



VRAJ
GROUP OF COMPANIES

EXCELLENCE THROUGH EXPERIENCE



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- VRAJ CONCAST
- VRAJ ENGINEERS AND CONSULTANTS PVT. LTD.
- V-SAR IMPEX

- AN ISO 9001 : 2008 COMPANY
- www.vrajconcast.com



VRAJ CONCAST is established in 2004, Mr. Sharad S. Parte is a man that many believe is a born visionary. It was his inborn instinct coupled with a desire to move beyond the ordinary that led to the formation of VECPL at the turn of the 21st century.

VRAJ CONCAST manufactures and exports a commendable array of continuous casting machines and steel plant equipments with high quality and modern technology. The products are manufactured with a lot of conviction and love.

VRAJ CONCAST has a state of art facility and an experienced team to manufacture and deliver quality machines and services to its customers as per commitments. **VRAJ** has designed its machines, keeping high interest in customers satisfaction in terms of quality, trouble free performance and reasonable cost.

VRAJ CONCAST is passionate about manufacturing machines of various types and customised designs having sturdy mechanisms, latest hydro-pneumatic systems, PLC based automation control by SCADA and much more, which gives smooth operation, less maintenance and breakdown free machine-experience to it's customers.



Milestones of VRAJ CONCAST :

- **2004:** Supply of 4/7 high speed caster to Tembo steel, Uganda with a section of 75mm X 150mm.
- **2005:** Supply of 6/11 caster to Nandan Steel and Power Ltd. casting 320mm X 150mm section.
- **2007:** Supply of 4 strand 6/11 caster to Mahamaya Ispat Ltd. Raipur.
- **2009:** Supply of 9/16 caster to Prim Ispat Ltd to produce 350mm X 250mm section
- **2010:** Supply of 7/13/27 multi-radius machine to cast 280mm X 320mm section.
- **2011:** Supply of 3/6 caster to TSRM to produce 75mm X 75mm to 120mm X 120mm Sections
- **2012:** Commissioned a green field project of 1.5 MTPY steel melt shop in Raipur for Hi-Tech steel & power Ltd.
- **2013:** Supply of 3 strand 5/9 caster to Rashmi Metallic Ltd.
- **2015:** Supply of 3 strand 4/7 caster to Rashmi Metallic Ltd.
- **2017:** Commissioned a green field project of 1MTPY steel melt shop in Liberia for Sethi Brothers
- **2021:** Commissioned a green field project of 2 MTPY steel melt shop in Ghana for Sethi Brothers

Wide Range of Caster Models :

| MODEL | SECTION RANGE | THROUGHPUT/STRAND |
|----------|--|-------------------|
| 3/6 | 75mm sq. to 120mm sq. | 13 MT |
| 4/7 | 75mm sq. to 140mm sq. Mini Slab up to 80mm X 200mm | 17.5 MT |
| 5/9 | 100mm sq. to 160mm sq. Mini Slab up to 100mm X 250mm | 19 MT |
| 6/11 | 100mm sq. to 200mm sq. Mini Slab up to 150mm X 500mm | 20 MT |
| 7/13 | 120mm sq. to 300mm sq. Mini Slab up to 150mm X 500mm | 22 MT |
| 8.5/15 | 130mm sq. to 320mm sq. Mini Slab up to 150mm X 600mm | 24 MT |
| 9/16 | 130mm sq. to 400mm sq. | 26 MT |
| 10.25/19 | 160mm sq. to 420mm sq. | 30 MT |
| Vertical | 100mm sq. to 250mm sq. | 15 MT |



Main Features of VRAJ CONCAST :

- MODERN TECHNOLOGY
- STURDY DESIGN
- FULLY AUTOMISED
- FLEXIBLE AND CUSTOMISED DESIGNS
- HI SPEED SUITABLE FOR DIRECT HOT CHARGING
- HYDRAULIC BILLET SHEARING MACHINE
- BLOOMS AND SALB CASTERS
- LADLE SEQUENCE CAR OR TURRET
- BILLET TRANSFER CAR
- TURN OVER COOLING BED FOR 12 METER LONG BILLET
- LADLES AND BAIL ARMS
- HYDRAULIC MOULD OSCILLATION
- ROUND CASTERS
- HORIZONTAL CASTERS
- TWEEN ROLL CASTERS

Benefits of Automation :

- Process can be controlled
- Manpower cost control
- Process can be centralised and monitored
- Recording parameters for history and improvement in the process
- Alert alarms and messaging through GSM is possible

Weight of liquid metal is the difference between gross weight and tare weight of ladle. Some of the benefits of ladle automation are as follows.

- 1 Graphical presentation of liquid metal throughput with reference to the time is possible. So by recording each ladle's history we can predict ladle nozzle choking possibility or can study behaviours of deferent grades with different temperature.
- 2 In most of the casting practices ladle shroud is used to avoid gas inclusion and temperature drop. To avoid choking of ladle shroud due to slag and maintain the life the shroud is removed before slag enters in to it. Prediction of ladle shroud removal is done on judgement only, which causes unnecessary and unavoidable open casting at end of the casting. So the gases inclusion and bad quality metal is obvious in last 2-3 MT billets. This can be avoided by observing the throughput display where the balance



These are few important features of the automation.

Automation in Ladle Process :

Automation phenomenon in case of casters starts from ladle temperature and quantity of liquid metal received at caster from the furnace. In earlier days only temperature of ladle metal was recorded manually with the help of pyrometer. So the temperature and weight of transferred liquid metal was always been a major issue between furnace and caster departments in steel melting shops. Data provided by both the departments were never matching as it was a manual process. Now with the help of SCADA interfacing, we can interface pyrometer (Temperature recorder) and record the temperature. Similarly to weigh the liquid metal weight, we can provide load cells at the ladle pads on caster platform and record the same by interfacing.

in the ladle is shown and ladle shroud can be used up to the last kg of the metal in the ladle. Slag alarm can be set for shroud removal.

- 3 In each next heat, metal holding capacity of ladle increases due to erosion of refractory. This compiles us to inspect the ladle frequently to avoid the dangerous metal leakage through the ladle shell. This History of ladle refractory performance can be maintained by providing load cell on the caster. So the frequency of inspection can be reduced or alarm system for overweight ladle can be set to avoid an accident.
- 4 Even jam in ladle can be detected and corrective action can be taken so that ladle choking due to temperature drop because of jam can be avoided. Thus all ladle related problems can be minimised by introducing ladle automation.

Aluminum Wire Feeder :

AWF is used to feed aluminium in mould tube if cast grade need specific amount of aluminium in its chemistry. This is done by VVF A.C drive and synchronised with speed of withdrawal motor so that quantity will vary directly proportional to the casting speed.

Automation In Tundish :

Liquid metal is released through slide gate in to tundish. Tundish is filled with LM up to an predetermined level so that we get enough ferro static pressure at tundish nozzle which will give proper stream of LM for casting. Here to give start instruction to operator supervisor observes the level of LM in tundish. This manual activity can be done automatically by providing load cell at tundish resting pads. System will weigh the tundish while filling and give signal as weight of tundish reaches at a predetermined and preset weight.

2 Slag inclusions in the surface of billet are decreased.

For casting with submerged nozzle, mould level fluctuation is the main reason which leads to slag/lubrication powder wrapping into the meniscus. There are many steel plants whose mould level fluctuation is very huge because of manual control, so slag inclusion in the surface of billet is a big problem for them. They may have to arrange several workers to eliminate the surface slag inclusion manually so that the billet is cleaned for the mill plant.

If the AMLC is applied, the slag inclusions in the surface of billet will be eliminated significantly or completely.

3 Slag inclusions in the billet are decreased.

It is very difficult for the slag in the mould to float upward when mould level fluctuate sharply, which results into the billet solidified with slag inclusion.



- This will avoid hazardous practice of manual observation.
- This will give alarm for maximum and minimum level of LM in tundish while casting in sequence.

AMLC (Automatic level controller):

This is used to control the level of LM in mould tube so precisely, that we can get better surface quality and avoid breakouts, slag interruption, slag patch problems in billets. This system is partly mounted on tundish and partly in mould jackets. A radioactive source and precise sensors are used through SCADA and HMI to control a mechanical actuator which operates stopper and flow of LM is regulated as required.

Some of the benefits of AMLC are as follows:

1 Surface quality of billet is improved significantly.

If the AMLC is applied, then slag in the mould has enough time to float upward because of steady mould level.

4 Vertical crack on the billet surface is decreased significantly.

If mould level fluctuates from ± 3 to ± 20 , index of vertical crack will be increased from 0 to 2.

You can see that if AMLC is applied and mould level fluctuation is controlled to be less than ± 3 mm, then index of vertical crack on the surface of billet will be eliminated completely.

5 Cross crack on the billet surface is decreased.

6 It has special benefits for alloy steel, high grade steel and high additional value steel.

- 7 Liquid steel is fed into the mould bath automatically and Mould level is controlled automatically so that the continuous casting rate and yield rate of liquid steel are improved significantly.
- 8 Breakout and overflow will be decreased significantly.
- 8 Less manual operation is needed, so manpower is saved greatly.

Primary and Secondary Water Automation :

Water plays an important role in billet casting process. Liquid metal is solidified by extracting its temperature through water circulation around die in primary cooling and spraying water on the surface of billet in secondary cooling. Quality and quantity of water used is an important factor for better radiation or conduction of temperature for fast and complete solidification of the section. In manual system the quantity of water is totally

- In case of direct feeding of hot billets secondary automation helps when billet is hold due to any reason in the chamber. When billet is hold water is automatically stopped or reduced and restarted when normal speed is resumed.
- All data can be recorded for history.

Auto Cutting By Hydraulic Shearing :

As you are well aware the cutting loss due to manual gas cutting per billet of 6000mm is about 10 mm. i.e. $(10/6000) = 0.166$ percent in the entire production. If you produce 60000 tons per year the loss shall be 99 tons i.e. Rs. 29 lakhs per year (assuming Rs.30000/per ton) Add to this cost of oxygen, LPG approx. 10 lakhs per year.

In the process of billet casting when the billet emerges out of the withdrawal and straightening machine the billet is received by the Hydraulic Shearing Machine by means of two blades



depends on the skill of the operator and different peoples operate it differently as per their individual experience and practice, which is very harmful to the quality of billets. To control this activity consentingly in a proper and regular manner and to record the data for study and setting better parameters, this automation is employed.

This is done by putting pneumatically controlled valves with fomenters in the system. This system is controlled by taking feedback from withdrawal motor speed and using it to open or close valve proportionally, so if speed of the motor increases or decreases the flow will increase or decrease gradually.

- Manual malfunctioning of vales is avoided.
- Minimum or appropriate quantity of water is used.
- Water is sprayed according to the speed of the billet.
- With the help of automation we can set different parameters for different grades in alloy steels.

approaching each other and shearing the billet. In the process and duration of the cutting the trolley which houses the set of blades also travels at the casting speed.

First cut is cut by the operator and then he puts the system in auto mode. Thereafter with the help of interfacing the withdrawal speed with SCADA, machine cuts the billets of preset lengths automatically.

- Manpower cost is cut.
- Cost of gasses is saved.
- Cutting loss is saved.
- As exact length is cut, random length wastage at rolling mill because of extra length cut due to manual malfunctioning is eliminated.
- Danger of gas/oxygen explosion injuries, dirty environment and disposable waste of oxides Can be totally eliminated.

Automation In Hydraulic System :

Hydraulic system plays important role in continuous casting process. Withdrawal machine, dummy bar holder, rigid dummy bar, shearing machine and pusher are operated by hydraulic system.

Power pack :

Power pack is a pump operated system in which hydraulic oil (Enco-68) is sucked and used to operate different cylinders as and when required, through direction control valves. One standby pump and motor is provided to operate in case of failure of other pump.

Other than operating cylinders it also regulates the pressure differently for different locations as required i.e in withdrawal cylinders are operated at two pressures

- Dummy bar pressure
- Billet pressure.

Dummy bar pressure is higher than the billet pressure as DBP is used for solid dummy bar operations and billet pressure is used at the time billet withdrawal. These pressures are variable for various sections. Pressure is higher for higher sections and lower for small sections.

| SECTIONS | 100x100 | 140x140 | 180x180 | 200x200 |
|--------------|---------|---------|---------|---------|
| D B Pressure | 25 bar | 35 bar | 45 bar | 55 bar |
| B Pressure | 10 bar | 20 bar | 30 bar | 40 bar |

Automation by introducing Proportional valve in hydraulic system :

Proportional System

The conventional system used for 2 strand caster consists of Hi and Low settings for Pressure Reducing valve which is to be manually adjusted as and when the billet size changes.

We are replacing this with a proportional system wherein the pressures for withdrawal can be adjusted by changing the current to the valve thru PLC.

Proportional pilot valve for the main Pressure Reducing valve will be controlled by a voltage of 0-10 Volts. As we increase the Voltage the pressure will increase on the reducing valve.

We will have to program the system so that whenever billet size changes we will have to change the voltage only to the proportional valve.

pressures and flows in primary-secondary headers. This is not required if we use flow control valves with flow meters and configuring them with scada program we can see that pumps are started automatically, pressures and flows are rechecked, and set as per data fed. If any abnormality found system will alarm and show the exact point, where necessary action to be taken.

Secondly, pump motors will run by A.C Drives control, where we can make the drive functioning as per data set in PID through PLC. So when pumps are run in ideal conditions they will automatically set to low rpm so that they will run with low power and thus energy can be saved.

In 6/11 machine as the casting range is so huge, pumps are installed as per highest section to cast. So when small sections are cast, water is blocked by valves, this creates back pressure on motors and motors runs taking high current which is more power consuming and harmful too for pump assembly. This can



Stand by pump can be started automatically by interlocking with proper logic.

Automation In Water Complex (Pump House Section) :

As water is like blood for CCM and water complex is heart section of continuous casting unit in which water is treated, cooled, regenerated and fed all over to the machine.

Circulated water is cooled, recycled through water softener and stored for recirculation. In CCM two types of water is used soft water for primary cooling and closed circuit machine cooling and raw water for secondary cooling and external cooling for machine.

When machine is put in START mode pumps are started 5 minutes before ladle reaches caster stand to check and set all

be managed by above automation and pump will deliver exact amount of water with required pressure by running at low RPM and thus power as well as pump life can be saved.

Conveyer and Skid Bank Automation :

After cutting of required length of billet it is conveyed to skid bank with the help of conveyer roller table. Roller table is run automatically by interlocking with home position of shearing machine. When billet reaches stop-end assembly pusher is operated by limit switch and billet is stored in skid bank. Pusher is restored at its home position by limit switch operation only.

Automation Through Interlocking :

We can atomize many activities in caster by interlocking and developing different logics using limit switches, timers, and switchgears.



SIMPLE SOLUTIONS FOR COMPLEX WORLD

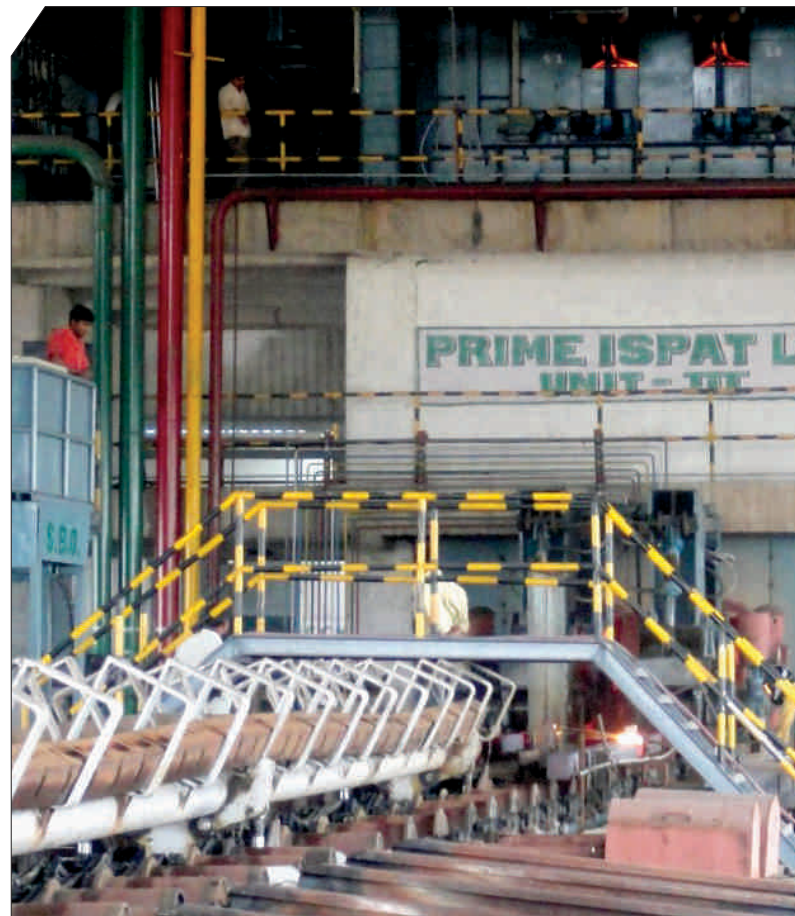
Turnkey Projects and Technical Solutions :

This branch of VRAJ provides turnkey solutions to its

clients. With a wealth of hard earned knowledge and experience we give solutions with an integrated approach for complete range of activities from greenfield planning to final production of desire capacity and various products like billets, slabs, blooms, rounds and much more.

Following Services are Provided Under Turnkey Projects :

- Design, Detailed Engineering and Documentation Activities
- General Plant Layout according to capacity of plant
- Civil and Structural Engineering
- Electrical and Instrumentation Engineering
- Utilities and Auxiliaries Engineering
- Technical support for procurement, inspections of plant equipment
- Technical support for installation and commissioning.



UPGRADING AND RETROFITTING

Many companies have sound equipment running smoothly but needs to be modified in some part of it, so those can meet newly arrived quality standards or quality parameters successfully.

Thanks to over three decades of experience coupled with highly skilled experts and engineers, we undertake any work related to following modifications in casters.

- Converting flexible dummy bar to Rigid dummy bar
- Modifying mould jackets by increasing mould tube length
- Modifications required for increasing speed of casting
- Hot billet charging equipment and necessary modifications in machines
- Rebuilding and revamping of old casters
- Converting manually operated casters to PLC based operated by Scada software



Axial Valve



Ball Valve



Butterfly Valve



Globe Valve



Knife Gate Valve



Needle Valve



Rotary Valve



Oil Seal



Air Below



Bearings



Couplings



Gear Box



Hydraulics



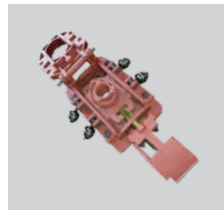
Hydraulics



Spray Nozzles



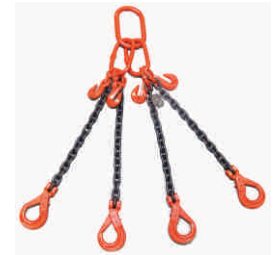
Industrial Motors



Slide Gate System and Spares



INDUSTRIAL SPRINGS



CHAIN AND SELLING



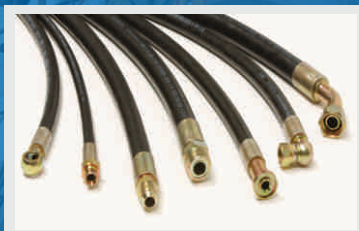
HAND TOOLS



LANCING PIPE



CASTING POWDER



HYDRAULIC HOSE PIPE

▼ Cooling Bed



▼ Ladle Platform



▼ Shearing Machine



▲ Tundish



▲ Tundish Trolley



▲ Stopper
Rod Mechanism

ACHIEVING NEWER HEIGHT OF SUCCESS

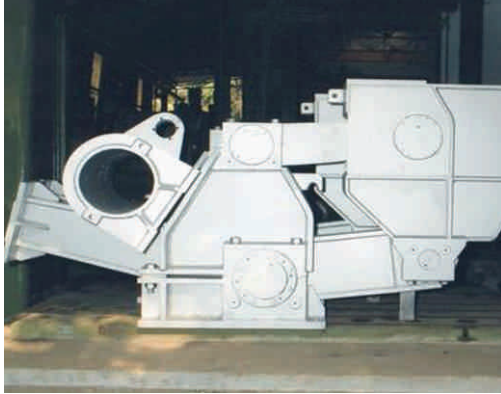
Advantage of Billet Casting

- Fine grain structure
- No taper through length
- Nice surface quality
- Neat and Clean process
- No refractory wastage like B P Set, Center col
- Negligible standard rejection (Metal loss in case of CCM is just app.150kg per heat cycle / In case of pit side it is app. 4%)
- High market demands
- Full automation possible
- Process can be controlled & standardized
- Less manpower required compared to pit side
- Selling price app. 2% more than ingot
- Some of the standards accept finished Product obtained from continuous cast billets only
- Central shrinkage and piping is rare phenomenon in billets (almost nil)



Our Strength...Our Products

▼ Mould Oscillator



▼ Rigid Dummy Bar



▼ Mould Jacket



▲ Withdrawal Machine



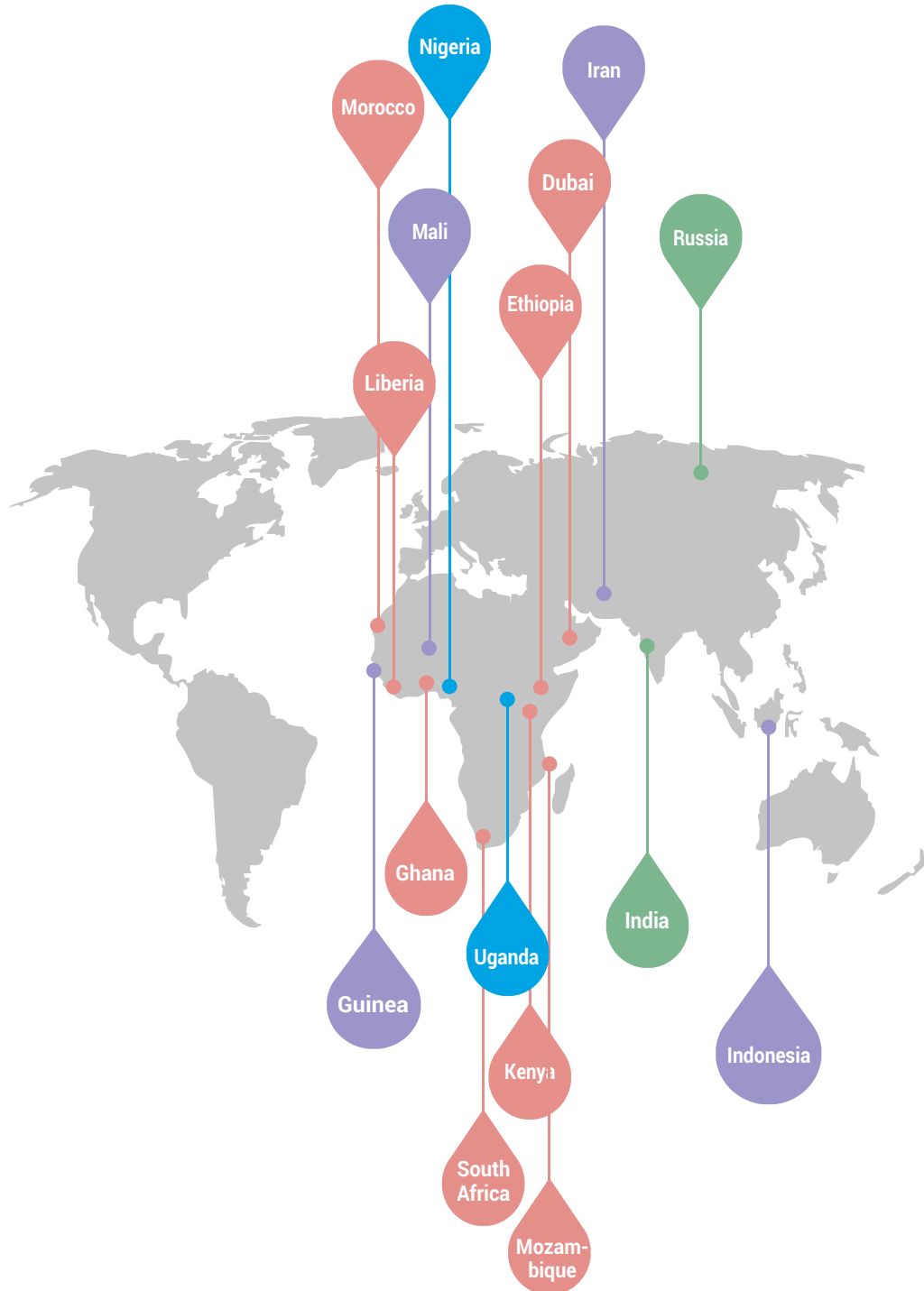
▲ Power Pack



▲ Flexible Dummy Bar

Advantage of Billet Casting

- This is also controlled by strict monitoring of temperature, speed, cooling in spray chamber
- The spray cooling pattern ensure the quality of billets
- The secondary cooling controlled by automation
- R.O.and D.M water is used for primary cooling
- Density of billet is high
- Refractory inclusion is almost nil
- Better reheating furnace utilization due to higher weight and same section through the length
- Due to higher density the saving in front end and back end cutting is considerable with respect to ingot
- Accurate length cutting by hydraulic streaming minimizes end-cutting in rolling thus releases standard rejection



AN ISO 9001 : 2008 COMPANY

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