



A unique training programme  
for foundry workmen in  
English, Hindi, Tamil, Telugu, Kannada,  
Marathi, Gujarati and Bengali

Improve skill  
levels to improve  
competitive edge



**THE INSTITUTE OF INDIAN FOUNDRYMEN**

*Affiliated to World Foundry Organization (WFO)*

IIF Center, 335 Rajdanga Main Road, Kolkata 700107, India

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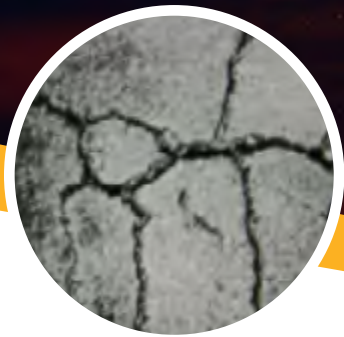
# Introduction

- ◆ Yogyata Vikas is a unique initiative of The Institute of Indian Foundrymen focussing on skill development of the foundry workmen. It is a programme exclusively designed to impart technical knowledge with practical orientation to foundry workmen
- ◆ This pan-India training will be carried out by well-experienced trainers with a foundry background, selected from different locations of India.
- ◆ Important topics were selected and developed into 10 modules which give an insight into the technical information, right processes, systems and procedures with the ultimate aim of improving quality and productivity at foundries.
- ◆ To reach the workmen effectively, training will be carried out in the vernacular with the training material translated into respective languages. Initially the training programmes are available in

Tamil, Telugu, Kannada, Hindi, Marathi, Gujarati and Bengali. Translations in other Indian languages will be done when required.

- ◆ These are on-site programmes and shall be scheduled at the convenience of foundries. Training modules can be customised to suit specific requirements of the foundry, in which case the trainer will visit the foundry, prior to the day of the training to acquaint himself or herself with the process and machineries in the foundry.
- ◆ IIF is committed to train more than 1000 workmen in year 2016, more than 5000 workmen in year 2017 and to conduct the training on a continual basis with an aim to cover most of the foundry workmen in Indian foundries.
- ◆ IIF invites Indian foundries to utilise these programmes to upgrade the skill level of their employees to improve their competitive edge in the domestic and global market.

# Synopsis of training programme modules



## Module 1: Casting defects in Grey and SG Iron and their remedies

- ◆ This module addresses various types of defects in detail like surface, subsurface, shrinkage in castings, dimensional variations, deviation in chemical composition and non-desirable microstructures.
- ◆ It also explains the causes, various precautions to take, tools, computer software to ascertain possible spots for defects and remedies to control the rejection. Practical case studies have been discussed providing solutions to control casting rejection in foundries.



## Module 2: Melting Grey Iron, SG Iron & Steel in Cupola and Induction Furnace

- ◆ Melting techniques of Grey and SG iron and the selection of cupola or induction furnace is explained with illustrations. Induction furnace lining practice has been discussed and illustrated.
- ◆ The basic metallurgy, technical points like effect of elements, charge make up, furnace operation, temperature measurement, carbon equivalent testing and chill test have been discussed in detail.
- ◆ Post-melting, inoculation, ladle maintenance, pouring techniques, lining practice and other practical aspects of melting are well-covered.



## Module 3: Cupola and its operation

- ◆ Cupola furnace is one of the cheapest furnaces that are used in foundry for melting grey iron worldwide. The design, construction and working principle of cupola are explained in detail.
- ◆ Also the lining practice, chill test, temperature measurement, ladle maintenance, metal charge, alloy additions like Ferro Silicon, Ferro Manganese and post melting, inoculation to achieve the desired mechanical properties are dealt in detail.
- ◆ Pollution problems with cupola melting and pollution control equipment have been discussed with illustrations.



## Module 4: Sand Quality and Testing

- ◆ Majority of the castings are produced in sand moulds with high consumption of sand per ton of casting. Importance of good quality silica sand with high fusion temperature is well-explained.
- ◆ The mould ability of the sand that can be ascertained by green compression strength, gas escape by testing permeability, moisture control by moisture tester are dealt with extensively.
- ◆ The quality of new incoming sand, grading, grain size and distribution by sieve test, shatter index, dead clay content, loss on ignition, sand binders have been covered in this module with illustration.

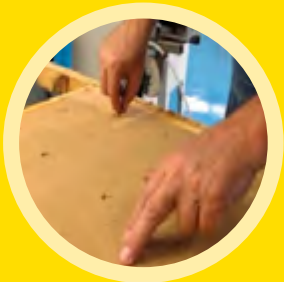
## Module 5: Mould Making Processes

- ◆ This module covers various moulding processes like, floor moulding, machine moulding, automatic moulding lines, hand moulding, sweep moulding, CO<sub>2</sub> core assembly techniques and their working with illustrations.
- ◆ Selection of right moulding process and the moulding machine have been explained, which shall result in high productivity and better quality castings



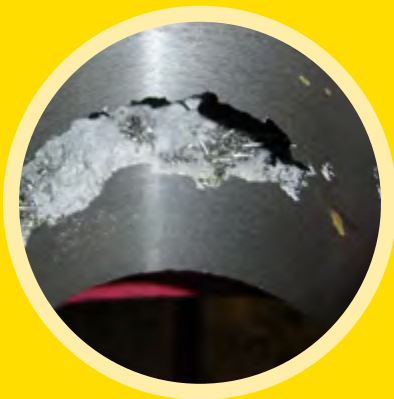
## Module 6: Basic Metallurgy of Steel Castings

- ◆ This module explains the different categories of steel like plain carbon steel, low alloy steel and high alloy steel and the impact of carbon on these steels.
- ◆ The metal chemistry, charge make up, furnace design, refractory lining, ladle, maintenance, metal degassing, heat treatment and testing of steels have been discussed.



## Module 7: No Bake Resin, CO<sub>2</sub> Sand System and Coatings

- ◆ Types of sand and selection of resin binder with easy breakdown property are explained.
- ◆ The use of various resin binders to achieve dimensional accuracy, faster production, better finish of castings and clean working atmosphere are also explained.
- ◆ Full chemistry of resins and working details with illustrations, application in foundry, advantages and disadvantages of the processes have been discussed in detail.



## Module 8: Defects in Steel Castings and their remedies

- ◆ Steel castings are preferred for their higher strength and ductility, but care should be taken to produce sound steel castings due to its high metal contraction ability while pouring
- ◆ Causes of defects like cavities/shrinkage, rough surface, sand fusion, sand inclusion, hot tears and scab are explained in detail.
- ◆ Remedial measures to be taken to produce quality castings are dealt with in this module.



## Module 9: Metallurgy of Grey and SG Iron for Foundrymen

- ◆ Metallurgical knowledge is essential to select the right manufacturing process and finishing of castings. It also helps melting operators to understand the recommendations of melting practices.
- ◆ Effect of alloy addition, melting operation, metal contraction, shrinkage defects and risering of castings have been explained in detail with illustrations.
- ◆ Enhancing mechanical properties of grey iron & SG iron by addition of various elements in various compositions are deliberated in detail in this module.



## Module 10: Pattern-making and Methoding of Castings

- ◆ The module covers all aspects of pattern design, pattern material, pattern-making, contraction allowance, venting, methoding and method card in detail with illustrations. Pattern maintenance and storage have been explained. It is very important to preserve the pattern in good condition, which has a direct impact on the quality of casting.
- ◆ It elaborates various factors to be considered at the pattern design stage to provide allowances in pattern-making for different types of metal used for casting.
- ◆ Methoding (gating & risering), which is the integral part of the pattern design is discussed with technical explanations.

# Trainers' Profile



## Dr N P Sinha

(teaches in Hindi and Bengali)

Doctorate in industrial metallurgy from the University of Birmingham with over 40 years of rich foundry experience, Dr Sinha has worked in various foundries such as L&T, Tata Foundries, BESCO, Orient Steel, Titagarh Wagons and Super Smelters in India and abroad. He was consultant to UNIDO and fellow members of British Foundrymen, (FICME), UK. A chartered engineer from London, he is associated with several engineering institutions and educational bodies. Presently, he is chairman of IIF-CET.



## G Banerjee

(teaches in Hindi and Bengali)

B Tech (Hons) from IIT, Kharagpur, Mr Banerjee has 45 years of experience in foundry. He has worked in foundries like Tata Yodogawa, MAMC Ltd. MetFlow, RBA Ferro Industries Ltd and NSI India Ltd with hands-on experience in various types of moulding processes. Presently, he is a consultant in foundry and management services, enforcing ISO 9000, ISO 14000/DHSAS 18000 and is course coordinator for IIF-CET.



## S K Maulik

(teaches in Hindi and Bengali)

A post-graduate from IIT, Kharagpur with more than 45 years of foundry experience. He has worked in various foundries like Burn Standard, TEXMACO, Hindustan Motors, BESCO and Titagarh Wagons Ltd with green sand, CO<sub>2</sub> and no bake sand system. A member of various academic institutions, he is involved in foundry training through CET.

## Ziauddin Ahmed

(teaches in Hindi)



Mr Ahmed has completed B Tech in metallurgy from IIT Kharagpur and an M Tech in metallurgy from

IIT, Bombay and has more than 45 years' experience in foundry. He was a teacher/trainer at National Institute of Foundry and Forge Technology, Ranchi for seven years before shifting to foundry operations. He has worked with DCM Foundry for 20 years and Amtek Foundry for 15 years, apart from working at Foseco and Jayaswal Neco for short durations.

## Balraj Seth

(teaches in Hindi)



B.Tech (Honors) in Metallurgy and Gold medallist from Punjab University. Mr. Seth is member of various Institutions in India.

He has presented technical papers in various seminars. A cumulative experience of more than 37 years in Foundry, he has worked in Leader Valves- Foundry, EIL and Vishal steel Foundry in various capacities. He has specialised in project planning, design and installation of Cupola and Induction furnaces and presently offering Consultancy services.

## T N Ramasamy

(teaches in Tamil)



A mechanical engineer from Seshasayee Institute of Technology, Trichy, he has more than 35 years of foundry experience. Mr

Ramasamy has worked with Addison & Co, Foundry Division at Chennai and specialises in casting development and pattern-making, methoding and rejection control activities. Presently, he is providing foundry consultancy to ferrous and HPDC foundries. An active member of IIF, he conducts training programmes for IIF and other foundries.

## C Rajasekar Thomas

(teaches in Tamil)



An engineering graduate in metallurgy from PSG Technology, Coimbatore, he has foundry experience of more than 40 years in various grey iron foundries. He is also an ISO lead auditor, certified by BVQI. He has worked as foundry in-charge at ALIND, Foundry Division, BPL Engineering, Hyderabad and Texmo Industries, Pump Division, Coimbatore responsible for manufacturing, quality control and vendor development. Mr Thomas has worked as Foundry consultant to various foundries in Coimbatore for the development of grey & SG iron castings and improvement programmes in manufacturing.

## Damodar Baliga

(teaches in Kannada and Hindi)



A graduate in metallurgical engineering from BHU with foundry experience of more than 30 years in public and private sectors, Mr Baliga has completed a certificate course in modern foundry practices from IIT, Karagpur and SQC from Indian Statistical Institute. He has received specialised training in the production of alloy steel castings from Grossman AG-Solingen, Posse Marre GmbH-Erkrath and Fried Krupp GmbH-Essen in Germany and in melting of high speed tool steels, die block steels and other high alloy steels from VEW, Austria. He has presented technical papers at seminars and conducted training programmes for foundry employees.

## P Kannan

(teaches in Tamil)



A graduate in mechanical engineering, Mr Kannan has 38 years' experience in Foundry and associated machining. He has worked as Manufacturing Head, Foundry Division of Lakshmi Machine Works, Coimbatore and has hands-on experience in various shop floor activities in foundry and machining old castings. He has trained workmen and staff in lean manufacturing practices, Kemba Kaizen, process improvement, etc. He is a qualified internal auditor for ISO 9000-2001.

## R Gopal

(teaches in Tamil and Kannada)



A post-graduate in foundry engineering from IIT Kharagpur, Mr Gopal has more than 40 years of foundry experience in foundries like Pistons Limited, Brakes India limited and Madras Engineering Industries Limited. A foundry consultant since 2013, he specialises in green field foundry projects and conducts training for IIF and leading foundries. He has visited foundries in Japan, Malaysia, England, Germany, USA, China, Turkey and attended GIFA 2011 and BCIRA.

## Kiran Sohoni

(teaches in Marathi)



A graduate in metallurgical engineering, he has more than 25 years of cross cultural experience in production, quality, business analysis & business growth, development, system implementation, maintenance support and resource management. He has worked as Plant Head in various organizations like Hero Group, Kores (I) Ltd, Jindal Group. He is well-acquainted with manufacturing of castings with all grades of metal.

## M K Shaikh

(teaches in Marathi and Hindi)



Graduate in metallurgical engineering from College of Engineering, Pune with more than 20 years' foundry experience that covers product development, tooling, heat treatment, machining, QMS, supplier development and operation. He has worked with organisations like Kalyani Steels, Greaves Ltd, Mahindra Hinoday, Kores India, NECO Industries, Crescent Foundry as Plant Head and Head of Product development & QA. He has extensive experience in horizontal and vertical high pressure moulding line, auto pour, no-bake mould making, automated sand plant, cupola and medium frequency induction melting.



# IN-PLANT TRAINING PROGRAMME

## WHAT our clients say



The faculty were very eminent, experienced and knowledgeable persons from the foundry industry. The supervisors who attended the training were exposed to both the theoretical and practical aspects of foundry technology which will definitely improve their skills and lead to improvement of the quality of our products.

**N C De**

*Deputy General Manager (HRD)*  
Texmaco Rail & Engg Ltd



.... Two training programmes were conducted at two of our facilities by The Institute of Indian Foundrymen.... All the faculty were very eminent, experienced and knowledgeable persons from the foundry industry/engineering colleges. The supervisors of our foundry who took the training were exposed to both theoretical and practical aspects of foundry technology and will now definitely contribute to enhancing their performance leading to improvement of quality of our products.

**Neerukunda Pitchaiah**  
*Works Manager*  
Crescent Foundry



Workshops on various aspects of CI casting technology were organised followed by an examination. The topics covered were Observation of Casting Defects and Remedies; Sand Quality and Testing, Mould-making (Green and Dry Sand), Core-making (CO<sub>2</sub> and Resin Bonded), Melting of CI & IF, Remedial Action and Defects. Interactive sessions were conducted by eminent, experienced and knowledgeable faculty of IIF and the feedback of the participants on the effectiveness of the deliberation was awesome. We were suffering from perennial problems of casting defects for a long time. Since conducting the workshops and following the guidelines and suggestions given, the organisation has benefitted to a great extent.

We are confident that the workshops will definitely give us an edge over others in supplying EP brake items to Indian Railways.

**Tapan Kumar Chakraborty**  
*DGM-HRD, Legal*

Westinghouse Saxby Farmer Limited



The guidelines for methoding of SG iron castings, principles of modulus calculations, types of feeders & feeder efficiency, running system & gating ratios, ingate positions and step-by-step methoding system design, methoding calculation in production, yield per cent improvement, defect analysis were discussed and practical illustrations were given during the training.

**Ciju M**

*General Manager - HR & Administration*  
J S Auto Cast Foundry India Pvt Ltd



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# THE INSTITUTE OF INDIAN FOUNDRYMEN

Affiliated to World Foundry Organization (WFO)



## Yogyata Vikas, an In-plant Training Programme

Dear Sir,

The Institute of Indian Foundrymen, a pan-India Industry Association is the nodal agency of the foundry industry in India. IIF provides exemplary service to its members in several areas including in-plant training programmes to upgrade the skills of the foundry workforce which will benefit the foundry fraternity at large.

In-plant training is provided in the vernacular/local language to foundry workers/operators all over India by experienced trainers, with audio-visual training material prepared by IIF. There are ten different modules.

- ▶ Basic Metallurgy of Grey & SG Iron
- ▶ Basic Metallurgy of Steel Castings
- ▶ Casting Defects in Grey Iron, SG Iron and their Remedies
- ▶ Casting Defects in Steel Castings and their Remedies
- ▶ No-bake Resin, CO<sub>2</sub> Sand System and Coatings
- ▶ Melting Grey Iron, SG Iron & Steel in Cupola and Induction Furnace
- ▶ Sand Quality & Testing
- ▶ Cupola and its Operation
- ▶ Mould-making Processes
- ▶ Pattern-making and Methoding of Castings

We would like to provide training at your foundry. You can choose Option I or Option II, on terms mentioned below:

**Option I:** Basic Training. The trainer shall carry out classroom training based on the module selected by the foundry.

**Option II:** Customised Training. The trainer shall visit your foundry a day prior to the scheduled date of training, discuss and understand your requirements and customize the training module to suit your needs.

### **IIF Deliverables**

Training will be based on the audio visual presentation of the relevant module prepared by IIF. While giving lessons, the trainer will take care to connect the module with the process, technology and equipment used in and relevant to your foundry. Towards the end of the session, the trainer will answer queries of the participants.

### **Responsibilities of your Foundry**

Foundry workers/operators of the hosting organisation will enrol for the training programme at your premises. The size of a batch of trainees shall not be more than 25.



If you choose Option II, a works visit for the trainer from IIF will be organised, to enable him/her to get acquainted with the process/technology and equipment at site

The training schedule and programme for each day of training will be finalised in advance with the trainer designated by IIF

During the training, facilities for the audio visual presentation will be provided to the trainer by your organisation

Attendance sheets, duly signed by the participants along with the feedback form also duly filled in will be organised by the foundry and handed over to the trainer, to send it to the designated authority of IIF.

### **Remuneration/Financial Obligations**

#### **Option I:**

- ▶ IIF Members: Training fee shall be Rs 10,000 per day of training plus service tax
- ▶ Non Members: Training fee shall be Rs 15,000 per day of training plus service tax

#### **Option II:**

- ▶ IIF Members: Training fee shall be Rs 20,000 per 2 days of training plus service tax
- ▶ Non Members: Training fee shall be Rs 30,000 per 2 days of training plus service tax

The amount is payable in advance to the Institute through NEFT. Bank details are as follows:

**The Institute of Indian Foundrymen, CET**

*SB A/C No: 098301001568*

*ICICI Bank Ltd, Kasba Branch, Kolkata*

*Ground Floor, Balaji Towers, 59 K N Sen Lane, Kasba, Kolkata 700042*

*RTGS/NEFT/IFSC Code: ICICI 0000983*

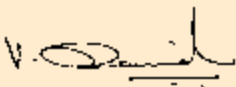
Other facilities and arrangements required for training, including trainer's local conveyance, boarding & lodging will be provided by the foundry.

For outstation trainers, 2nd class A/C train/air travel will be arranged by the foundry or reimbursed in addition to the above.

As a token of your acceptance of the above stated terms and conditions, please sign a duplicate of this letter and send it to The Institute of Indian Foundrymen, #3, 3rd Floor, C Block, The Ushush Uptown, New No. 86, First Main Road, Anna Nagar East, Chennai 6000102

If you need any clarification, please contact: V Ravindran, National Coordinator, In-plant Training, IIF, +91 44 2622 0196, +91 73583 84578 E mail: iiftraining@indianfoundry.org

Yours truly,



**V Ravindran**

*Director, IIF*

Accepted by: Name \_\_\_\_\_ Designation \_\_\_\_\_

Name & address of organisation \_\_\_\_\_

Date:



# IN-PLANT TRAINING PROGRAMME

## REQUISITION FORM

Name of the Foundry \_\_\_\_\_

Administrative Address \_\_\_\_\_

IIF Membership No. (if applicable) \_\_\_\_\_

Address of Training Location \_\_\_\_\_

Training Option (please tick whichever is applicable)

Option I: Basic Training (1 day)  Option II: Customised Training (2 days)

Training Module(s) requested (please select from enclosed list) \_\_\_\_\_

Vernacular (medium of instruction) (please tick your selection)

Bangla  Gujarati  Hindi  Kannada  Marathi  Tamil  Telegu

For option II, please give your requirements \_\_\_\_\_

Dates for training \_\_\_\_\_

Training Fee payment details (NEFT)

Name of Foundry official \_\_\_\_\_

Designation \_\_\_\_\_

Date: \_\_\_\_\_

Signature with seal

### For use by The Institute of Indian Foundrymen

Requisition accepted  Yes  No

Date(s) allotted \_\_\_\_\_

Name of trainer designated \_\_\_\_\_

Signature of approving authority \_\_\_\_\_ Date \_\_\_\_\_

Name \_\_\_\_\_

Designation \_\_\_\_\_



# IN-PLANT TRAINING PROGRAMME

## FEEDBACK FORM

1. Training Module: \_\_\_\_\_
2. No. of participants: \_\_\_\_\_
3. Name of trainer: \_\_\_\_\_

4. Please rate the training programme on a scale of 1-10 (1 being the least and 10 being the highest)

- 4.1. Duration of the programme:  1  2  3  4  5  6  7  8  9  10
- 4.2. Areas discussed in the programme:  1  2  3  4  5  6  7  8  9  10
- 4.3. Audio-visual presentation:  1  2  3  4  5  6  7  8  9  10
- 4.4. Interaction with trainees:  1  2  3  4  5  6  7  8  9  10
- 4.5. Usefulness of the programme:  1  2  3  4  5  6  7  8  9  10

If your rating is below 5, please specify the areas which need greater coverage or improvement

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- 4.6. Your valuable suggestions for improvement \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

- 4.7. Overall rating  1  2  3  4  5  6  7  8  9  10

Name of foundry: \_\_\_\_\_

Address: \_\_\_\_\_  
\_\_\_\_\_

Signature of Foundry Head

Seal of the Foundry



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