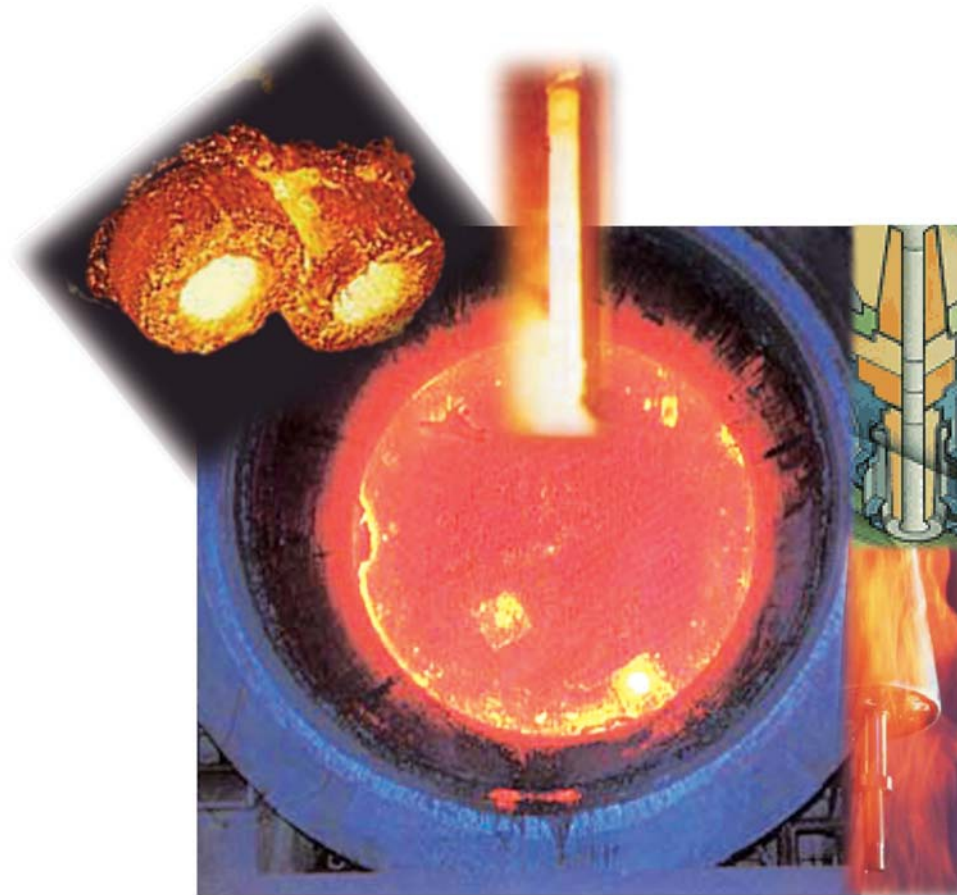




環球物源有限公司
Sino-Global Sourcing & Supply Ltd.
A Mishra Enterprise



REFRACTORIES *for*
LADLE METALLURGY



www.sgs.com

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Over a decade, operational experience gained by top-notch professionals in sourcing industrial goods and raw-materials from China, global manufacturing hub and catering to the world market, is the hallmark of Sino-Global Sourcing & Supply Limited (SGSSL). Prudent knowledge of the material sources in China coupled with strategic positioning, SGSSL is a competent partner in endeavors towards making your operation more and more cost-effective, in this increasingly difficult business environment.

SGSSL came to existence in the year 2005, largely to cater to the needs of sourcing from China. Today, there are three full fledged divisions working at SGSSL, namely:

- Refractories Division
- 'Minerals and Metals' Division
- 'New Business' Division

Refractory has been a very important input material for steel making. While in constant contact with molten iron and steel in the manufacturing process, it greatly impacts the cleanliness of steel. Refractory performance also decides the equipment availability for steel making. The high quality and chemically compatible basic refractories were scarce. Chinese Magnesite (in Liaoning Province) was discovered in early ninties for making high-performance steel plant refractories. SGSSL being based there has access to the best sources, coupled with experienced sales-service team it offers a good bet in terms of “Total Cost of Ownership (TCO)”.

At 'Minerals and Metals' division, forging long-term strategic alliances and price contracts with reputed producers, we are hedged against price escalations and short supplies of the materials. Continuous technical developments have been brought about through our active interfacing between the manufacturers and our esteemed clients. It has yielded optimum results with respect to material usage and service performances. At SGSSL we can be proud of every family member of their entrepreneurial penchant for exploring more viable sources.

The 'New Business' division focuses on our customers needs which come-up time to time and exploring sourcing opportunities from new geography.

Treatment of hot metal or steel in the ladle as a measure of supplementing melting shop metallurgy has had a long tradition. Cost-competitiveness in the production of high-end products coupled with the need to rationalize and ensure a safe operation, a structural change took place in the steel industry in early 60s, as a result of which *Ladle Metallurgy* emerged as an independent process steps in new roles.

Removal of undesired inclusions from hot metal or steel heats to the largest possible extent, homogenization of temperature and concentration, precise chemistry control, improvement of fluidity of steel heats, process optimization, and the improvement of productivity in iron-making and steel-making operations are the various objectives that can be accomplished through *Ladle Metallurgy*.

Injection, stirring and dipping of reagents into the metal bath are process technology elements of *Ladle Metallurgy* that are used for treatment of hot metal heats, whereas stirring, injections of gaseous and solid reagents, and application of vacuum & RH degassers are used for treatment of steel heats.

While the advent of *Ladle Metallurgy* brought about a cost-effective process for production of high-end steel, it threw a challenge to refractory makers. Developing the refractories with chemical compatibility with the operation and ability to stand the severity of operation appeared insuperable. Globalization in every sphere of life starting in early nineties opened a floodgate of global competitions, compounding the problem.

With time the refractory makers, refractory engineers and steel makers, working together brought about the much desired improvement in the performance of ladle refractories, through flow of information from users end to refractory maker R&D utilizing the information to make desired changes in the refractory quality; improving the refractory design to a more robust one achieving stability & uniform erosion; identifying the abuses on refractories restricting them to the extent possible. Last but no the least, the steel makers consciously adopted the refractory friendly operating practices.

The bricks shapes including lining thickness, for the walls coupled with installation techniques like spiral or ring concept based on ladle shapes (oval, conical or cylindrical) play an important role in the overall performance of the refractory lining.

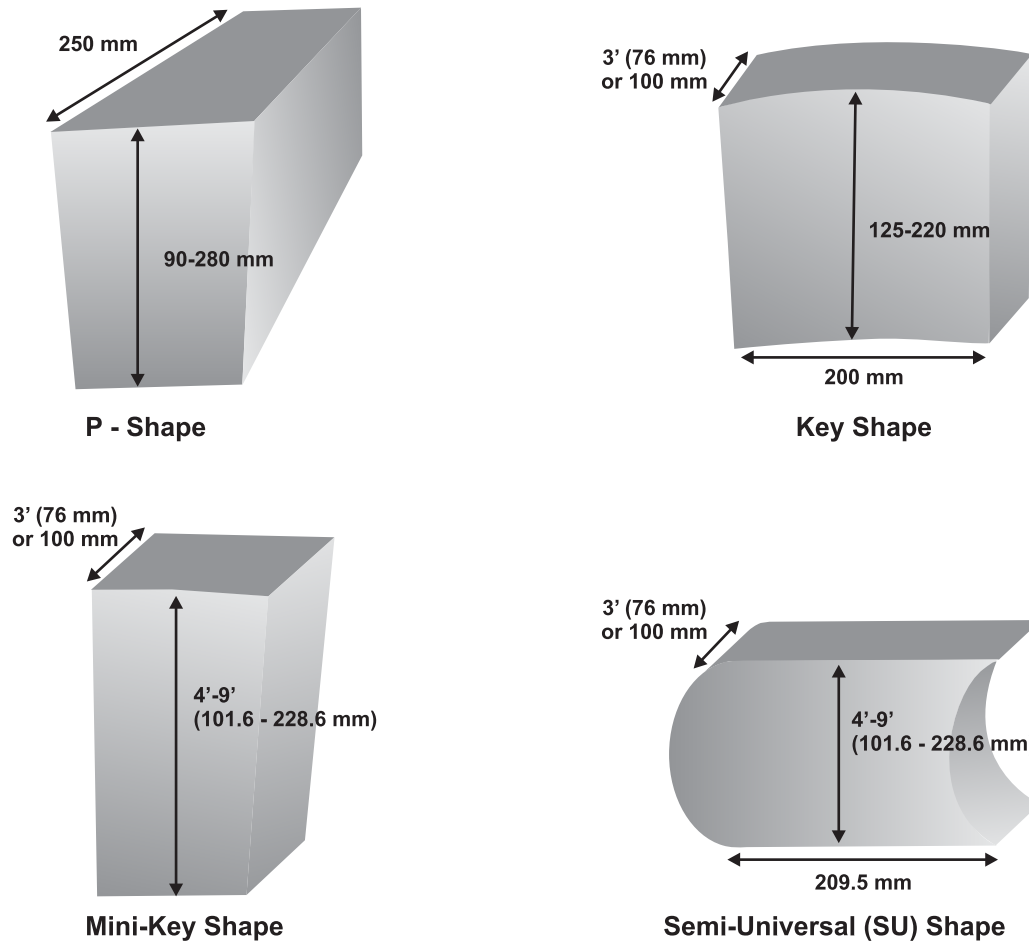
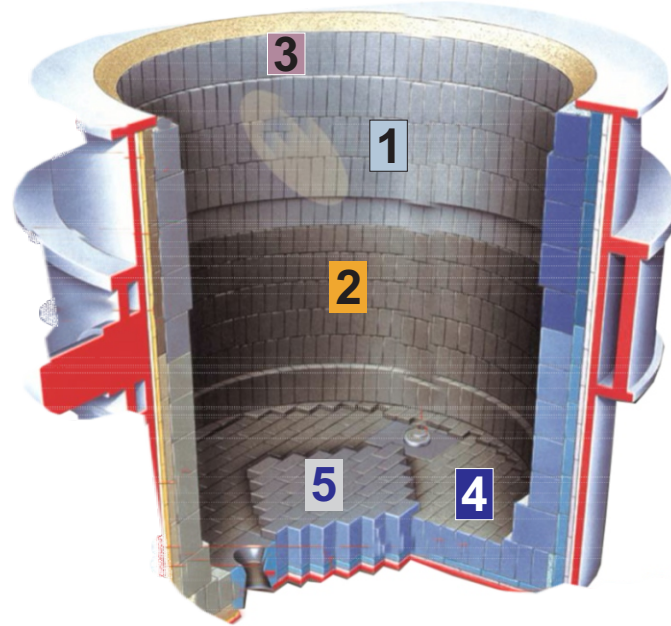


FIGURE: Different Bricks Shapes for Ladle Walls

SHAPES	ADVANTAGES	DISADVANTAGES
P-series	<ul style="list-style-type: none"> Good dimensional tolerance on thickness helping in achieving uniform thickness all over the ring, as pressed on the wedge side 	<ul style="list-style-type: none"> Tend to break into two/three parts during operation
Key Bricks	<ul style="list-style-type: none"> Easy to install 	<ul style="list-style-type: none"> Poor dimensional tolerance on thickness resulting in non-uniform thickness all over the ring, as pressed on the flat side
Mini-Key Series	<ul style="list-style-type: none"> Good dimensional tolerance on thickness helping in achieving uniform thickness all over the ring, as pressed on the wedge side Can be laid in rings or spirals 	<ul style="list-style-type: none"> Larger quantity to handle while laying the bricks
Semi-Universal (SU) Series	<ul style="list-style-type: none"> Easy to install 	<ul style="list-style-type: none"> Loose the tightness after certain erosion

TABLE: Advantages and disadvantages of different shapes for Ladle Lining

The wear profile is not uniform in a ladle operation, since operating parameters vary from zone-to-zone and plant-to-plant. SGSSL zoned lining concept is recommended in the ladle lining to get balanced wear-out for economical and optimal performance. The zoning of the lining is done either with varying lining thickness or quality.



- 1 Slagzone**
High corrosion, erosion and oxidation
Pericarb 98
- 2 Metalzone**
Low corrosion and oxidation
Pericarb 97/ Alucarb 80
- 3 Freeboard**
Oxidation and erosion
Pericarb 96 / Alucarb 80 / Alumex 80
- 4 Bottom**
Low oxidation and corrosion
Pericarb 97/ Alucarb 80CR
- 5 Impact-Pad**
High thermal-shocks and erosion
Pericarb 98 / Alucarb 80

FIGURE: Factors influencing the wear profile & recommended refractory lining from SGSSL

QUALITY	ADVANTAGES	DISADVANTAGES
Magnesia - Carbon	<ul style="list-style-type: none"> • Chemically compatible with steelmaking slags (including FeO containing slags) • High refractoriness 	<ul style="list-style-type: none"> • High thermal expansion and relatively poor thermal-shock resistance
	<ul style="list-style-type: none"> • Good thermal-shock resistance • Positive expansion at high temperature 	
Monolithic Castables	<ul style="list-style-type: none"> • Suitable for steel with high carbon • Longer campaign life 	<ul style="list-style-type: none"> • Need installation equipments • Longer pre-heating time

TABLE: Advantages and disadvantages of different qualities for Ladle Lining

BRAND	MgO in FM used	Al ₂ O ₃	FC	AP	BD	CCS	HMOR at 1400 °C/ 0.5 hr	Application Area
	(%)	(%)	(%)	(%)	(gm/cc)	(Mpa)	(Mpa)	
	min	min	min	max	min	min	min	
MAGNESIA CARBON								
PERICARB 98	98.0	-	8.0	6.0	3.0	38.0	8.0	LRF SZ/BIP
PERICARB 97	97.0	-	8.0	6.0	3.0	38.0	8.0	LRF B/MZ
PERICARB 96	96.0	-	8.0	6.0	3.0	38.0	8.0	LRF FB
ALUMIN MAGNESIA CARBON								
ALUMCARB 80CR	8.0	80.0	5.0	10.0	3.2	40.0	12.0	LRF/ Other Ladle MZ; FB; B; BIP
ALUMCARB 80	8.0	70.0	5.0	10.0	3.1	40.0	12.0	
ALUMCARB 70	8.0	70.0	5.0	10.0	3.0	30.0	14.0	
HIGH ALUMINA								
ALUMEN 80BX	-	80.0	-	21.0	2.7	50.0	-	Ladle MZ; B
ALUMEN MUL70	-	70.0	-	20.0	2.5	50.0	-	
ALUMEN 70BX	-	70.0	-	20.0	2.6	45.0	-	
BACK - UP LINING								
ALUMEN 80BX	-	80.0	-	21.0	2.7	50.0	-	Ladle Back-ups
ALUMEN 70BX	-	70.0	-	20.0	2.6	45.0	-	

SZ: Slag Zone

MZ: Metal Zone

B: Bottom

BIP: Bottom Impact Pad

FB: Free Board

CR: Corrosion Resistant

BX: Bauxite

NOTE:

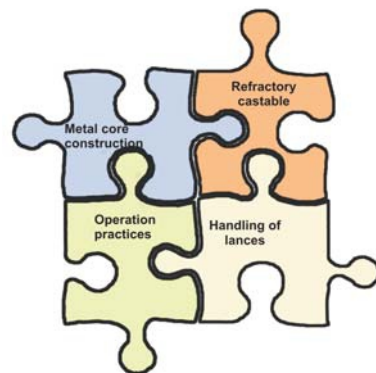
1. The above data pertain to pressed bricks only.
2. The above data are only indicative of our product range. We do meet customized needs of individual customer.



In the area of hot metal desulphurization and injecting solid and gases in steel bath, SGSSL offers a range of tailor-made monolithic lances. Mainly 4 types of lances are used in ladle metallurgy for following applications:

- Hot metal desulphurization lance
- Argon rinsing lance
- Emergency stir lance
- Injection lance

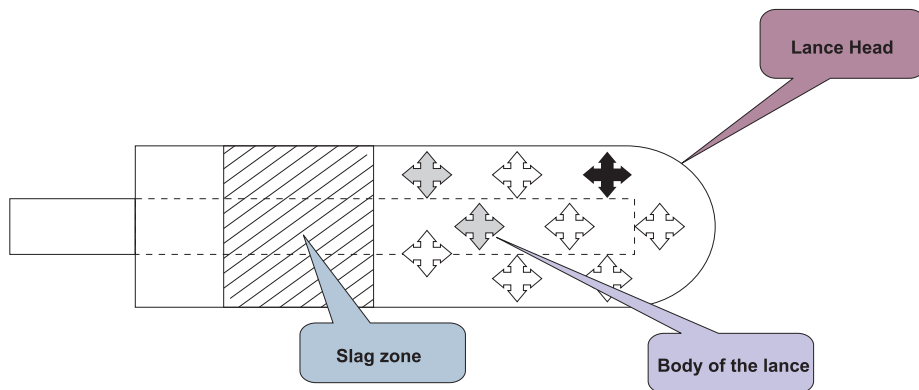
The monolithic lances are comprised of a rigid core steel construction with suitable castable installed on it with proper anchorage system. During the operation the lances are subjected to Thermal, Mechanical, and Chemical loads. Manufacturing a high-performance monolithic lance can be very enigmatic.



The selection of the material is the key to improve upon corrosion resistance. To absorb the thermo-mechanical shock and consequently enhance the durability of the lances, generation of a differential residual expansion is desirable.

Rigidity of the pipe is very important to withstand the vibration while castable is being installed. The desired rigidity is also ascertained by estimating the transition of temperature increase at the core pipe under the shop's operating conditions. The very longitudinal structure of the lance calls for careful handling at various stages during manufacturing, transportation, storage and in the steel shop.

SGSSL zoned concept is recommended in the lance design to get a balanced wear-out for economical and optimal performance.



CASTABLES

PROPERTIES	BRAND	Lancecast <i>DS</i>	Lancecast <i>LT</i>
	Chemical Compositions (%)	Al ₂ O ₃ ≥	62
	SiO ₂ ≥	35	1
Bulk Density at 110°C(gm/cc)	≥	2.5	3
Cold Crushing Strength (Mpa)	(110°C x 24h) ≥	35	40
	(1400°C x 3h) ≥	45	60
Max. Permanent Linear Change at 1400°C/3hr		+ 1%	+ 0.5%
Grain Size (mm)		0-5	0-5
Max. Service Temperature (°C)		1500	1750

NOTE:

1. The above data are only indicative of our product range. We do meet customized needs of individual customer.
2. We manufacture all the above as per the customers design.

Since the Ladle Slide Gate system was introduced, various grades such as silicon nitride, high alumina, zircon, graphite, magnesia and other materials were considered for the slide gate plates, the most important component in the system. Depending on the mode of operation and quality of steel being produced, following characteristics are required in a slide plate:

- High thermal-shock resistance
- High resistance to corrosion by molten steel and slag
- High abrasion resistance (metal penetrations may adhere to the plate surface and results in an abrasive action during subsequent uses)
- High strength for withstanding rapid steel flow at high temperature
- High bulk density and low apparent porosity
- Very smooth surface finish and surface texture, particularly surrounding bore

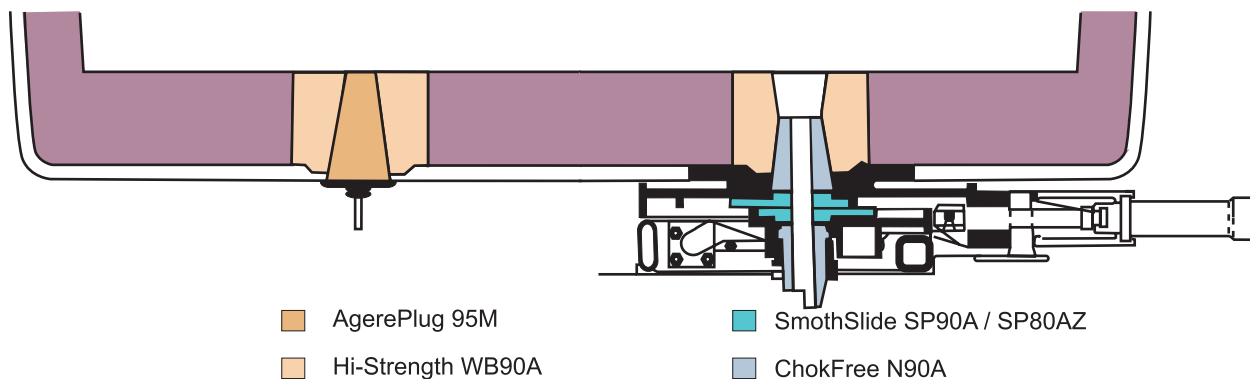
Alumina-Carbon plates were found most suitable for the purpose and are most extensively used, today. Addition of zirconia to the Alumina-Carbon system improves the modulus of rupture of the slide plates.

While the beginning of inert gas (argon and nitrogen) purging in steel making was characterized by the dominance of purging lances, now the bottom purging is gaining currency in the ladle. Presently, the use of lances is restricted to the solid reagent additions and as a stand-by in case of bottom purging failures.

The bottom purging is accomplished through three types of purging plugs, namely Porus Plugs; Slot Plugs; and Hybrid Plugs

Porus plugs are very sensitive to the gas jet formation that results in a strong back-attack phenomenon and a subsequent lifetime deficiency. The characteristic wearing is spalling on the hot face during the start up of purging that decreases the plug life. This was surmounted by advent of the Slot Plugs. The Hybrid plugs encompasses the qualities of a porus plug that enables a 100% opening rate and a good performance at low gas flow rates with a slot plug that provides optimum performance at high gas flows and has an increased service life.

The ease of handling and degree of homogenization and purification achieved, make the bottom purging most preferred choice among steelmakers.



BRAND	Al ₂ O ₃	Fe ₂ O ₃	ZrO ₂	FC	AP	BD	MOR (1400°C x 3h)
	(%)	(%)	(%)	(%)	(%)	(gm/cc)	(Mpa)
	min	min	min	min	max	min	min
SLIDE PLATE & PORUS PLUG							
SMOTHSLIDE SP90A	90.0	-	-	4.0	8.0	3.1	20.0
SMOTHSLIDE SP80AZ	80.0	-	5.0	4.0	8.0	3.0	20.0
AGEREPLUG 95M	95.0	0.1	Air Flow at 0.4 kg/cm ² (Ltrs/min) 50		15.0	3.0	18.0
	(MgO%)						
NOZZLE AND WELL BLOCK							
CHOKFREE N90A	90.0	0.5	-	5.0	8.0	3.0	15.0
HI-STRENGTH WB90A	90.0	0.5	-		16.0	2.8	10.0
BRAND	Al ₂ O ₃	Fe ₂ O ₃	SiO ₂	Grading	Setting	Sintering Temp	Application
	(%)	(%)	(%)	(mm)	-	(°C)	
	min	max	max	-	-	-	
MONOLITHICS							
GreenSet 90A	90.0	0.5	4.0	0-0.2	Ceramic	1,200	Joining Mortar
GreenRam 95A	95.0	0.1	0.5	0-5	Hydraulic	1,400	Fixing Ramming mix
Nozzlefill	97.0						Nozzle filling mass

NOTE:

1. The above data are only indicative of our product range. We do meet customized needs of individual customer. We manufacture all the above as per the customer's design.
2. Slot and Hybrid plugs are tailor-made based on Alumina with Spinel addition to ensure optimum corrosion resistance.

RH-Degasser is being extensively used for purposes besides the main objective of degassing, such as mixing equipment to adjust constituents and to homogenize bath temperature. It is also being used for maintaining the bath temperature by O₂ blowing into the vacuum tank. Therefore, the wear lining of RH-degassing system must be able to withstand the severe operating conditions.

SGSSL zoned lining concept is recommended for the RH lining to get balance wear out for economical and optimal performance.

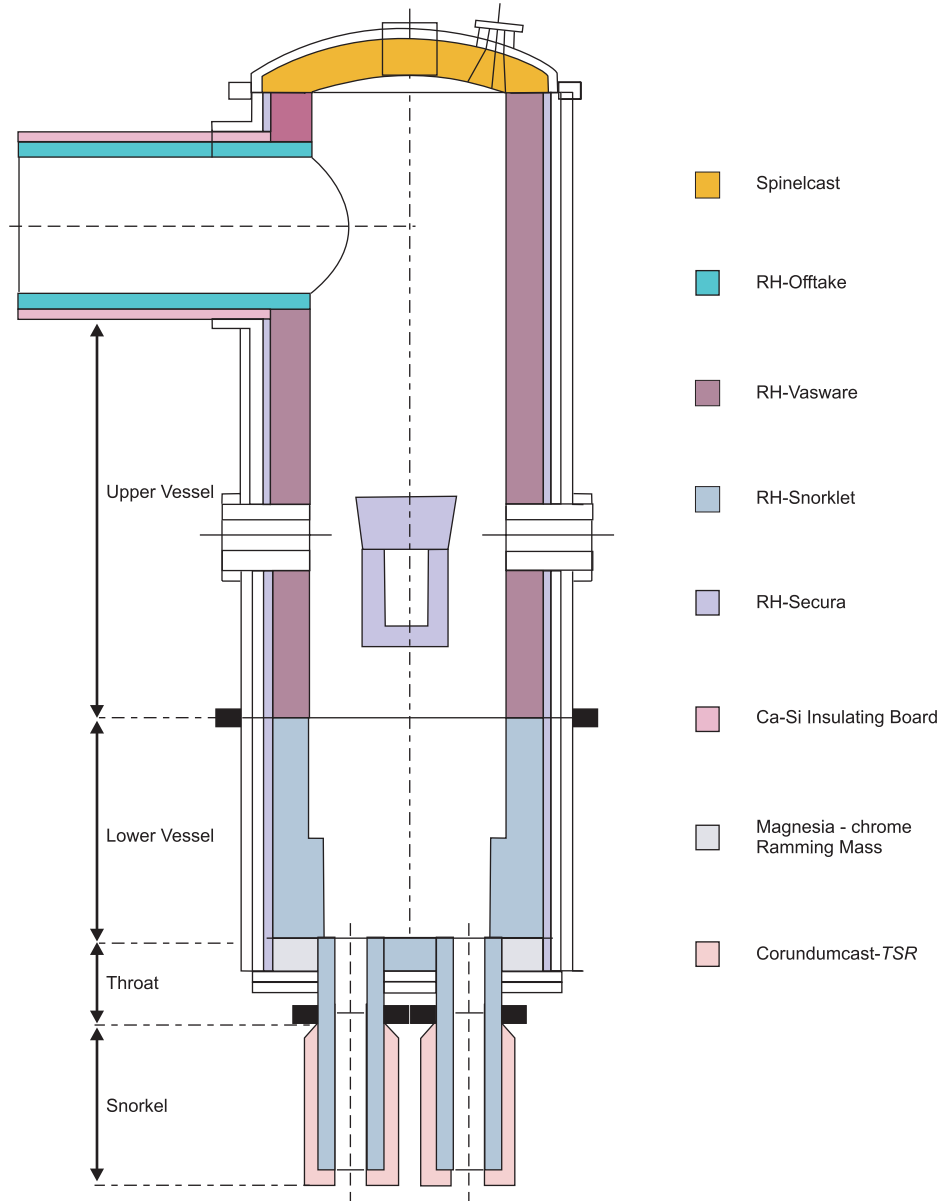


FIGURE: The recommended SGSSL Refractory lining for RH-Degasser

SHAPED REFRACTORIES

PROPERTIES	BRAND	RH -Snorklet	RH - Vasware	RH -Offtake	RH -Secura
	Chemical Compositions (%)	MgO ≥	60	60	55
	Cr ₂ O ₃ ≥	18	16	16	12
	SiO ₂ ≤	2.0	2.0	2.5	2.0
Bulk Density (gm/cc)	≥	3.15	3.10	3.1	3.10
Apparent Porosity (%)	≤	16	18	16	18
Cold Crushing Strength (Mpa)	≥	45	40	35	40
Refractoriness Under Load T _a (°C)	≥	1700	1700	1700	1700
Grain Bonding		Rebonded	Rebonded	Semi-rebonded	Direct-Bonded

NOTE:

1. The above data pertain to pressed bricks only.
2. Suitable grades Calcium-Silicate structural boards are available with us for the RH-degasser insulating lining.
3. The above data are only indicative of our product range. We do meet customized needs of individual customer.

CASTABLES

PROPERTIES	BRAND	Spinelcast	Corundumcast _{TSR}
	Chemical Compositions (%)	Al ₂ O ₃ ≥	80
	MgO ≥	8	5
Bulk Density (gm/cc)	≥	2.9	3
Cold Crushing Strength (Mpa)	(110°C x 24h) ≥	30	60
	(1500°C x 3h) ≥	60	70
Modulus of Rupture (Mpa)	(110°C x 24h) ≥	5	6
	(1500°C x 3h) ≥	7	10
Max. Permanent Linear Change at 1500°C		+ 1%	± 0.5%
Max. Service Temperature (°C)		1800	1800

NOTE:

1. Suitable grades Magnesia-Chrome ramming mass and mortar are available with us for the RH-degasser lining.
2. Suitable grade magnesia gunning mass is available with us for the RH-degasser periodic maintenance during the campaign.



**Highest ever
RH Snorkel Life of
181 heats
achieved
at Bhilai Steel Plant**



**STEEL AUTHORITY OF INDIA LIMITED
ROURKELA STEEL PLANT**

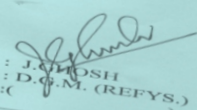
SHOP NAME : SMS - II

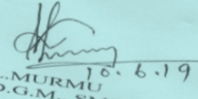
MONTH : MAY - 2019

MONTHLY CERTIFICATE TO BE ISSUED BY THE SHOP INCHARGE FOR
FACILITATING PAYMENT FOR LADLE

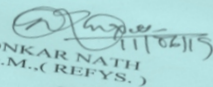
- 1) CERTIFICATE SL.NO : 06/SGL-AMI/1772000053 DATED : 01/04/2019
- 2) P.O. NO.: 1800500053 DATED 05/07/2018 - M/s. SGSSL
1800500054 DATED 05/07/2018- M/s. AMI
- 3) NAME OF THE SUPPLIER : M/s. SINO GLOBAL SOURCING & SUPPLY LTD.
- 4) MINIMUM GUARANTEE LIFE/ THRESHOLD LIFE : 120 / 85
- 5) OTHER DETAILS TO BE FURNISHED : Order Qty.- 22 Sets

MATURED CAMPAIGN LIFE MEETING MIN. GUARANTEE / BELOW MIN. GUARANTEE.					
SL. NO.	LADLE NO.	DATE OF START OF CAMPAIGN	DATE OF COMPLETION OF CAMPAIGN	CAMPAIGN LIFE	REMARKS : REASONS FOR TERMINATION OF CAMPAIGN, IF ANY.
1	1	21.03.2019	21.05.2019	191	POOR OVERALL LINING.

INITIATED BY:
SIGNATURE : 
NAME : J. GHOSH
DESIGNATION : D.G.M. (REFYS.)
DATE :

SIGNATURE : 
NAME : L. MURMU
DESIGNATION : D.G.M., SMS - II (O)
DATE : 10.6.19

- CC TO:
- 1) FINANCE (PAYMENT COPY)
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APPROVED BY:
SIGNATURE : 
NAME : ONKAR NATH
DESIGNATION : G.M., (REFYS.)
DATE :

Rourkela Steel Plant creates new record in Steel Ladle life

**PBD BUREAU
ROURKELA, OCT 12**



ROURKELA Steel Plant (RSP) has created a new record in Steel Ladle Life in Steel Melting Shop-II department. The ladle life is not only highest in SAIL but also the best ever life achieved in India with Magnesia Carbon Bricks. The plant scripted this record by docking the highest ever Steel Ladle Life of 192 heats in a single campaign surpassing the earlier best Steel Ladle Life of 191 heats achieved in May 2019. The steel ladle management set was supplied by Sino-Global Sourcing & Supply Ltd. The Ladle was taken down for relining on Friday. The significant achievement was made possible because of the dedicated and coordinated efforts of Refractory

Engineering (Services) and Steel Melting Shop-II (Operation). Notably, the Steel Ladle was due for slag zone repair on September 16, 2019 at 152 life. During inspection of the Ladle by Refractory Department it was found that the metal zone condition of the ladle was in good shape and the metal zone left over thickness was found to be in excess of 130 millimetres. Considering the potential of the Ladle, the team of Refractory Engineering decided to continue the ladle in service with slag-zone repair. The ladle had a

guaranteed life of 120 heats. Under the guidance of Onkar Nath, CGM (Refractory), the Refractory collective repair and monitored the ladle with utmost care to achieve the record lining life of the Steel ladle. The endeavor ensured intangible benefits of enhanced Ladle availability and improved productivity. The effort is one amongst many such initiatives being undertaken by the enterprising RSP collective to reduce cost of production and further improve techno-economics of the steel plant.



Customer Testimonial

ME

Sino-Global
Delivering Value

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