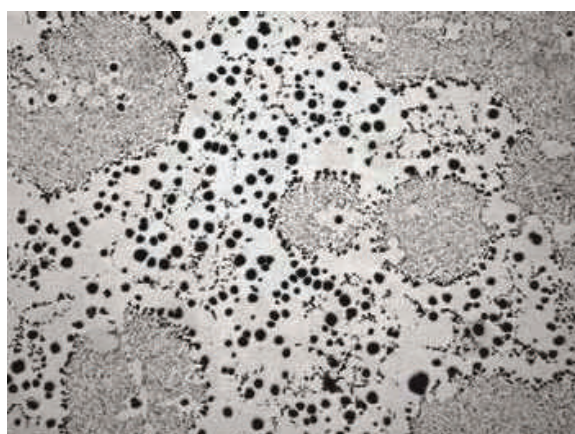


FIGURE 8. Chunky graphite cells in a ductile iron, x30. [18]

network in cells of up to 2-3mm in diameter and results in significantly reduced mechanical properties. It tends to occur in the centre of heavy sections of irons produced from high purity charge materials which have been treated with Ce-containing Mg treatment alloy since under these conditions Ce and other rare earth (RE) elements can themselves be damaging to nodularity, especially in irons with high carbon equivalents. In irons based on pure charge materials the presence of cerium and RE elements, which may arise from nodularisation and inoculation treatments, can be counteracted by carefully controlled additions of subversive elements such as bismuth (Bi) or antimony (Sb) [5,10,15-17]. The safe level of Sb addition and optimum RE/Sb ratio needed to prevent the formation of chunky graphite must be determined by the foundry since Sb itself, if not

counteracted by Ce, will have a deleterious effect on graphite morphology [10]. Any build-up of Sb content in foundry returns will also lead to future problems in microstructure control.

References:

1. C.E. Bates & J.F. Wallace : "Effect and neutralization of trace elements in gray, ductile and malleable irons". AFS Transactions (1968) Vol.75 pp. 815-838.
2. G.N.J. Gilbert : "A new look at subversive elements in nodular irons". BCIRA Journal (1976) Vol.24 pp.376-389.
3. M.J. Fallon : "The effects of some trace elements in cast iron". Indian Foundry Journal (1980) Vol.26 pp.1-28.
4. J.F. Meredith: "The Influence of Deleterious Elements in Ductile Iron Castings". Metal Casting Technologies (2004) Vol.50 September pp.32-33.
5. J. Lacaze: "Trace elements and graphite shape degeneracy in nodular graphite cast irons". International Journal of Metalcasting (2017) Vol. 11 pp. 44-51.
6. I.C.H. Hughes & G. Harrison: "The combined effects of lead and hydrogen in producing Widmanstätten graphite in grey cast iron". BCIRA Journal (1964) Vol.12 pp.340-360.
7. I.C.H. Hughes: "The role of gases in the structure of cast iron". AFS Transactions (1969) Vol.77 pp.376-395.
8. J.M. Greenhill: "Some Practical Observations on Lead Contamination of Cast Iron". British Foundryman (1984) Vol.77 pp.370-378.
9. "Abnormal graphite forms in cast irons". BCIRA Broadsheet 138-2 (1979) 4pp.
10. J.T.H. Pearce.: "Antimony in Cast Irons". Metal Casting Technologies (2017) Vol.63 4th Quarter pp.20-23.
11. C.R. Loper Jr. & J. Park: "Mechanism of Widmanstätten graphite formation in flake graphite cast iron". Int. J. of Cast Metals Research (2003) Vol.16 pp.59-64.
12. H. Yoneda & K. Asano: "Effects of zinc on the microstructure and mechanical properties of cast iron". Foundryman (2003) Vol.96 pp.247-249.
13. H. Rodter & A. Godde: "New high-performance steels: a risky charge material for ductile iron foundries". (2007) Sorelmetal 112, February, 3pp.
14. H. Nakae & K. Fujimoto: "Influence of Ti on graphite morphological transition in flake graphite cast iron". Key Engineering Materials (2011) Vol.457 pp.25-30.
15. "Subversive elements in nodular iron". BCIRA Broadsheet 230 (1984) 2pp.
16. R. Barton: "Nodular (SG) iron: possible structural defects and their prevention". BCIRA Journal (1981) Vol.29 pp.340-353.
17. J.T.H. Pearce: "Microstructure in Heavier Section Ductile Irons". Metal Casting Technologies (2014) Vol.60 December pp.26-28.
18. J. Sertucha et Al: "Statistical Analysis of the Influence of Some Trace Elements on Chunky Graphite Formation in Heavy Section Nodular Iron Castings". Met. & Mat. Trans. A (2013) Vol. 44 pp. 1159-1162.
19. R. Kalbom et Al: "On the solidification sequence of ductile iron castings containing chunky graphite". Mat. Sc. & Eng. A (2005) Vol.413-414 pp.346-351.
20. P.M. Cabanne et Al: "Production of Heavy and Thick Ductile Iron Castings: Process Review and Potential Defects". Indian Foundry J. (2010) Vol.56 February pp.33-42.
21. J.T.H. Pearce: "Compacted Graphite Irons on The Move". Metal Casting Technologies (2008) Vol.54 pp.52-56.
22. R. Barton: "Experience in the prevention of defects in nodular iron castings". BCIRA Journal (1968) Vol.16 pp.554-567.
23. R. Barton & C.W. Moss: "Effect of bismuth and other trace elements on graphite nodule count in nodular iron". BCIRA Journal (1967) Vol.15 pp. 458-474.
24. M.J. Fallon: "Experiences in the Manufacture of Ductile Irons". The Foundryman (1995) Vol.88 pp.308-318.

CAST QUIZ

GATING AND RISERING

Contributed by Prof. Ashok Sharma

- The metal must flow through the gating with a minimum of turbulence to avoid mainly
 - Sucking of the gases
 - Slag formation
 - Formation of inclusions
 - Rapid filling
- Open riser is made of cylindrical shape where h/d ratio varies from 1 to 1.5. The reason being its
 - Surface area is maximum
 - Surface area is minimum
 - Volume is optimised
 - Surface area is optimised
- It is advisable to use a sprue well at the base of the sprue to
 - Reduce turbulence
 - Have maximum flow of metal
 - To avoid aspiration effect
 - To trap oxide particles
- A typical expression for pouring time 't' is given by
 - $K \times \text{Pouring volume}$
 - $K \sqrt{(\text{Pouring weight})}$
 - $K \sqrt{(\text{Pouring volume})}$
 - $K \times \text{Pouring weight}$
- For a plate casting, a riser can feed metal and produce a sound region only for total distance of (where 'T' is the plate thickness)
 - 3.5T
 - 5.0T
 - 4.5T
 - 5.4T
- Risers are located
 - Close to thin section
 - Close to heavy section
 - Close to sprue
 - Close to runner
- For tall castings, following gating system may be used to ensure uniform flow
 - Step gate
 - Bottom gate
 - Top gate
 - Middle gate
- Which of the followings is the formula for calculating the choke area (A)?
 - $3/\rho t C \sqrt{2gh}$
 - $W/\rho t C 2gh$
 - $4W/\rho t C \sqrt{2gh}$
 - $W/\rho t C \sqrt{2gh}$
- Swirl gate is particularly used for
 - Certain copper castings
 - Certain aluminium castings
 - Certain grey iron castings
 - Certain steel castings
- Which of the following is the purpose of runner extension ?
 - To avoid turbulence
 - To avoid aspiration effect
 - To avoid entering of slag and dross into the mould cavity
 - To achieve directional solidification

Answers

- (a) Sucking of the gases
- (b) Surface area is minimum
- (a) Reduce turbulence
- (b) $K \sqrt{(\text{Pouring weight})}$
- (c) 4.5T
- (b) Close to heavy section
- (a) Step gate
- (d) $W/\rho t C \sqrt{2gh}$
- (d) Certain steel castings
- (c) To avoid entering of slag and dross into the mould cavity



QADRI GROUP COMPANIES

experience of a 100 years



**Manufacturers & Exporters of Heavy Plant & Equipment
for Industrial Sectors including Sugar, Cement, Steel, Chemical, Power**



- Qadri Brothers (Pvt.) Ltd.
- Qadcast (Pvt.) Ltd.
- Qadri Foundry (Pvt.) Ltd.
- Qadbros Engineering (Pvt.) Ltd.
- Qadri Engineering (Pvt.) Ltd.
- Qadri Forge (Pvt.) Ltd.
- Qadri Sons (Pvt.) Ltd.
- Kashif Trading (Pvt.) Ltd.

CORPORATE OFFICE

Sharif Centre, 72-A Izmir Town, P.E.C.H.S, Canal Bank, via Thokar Niaz Baig, Lahore-53800, Pakistan

Tel: + 92-42-3 596 1761~65 Fax : + 92 42 3 596 17 66 Email: info@qadbros.com

www.qadrigroup.pk

ENGINEERING FOR LIFE!

Millat Tractors Limited has played a pivotal role in Pakistan's Agricultural and Industrial sector for over five decades. Our eight dependable tractor models excel in quality and cater to the farming needs and buying power of Pakistani farmers.

To the Industrial sector, we offer quality Forklift Trucks and Power Generator Sets as reliable, low-cost solutions for better performance and peace of mind.

For Millat, engineering is not a profession, it's our passion!



ACCORDING TO EVERY FARMER'S NEED & PURCHASING POWER

TO GET YOUR MILLAT TRACTOR IMMEDIATELY, CONTACT OUR DEALERS OR BELOW MENTIONED OFFICES TODAY


MILLAT TRACTORS LIMITED
8.5-km, Shekhupura Road, Shehdara, Lahore-Pakistan
www.millat.com.pk
info@millat.com.pk

	LAHORE	KARACHI	ISLAMABAD	MULTAN	SUKKUR
Phone >	042-37911021-25	021-34553752	051-2271470	061-6537371	071-5815041
UAN >	111-200-786	111-200-786	111-200-786		
FAX >	042-37925835	021-34556321	051-2270693	061-6539271	071-5815042

Energy Saving opportunities in a foundry by optimizing compressed air System

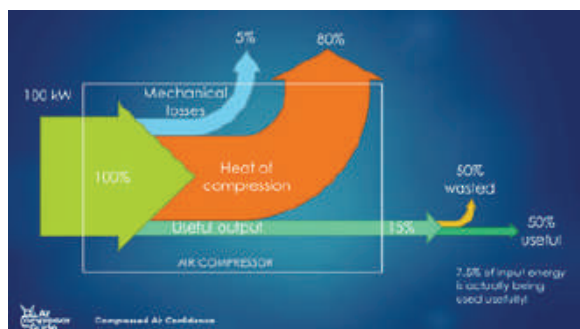
By: Muhammad Farooq CEO, Certified Energy Auditor(AEE, USA)

Since the cost of energy has dramatically increased during the past few years. In this scenario cutting energy cost is the option that needs full attention and fortunately it is in our hands. About 10 -20 % of the energy cost can be reduced by implementing a proper energy management system in any facility without going into the debate of sector and size. In this very case study, we have discussed only compressed air system for energy efficiency improvement opportunities.

Compressed Air System

Compressed air is the second most important utility in a foundry after electricity. Yes it is true that air is free by nature but compressed air is not free. It is 8 - 10 times more expensive than electricity due to the low efficiency of an air compressor. A well maintained compressor is said to be 10 - 13 % efficient by its design because about 85 % of the input energy goes into waste heat during compression of air.

Graph 1 sankey diagram of input/output of a typical compressor



Courtesy :

<https://www.air-compressor-guide.com>

Having worked in many manufacturing facilities, we know the importance of reliability and air quality but it does not have to be at the

expense of energy efficiency. This can be accomplished through a number of ways including proper selection and sizing of compressors, layout of distribution system, and proper control technique to ensure delivery of quality air meeting all specifications such as fluctuating demand, pressure, quality and after treatment including point of use filtering and lubrication.

The following case study gives an example of significance of taking care of compressed air system as a serious utility. We will see how it can waste a lot of our hard earned money into air silently. In this case study, an Air Audit of a PFA member facility was conducted that is located in Lahore. Name of the company is not mentioned, as our focus is on unbiased review of energy saving opportunity in a normal size casting facility.

The goals of the compressed air Audit were as follows:

1. To provide an operating profile and consumption report on the cost of compressed air operations in the facility. To provide recommendations on any potential opportunities to improve compressed air system efficiency of the facility.
2. To generally determine how well the compressed air system is meeting the facility needs.
3. To identify any compressed air system problems that could be solved in an energy-efficient way.

That facility has 2 screw compressors, each of power rating 45 kW. In normal working

condition, only one compressor runs for all the compressed air need and second compressor acts as standby.

Multiple Opportunities for Energy Savings

The readings and observations during the measurement period showed the compressed air system was operating at lower efficiency especially during off-peak operating times as well as during average operation compared to similar optimized systems. It also showed small improvements were possible. In general, the study suggested better operation would be gained if the existing or new air compressors had the pressure settings properly coordinated so the fixed speed unit would not load and unload when it runs. It could also be set high enough to better contribute to adequate air pressure.

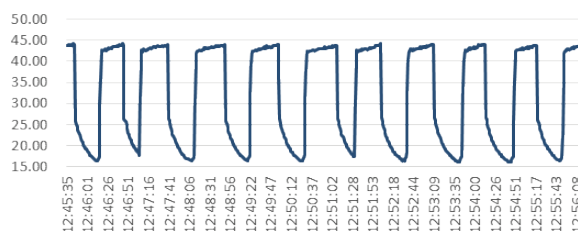
Data loggers were used to monitor the electrical input to the compressed air system in order to get compressor running profile during a whole day production process as well as to calculate the approximate annual electrical operating consumption. The data showed the annual energy consumption for compressed air was about 200,000 kWh with average system air demand of 2.7 m³/min. The compressed air system represented about 14-20 % of the total facility annual electrical costs. Analysis of the information and data collected showed some potential opportunities that would result in improvements in the operation of the compressed air system. It also showed potential savings in compressed air related electrical and maintenance costs.

Opportunities for Savings with Supply-side and End-use Measures

The audit showed multiple opportunities for savings. A thorough assessment of the complete compressed air system led to the

following recommendations: Elimination of Excessive Off-Load running of compressor by retrofitting VFD on compressor.

Following graph shows the compressor running profile, derived from 24 hours data logging.



Graph 1 Compressor Running Profile

The analysis of running pattern of compressor reveals that it runs just 42 % of the time On-Load and remaining time runs on Off-Load mode. Thus, wasting a lot of energy, due to Off-Load running.

Let me explain these terms for those who are not familiar with these terms. On-Load mode is when compressor is On and delivering compressed air to the system, whereas Off-Load mode is the state when compressor is no more delivering the air to the system but it still runs continuously. It may be called as standby mode. This mode is designed especially to reduce the frequent start-ups of main motor which deteriorates the motor winding and insulation thus shortening its life.

In Off-Load mode, usually a compressor consumes 25-50 % (depending upon health) of the On-Load energy. This energy is straight away a loss, No second thought. It is worth mentioning a very common myth about the off load running of compressor that, it gives the rest to compressor to avoid heat it-up. The truth is, all the compressors are designed to run continuously On-Load without any heat-up issue. If it is there, is due to the malfunction of its cooling system or relevant issue. Do we stop the car when its radiator becomes hot, or there is an automatic system in place to keep it cool till the end of journey?

Energy loss associated with this issue

Annual operating hours of compressors	=	6,600 (hr./a)	
Off Load run time (hr/year)	=	6,600 (hrs./a) x 58 %	= 3,828 hrs.
Off -Load running power consumption	=	18.5 kW	
Energy Loss (Rs/year)	=	18.5 (kW)x 3,828 (hrs./a) x 18 Rs./kWh	
	=	70,818 kWh/year	= 1,274,724 Rs/a*

*Energy cost = 18 Rs. /kWh

Conclusion:

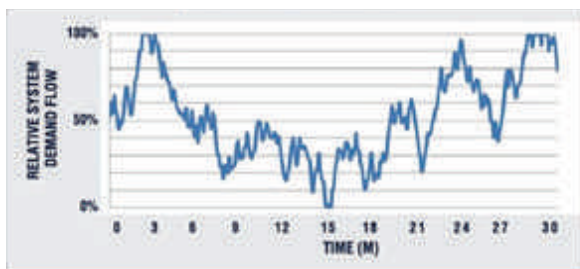
In order to eliminate the Off-Load running of a compressor, retro-commissioning of VFD is the most economical option rather than buying a new VFD compressor.

How much to invest:

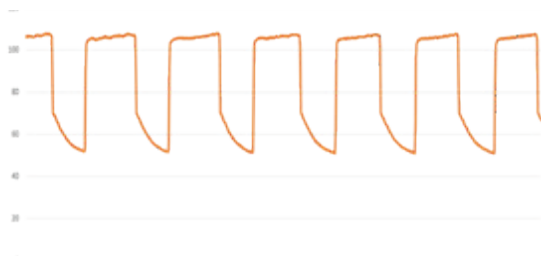
In order to achieve above savings, an investment of 500,000 was made, so the payback is just 141 day. Is that not amazing?

How does it work

As we know that the air demand of a production facility is always fluctuating. Instead of running a compressor motor at constant speed, a VFD control modulate the speed of motor in such a way that it dynamically match the production of compressed air with respect to the system air demand, by sensing the rate of decay of pressure with the help of a pressure transducer. Thus keeping the system pressure nearly constant.



Variable Speed air compressor, varying the air supply as per demand of system



Fixed Speed air compressor with On and Off-Load control technique

Elimination of excessive air leakages

Leaks can be a significant source of wasted energy in an industrial compressed air system, sometimes wasting 20-30% of a compressor's output. A typical plant that has not been well maintained will likely have a leak rate up-to 30-50 % of total compressed air production capacity.

Leakage test to quantify the amount of leakages

The compressor will load and unload because the air leaks will cause the compressor to cycle on and off as the pressure drops from the system by escaping through the leaks. Total leakage (percentage) can be calculated as follows:

$$\text{Leakage (\%)} = [(T \times 100)/(T + t)]$$

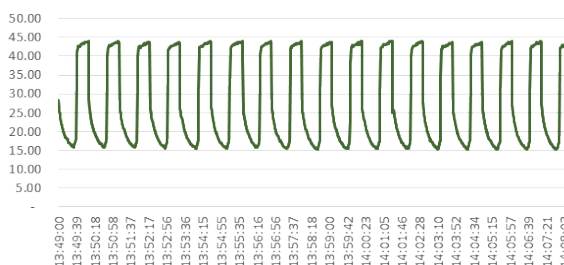
Where: T = on-load time (minutes)

t = off-load time (minutes)

Leakage will be expressed in terms of the percentage of compressor capacity lost.

Following graph shows the Load and Unload running patterns of the compressors during leakage test. In this test it is strictly make sure that no machine or process is using compressor air, otherwise that air will be counted as leakage.

Graph 2: Compressor pruning profile during leakage test.



Leakage % calculated 28.16 % (after giving 5% leakage allowance) of the total capacity of the compressor. FAD of that compressor (45kW) was measured as 6.32 m³/min.
So the leakage volume was as follows.

Leakage volume	=	6.32 (FAD, m ³ /min) x 28.16 %	= 1.78 m ³ /min
Money Loss	=	1.78 (m ³ /min) x 6.72(kW/m ³ /min)* x 6,600 (hrs./a)	
	=	78,946 kWh/a	
	=	78,946 x 18 (Rs./kWh) =	1,421,038 PKR/a

Repair the leakages is the only way to save that much amount of energy, it need strong will power, dedication and continuously monitoring to implement a proper leakage management program.

How to identify and Fix Leaks

After knowing the quantity of leakages, identification and tagging the leak points is the next important step, In most of the cases it is a critical process in a production facility with a lot of noise at work space. So, we used stat-of-the-art ultrasonic leak detector to identify the leakages in very sophisticated way. It is the best way to detect leaks, which can recognize the high frequency hissing sounds associated with air leaks that it can even detect the micro leakages with greatest accuracy.

Investment to plug leakages

It took 4 man days and 100,000 PKR to plug all the leakages and replace the worn-out flexible pipes, handle valves, nozzles, Pressure Regulators and other pneumatic fittings. So the payback is just 25 days. More that very good.



Courtesy <https://www.skf.com>

The advantages of ultrasonic leak detection include versatility, speed, ease of use, the ability to perform tests while plant is running, and the ability to find a wide variety of leaks.

Leaks occur most often at joints and connections at end-use applications. Stopping leaks can be as simple as tightening a connection or as complex as replacing faulty equipment such as couplings, fittings, pipe sections, hoses, joints, drains, and traps. In many cases leaks are caused by bad or improperly applied thread sealant. Select high quality fittings, disconnects, hose, tubing, and install them properly with appropriate thread sealant.

Non-operating equipment is the additional source of leaks. Equipment no longer in use should be isolated with a valve in the distribution system.

Another way to reduce leaks is to lower the demand air pressure of the system. The lower the pressure differential across an orifice or leak, the lower the rate of flow, so reduced system pressure will result in reduced leakage rates. Stabilizing the system header pressure at its lowest practical range will minimize the leakage rate for the system.

In addition to being a source of wasted energy, leaks can also contribute to other operating losses. Leaks cause a drop in system pressure, which can make air tools function less efficiently, adversely affecting production. In addition, by forcing the equipment to cycle more frequently, leaks shorten the life of almost all system equipment (including the compressor package itself). Increased running time can also lead to additional maintenance requirements and increased unscheduled downtime. Finally, leaks can lead to adding unnecessary compressor capacity.

Continuous Monitoring of Constant Change

Over the years of experience, it has become clear that continuous monitoring is a key success factor for efficient compressed air systems. Due to its nature, improvements may be quickly lost shortly after implementation and go unnoticed. System monitoring allows operators and facilities maintenance to see real time effects of changes to the system and respond with appropriate adjustments when necessary. A continuous monitoring system is a very useful tool to understand the effect of any implemented improvement measures.

Summary

As you came to know that a foundry with only one compressor of 45 kW can be wasting 2.7 Million PKR/annum. What would be the opportunity for medium to large scale industries.

Compressed air system optimization is the only low hanging fruit that can be harvested with a very little effort. The only thing needed is awareness and willingness to improve.

We have only discussed Load/No-Load running of air compressors and air leakages here, however there are many other areas in compressed air system where even more savings can be achieved. And don't forget the Demand Side, this is where the corrections need to be made to cash-in on the real savings.

Companies usually hesitant to spend money on compressed air audits, especially when they have little understanding of the true possible savings. The objective is to help them understand the importance and the benefits of an audit; not only will they lower energy costs, but their production lines will operate more efficiently as well. In more than 200 Energy audit of my experience, every client can get its money back within days not in months or years, by implementing No/Low cost measures.

One point is always discussed, "Are Compressed Air Audits viable for everyone?" Our answer is a big, "Yes." By adjusting the audit scope to meet your needs you can save a lot of money, whether you operate a 4 billion-square-foot facility or much smaller operation.

About the Author

Muhammad Farooq is a certified energy auditor CEA (AEE, USA) and compressed air system professional. He is the lead auditor of ISO 50001. He has conducted more than 200 Energy audit across the country, and has the experience to work with national and international organizations, such as GIZ, JICA, BFZ, UNIDO.



铸造冶金
Foundry & Metallurgy

动力传动及控制
Motion & Drives

工业自动化
Industrial Automation

热处理及熔炼技术与设备
Thermal Process &
Smelting Technology and Equipment

机床及金属加工
Machine Tools &
Metalworking

压铸及有色合金与特种铸造
Die Casting & Non-ferrous
Alloys and Special Casting



扫描二维码 了解更多资讯
Find us on WeChat

2020

泰国·曼谷
Bangkok Thailand



泰国国际铸造冶金展览会
METAL+METALLURGY [THAILAND]



泰国国际智能制造展览会
THE SMART MANUFACTURING EXHIBITION [THAILAND]

主办单位 / Sponsors:

中国铸造协会
China Foundry Association

西麦克国际展览有限责任公司
CMEC International Exhibition Co., Ltd

承办单位 / Organizer:

北京中铸世纪展览有限公司
Beijing Zhongzhu Century Exhibition Co., Ltd

For visitor registration, please contact:

Pakistan Foundry Association: pakistanfoundryassociation@gmail.com

China Foundry Association: Thomas Gao: gaowei@foundry.com.cn,

Maggie Li: limengmeng@foundry.com.cn



第十八届中国国际铸造博览会

The 18th China International Foundry Expo (Metal China)

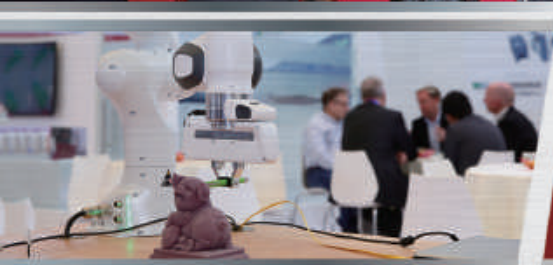


第十四届中国国际压铸工业展览会

The 14th China International Die Casting Industry Exhibition

第十四届国际有色及特种铸造展览会

The 14th International Nonferrous and Special Casting Exhibition



Metal China +CIDC



展览面积



参展企业



国家和地区



专业观众

2020. 5.13-16 | 国家会展中心 (上海)

National Exhibition and Convention Center (Shanghai)

For visitor registration, please contact:

Pakistan Foundry Association: pakistanfoundryassociation@gmail.com

China Foundry Association: Thomas Gao: gaoweif@foundry.com.cn,

Maggie Li: limengmeng@foundry.com.cn



www.foundry.org.cn www.expochina.cn

Trained workers are the pre-requisite for performance improvement and enhanced productivity in any business.

Employees are the most valuable assets and face of an organization and these are also the main reason for success or failure of a business.

Asif Rasheed-Office of International Affairs (Infinity School of Engineering, Lahore.)

Hiring **unskilled laborers** or those with limited training and education may initially save your business money in the form of lower starting wages. However, hiring unskilled workers, particularly for skilled positions, can have **disadvantages related to production, longevity and overall company performance**. That will end up spending more money trying to attract outside talent, while your current workforce stagnates.

In Pakistan, foundry sector is growing at a very fast pace. Currently this **sector consists of more than 1600 foundries** working as small & medium enterprises. But there has been a **shortage of professional trainings for skills upgradation**. Due to this, foundry sector is facing following issues of Low Yield, Low Productivity, Poor Surface Finish and High Rejection & Rework Rate.

RAVI-INFINITY GROUP (A renowned name in Automobile Manufacturing) laid the foundation of **INFINITY SCHOOL OF ENGINEERING (ISE)** three years ago which started to provide technical training in a number of demand driven courses according to the needs of international as well as local industry pursuing **Knowledge, Skills, and Attitude** through state of the art labs, latest equipment and modern machines and is also pioneer to be **certified for ISO 29990:2010**. The group consists of following

progressive member organizations:

- Aska Engineering
- Ravi Motorcycles
- Infinity Engineering
- RND
- Ravi Spherocast
- Ravi Agric
- Ravi Automobiles
- Punjnad Tractors
- Etech
- ESS

ISE has well equipped labs with **CNC machines, Conventional machines, Material Testing and Metrological Inspection, PLC Lab** and State of the art Energy Efficiency Lab. Furthermore, updated **Programming & CAD/CAM** Labs equipped with latest Design and process Simulation Software are also available for practical training of trainees.

ISE is accredited by the National Vocational and Technical Training Commission (**NAVTTTC**) Islamabad with **Category A** and has been declared as the **Centre of Excellence in the region**.

ISE has joint venture with China Foundry Association (CFA) for trainings of foundry industries according to the latest technologies



as per industrial needs. This collaboration will provide Practical/Hands-On training in industrial environment will enable the trainees to get exposure of foundries working through modern equipment according to International Standards.

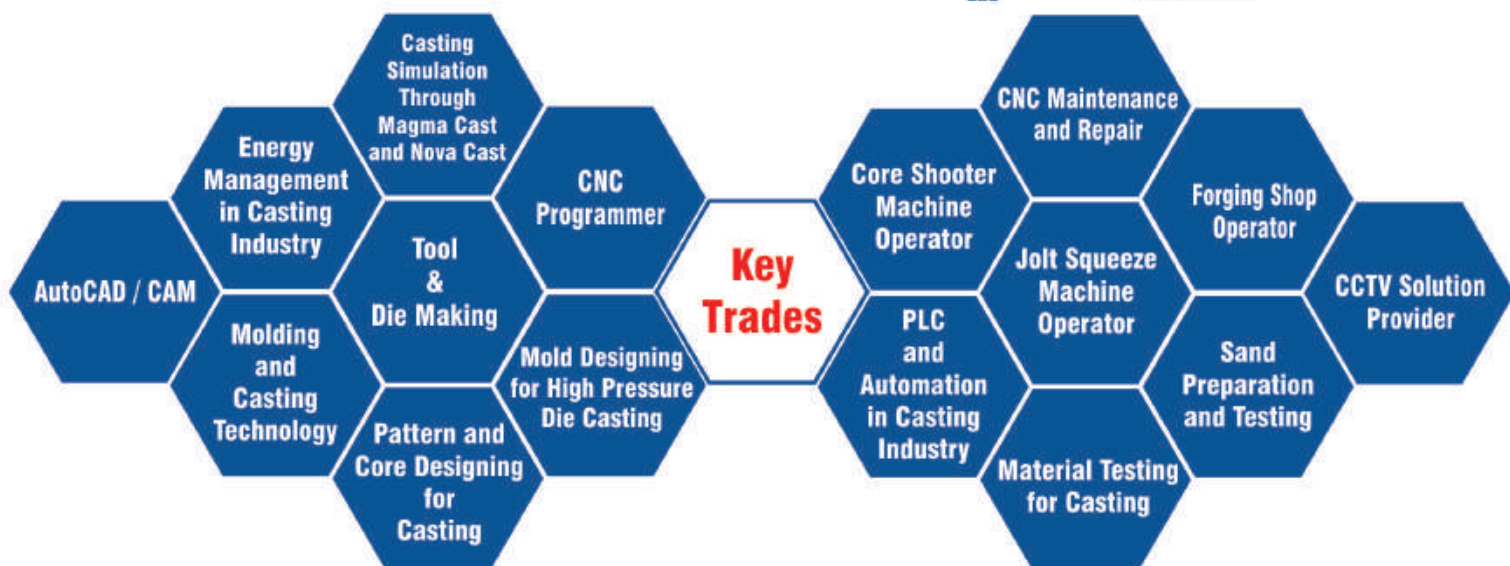
ISE provides the skills training as per the needs of industry. The trainees are trained with hand on **practical experience with 80% practical**. These trainings are available for different hardcore engineering trades related to foundries including:

1. Auto CAD/CAM
2. Molding & Casting Technology
3. Pattern & Core Designing for Casting
4. Casing Simulation through Magma Cast & Nova Cast
5. Molding Designing for high pressure Die Casting
6. Core Shooter Machine Operator
7. Jolt Squeeze Machine Operator
8. Sand Preparation & Testing
9. Forging Shop Operator
10. Material Testing for Casting
11. PLC & Automation for Casting Industry
12. CCTV Solution Provider

13. CNC Maintenance & Repair
14. CNC Programmer
15. Tool & Die Making
16. Energy Management in Casting Industry.



Apart from that, **customized training** have also been conducted for the **newly hired and experienced employees** of different organizations as per their industrial needs. These trainings are provided by **qualified & professional trainers** graduated from renowned universities of Pakistan and polished with **extensive industrial experience**. This will help the foundries to overcome problems as **Low Yield, Low Productivity, Poor Surface Finish, High Rejection & Rework Rate, High energy consumption, Environmental Pollution** and Unsafe Operating Environment related to their organizations.





PAKISTAN
FOUNDRY ASSOCIATION
PFA for Development of Foundry Industry

ELEMENT

Your Guide to Foundries in Pakistan

To enhance the corporate image of your company and to grow your business

ADVERTISE IN

Rate for Local Companies
Rs:20,000/- (A4 size)

Rate for Foreign Companies
\$ 400/- (A4 size)

CONTACT

Mr. Pervez Iqbal Mughal
Secretary

Pakistan Foundry Association
Foundry Service Center,
University of Engineering & Technology,
(Opposite Gate # 5, U.E.T) G.T Road, Lahore,
Pakistan
Ph:+92-42-36851559,
Cell: +92-321-4603000
E-mail: pakistanfoundryassociation@gmail.com/
info@pfa.org.pk, Web: www.pfa.org.pk

Technical Seminars Workshops by Global Experts in IFCE 2018

**20 Sessions in
5 Recorded DVDS
Cost per DVD is
Rs:1000/-**



CONTACT

Mohammad Shiraz - Administration Officer
Pakistan Foundry Association
Foundry Service Center,
University of Engineering & Technology,
(Opposite Gate # 5, U.E.T) G.T Road, Lahore, Pakistan
Ph:+92-42-36851559,
Cell: +92-308-4382965

Howrah Foundry Cluster

Promoting energy efficient divided blast cupola (DBC)

Tags;

Sub-sector: Foundry

Location: Howrah Partners: SDC, TERI, Cast Metals Development Limited, M B Associates, Sorane SA

Year: 1994–2011

Background

There are about 5000 small-scale foundry units in India, with a collective annual output of about six million tonnes of castings which are marketed both in India and abroad. The foundry industry provides direct employment to an estimated 500,000 people.

The Howrah foundry cluster is one of the oldest and largest foundry clusters in India. There are about 300 foundries operating in the cluster that mainly produce low-value-added castings such as manhole covers and pipes. Many of the foundry units still use poorly designed melting systems and sub-optimal operating practices.

Context

The foundry sector is among the most energy intensive MSME sectors in India, consuming around 600,000 tonnes of coke per year (equivalent to around 1,640,000 tonnes CO₂). Melting is by far the most energy intensive stage of a foundry's operations. Recognizing the potential to increase the energy efficiency of the conventional coke-based cupolas and thereby reduce CO₂ emissions, SDC partnered with TERI in a project to demonstrate and promote a more energy-efficient cupola for small-scale foundries in India. The Howrah foundry cluster was chosen for demonstration of the energy efficient melting technology. After considering various technological options, the project partners shortlisted 'Divided Blast Cupola' (DBC), developed by the British Cast Iron Research Association (BCIRA), UK, as the best option suitable for Indian foundries

which would help in improving energy efficiency of the foundry sector at a modest investment. In Grade 220 grey iron the formation of Widmanstätten graphite reduces tensile strength from 230MPa in uncontaminated iron to 45-155 MPa in Pb-contaminated irons and also spoils machined surface finish [8]. Contamination with lead has also been associated with unpredictable chill formation in grey irons and surface tear and shrinkage porosity defects [8]. In alloy irons such as flake austenitic and ferritic 15%Si irons the combined effects of Pb contamination and dissolved H are more damaging with much of the graphite being in Widmanstätten

Intervention

The demonstration unit in Howrah, Bharat Engineering Works, was selected in consultation with the local industry association, i.e. Indian Foundry Association (IFA). In setting up the DBC demonstration plant, the project adopted a 'competence pooling' approach, i.e. it brought together local and international experts in many disciplines like project management, foundry technology, energy management, cupola operations, and environmental technology. Cast Metals Development Limited, U.K., a BCIRA group company and consultants from M B Associates and Sorane SA provided crucial support and expertise in transferring technical know-how related to the DBC, and at every stage during the design and commissioning the demonstration plant. The DBC was successfully demonstrated in July 1998.

Key features of energy efficient DBC

Reduces coke consumption by about 25–65% compared to conventional cupola
Increases molten metal tapping temperature by about 50 °C
Increases the melting rate
Reduces silicon and manganese losses in the metal



Demonstration unit at Howrah

Results

The demonstrated DBC yielded an energy savings of about 40% compared to the conventional cupola. The DBC system paid back its capital investment in less than two years.

In order to ensure the sustained uptake of the energy efficient DBC technology in the Howrah cluster, the project identified technically capable local service providers (LSPs) who could generate awareness on and provide technical backup support for adoption of the TERI-designed DBC technology by other foundry units. Thanks to the LSPs' sustained efforts, around 23 DBC replications have taken place in the Howrah cluster till June 2011; these have exhibited consistent energy savings.

Key lessons

The Howrah experience illustrates the vital role played by LSPs in ensuring the sustained uptake of energy efficient technology in an MSME cluster. While the demonstration unit helped showcase the benefits of the energy efficient DBC technology, other foundry units in Howrah were initially cautious about adopting the new technology—primarily because of its relatively high capital cost, coupled with uncertainty about the availability of necessary technical support services at cluster level in the long term. The LSPs identified and supported by TERI were technically adept persons already familiar to foundry entrepreneurs and other stakeholders in Howrah. The LSPs were also sensitive to the cluster dynamics—in particular, they were aware of the differing profiles, priorities and technological requirements of different foundry entrepreneurs. In essence, the LSPs commanded both credibility and trust among the local industry, and this has enabled them to promote, support and sustain replications of the energy efficient DBC in the Howrah cluster.

Source:

www.sameeksha.org



We Pour Quality Into Castings

THE ART OF CASTINGS AT...

Being a modern and well equipped foundry, holding a major market share of Tractors and Automotive castings, **Bolan Castings Limited** can rightly claim to be the leading foundry of its kind in Pakistan.



**Bolan
Castings
Limited**

A Millat Group Company

- Casting unit produces Grey and Ductile Iron castings like, Cylinder Block, Center Housing, Axle Housing, Transmission Case, Hubs, Brake Drums, etc.
- State of the art inspection and testing facilities; including Spectrometer, Chemical Lab, Metallography lab, Physical Lab & Sand Lab.
- BCL is the first ISO certified foundry in Pakistan (since April, 1999). Currently, the company has achieved ISO 9001:2015 version of Quality Management System.

Main R.C.D Highway, Hub Chowki, District Lasbella, Balochistan.

Phone # +92-853-363295, 363296, 364033, 364036

Fax # +92-853-363292

E-mail: bclho@bclpk.com

www.bolancastings.com

ELECTRO HEAT

For total melting solutions

Manufacturers of Medium Frequency Induction Melting Furnaces

Custom made foundry solutions

Flexible design to match your foundry requirements

Motor Generator upgrade solutions to Solid State Furnace



Made In Pakistan
Based on latest technology



Melting Capacity

Steel Frame Crucible: 10MT to 50MT

Yokeless Aluminum Crucible: 50kg to 10MT

Power Pack

Series Inverter: 50 kW to 900 kW

Parallel Inverter: 50 kW to 14000 kW

Address:

10km, Gujranwala-Lahore G.T Road, Attawa, Gujranwala Pakistan

Mobile: +92 300 8442057

Phone: +92 55 34000505

Fax: +92 55 3264490

Email: electroheat@gmail.com | mnubeg@gmail.com

Website: www.electroheat.com.pk

Among our prestigious customers:

Bolan Castings Ltd, Karachi

Chenab Engineering Works and Foundries (Pvt) Ltd, Faisalabad

Friends Foundry (Pvt) Ltd, Islamabad

Qadri Brother (Pvt) Ltd, Lahore





Chemical Tools for Foundry Engineering **SINCE 1974**

WHO WE ARE ABOUT US

Çukurova Kimya Inc. was established back in 1974 which is located in an industrial zone in Manisa / Turkey. Çukurova Kimya who provides high quality products to ensure customer pleasure from date of foundation, has a lead position in Turkish market with regard to sales of foundry products. Çukurova Kimya offers you more than 40 years of experience, extensive know-how and engineering expertise.

WHAT WE PRODUCE?

Foundry Resins

Feeding Systems

Insulation Materials

Refractory Coatings

Industrial Resins