Inaugural address

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It gives me great pleasure to associate myself with this Seminar on 'Refractories for Reheating and Heat Treatment Furnaces" which is being organised by the Jamshedpur Section of Indian Ceramic Society.

I am aware that the local chapter has been very active and they have been organising seminars regularly on various topics of interest. I understand that these seminars have been well attended by leading technologists and scientists both from India and abroad.

I am glad to note that the local chapter has been continuing its efforts in this direction for the advancement of knowledge in the field of refractory technology. These seminars provide a common forum for refractory technologists, scientists and engineers to exchange their views and enrich themselves with latest technological developments. The mutual exchange of experience is also greatly beneficial in reducing the problems in the transfer of technology from research laboratories to the shop floor.

I have been associated with the Steel Industry for over three decades in various capacities and of late I am also associated with two major Refractory Manufacturers in the country. While the R & D efforts put in, and the trend of developments noticed in this field, are fairly satisfactory, the refractory manufacturers in India are yet to gear themselves fully to meet the requirements of changing technologies in the metallurgical industries.

The steep increase in fuel costs, coupled with irregular supplies of liquid fuel and its depleting reserves, have focussed attention on the need for conservation of energy. The various reheating and heat-treatment furnaces in advanced countries now-a-days are being designed with improved quality of refractories to meet this challenge. Various types of insulating materials have been developed in the recent past to cater to the needs of the industry. Hot face insulating bricks are available commercially today in light-weight or ultra-light-weight varieties which are capable of withstanding temperatures upto 1600°C.

The development of ceramic fibres with very low thermal mass properties has been a major break through in recent times. This material has not only

made it possible to reduce the heat losses from furnaces, but also has cut down the installation time. The ceramic fibres, being very light, are also easy to handle. Further, the wall thickness can be considerably reduced with the use of this material.

Ceramic fibres are made from various base materials viz silica, alumino-silicate, pure alumina and zirconia. They are capable of withstanding temperatures from 1000°C to 1600°C. These fibres are available in various forms and felts or blankets are used for wall and roof linings. Various techniques have been developed for the installation of these blankets. A recent development amongst them is the fibre modules which involves the installation of entire lining thickness at one time. It has also been reported that the ceramic fibres are applied over the existing walls as hot face veneer for improving the thermal efficiency. Ceramic fibres are also used as a replacement of conventional sand seals in Soaking Pits. Its use has been further extended for covering the water cooled skid pipes in reheating furnaces.

In contrast to the light weight materials mentioned so far, 'Fusion Cast Refractories' are quite dense with almost zero porosity. These refractories possess excellent abrasion resistance properties and are used for the hearth lining of steel processing furnaces. Due to the absence of pores, these bricks are quite inert towards chemical erosion and do not absorb any slag or fused scale from the stock. This eliminates the build up of hearth during operation which is an inherent problem with conventional type of refractories. However, these bricks are susceptible to spalling due to its dense structure.

Though fusion cast refractories are manufactured from various base materials, aluminosilicate are normally used in the reheating furnaces. Recently, Improved quality of fusion cast refractories made from Mullite-Corrundum-Zircon have been developed which are commercially available now.

Conventional bricks have also been developed with improved abrasion resistance properties for the hearth lining. These refractories are made from either High alumina, Silicon carbide or Basic materials.

Monolithics in the form of castables, mouldables and plastics are extensively used in the construction and maintenance of reheating furnaces. While castables are generally made from hydraulic setting materials, the mouldables and plastics are chemical or air setting in nature. Castables normally require curing after application and also suffer from loss of strength at intermediate temperature ranges. However, properties of castables can be further improved by the incorporation of different types of fibre reinforcements. Mouldables and plastics are available in the ready mixed condition in the form of bricks which can easily take any shape with slight pressure and they develop strength on drying and heating.

Mouldables and plastics are gradually replacing castables due to the various advantages mentioned earlier. They are extensively used for the construction of reheating furnace walls and roofs, soaking pit walls and covers, covering of skid pipes, burner blocks, etc. Mouldables and plastics are also a versatile material for easy maintenance as it can be applied on worn out or spalled surfaces, thus restoring the original contour. In the application of mouldables, refractory anchors are used for holding the material in position which prevents the damage to walls due to mechanical abuse.

I have been told that pre-fabricated large blocks are also used in the construction of soaking pit walls and roofs which has drastically reduced the down time of pits for relining. Such blocks are also being used in reheating furnaces.

Efficient utilisation of fuel in reheating furnaces largely depends on the waste heat recovery system. Recent energy crisis has compelled us to pay more attention in this area. A number of developments have been reported with regard to the design, construction and quality of materials used for recuperators in soaking pits and reheating furnaces. The various qualities of ceramic recuperators used are high alumina, silicon carbide, zircon, etc. British Steel Corporation has developed ceramic recuperator designs in which joints are practically eliminated by providing a large one piece tube fitted with flexible ceramic fibre seals which has given encouraging performance. Prevention of heat loss from water cooled skids need not be over emphasized and insulation of these pipes with various refractory materials have already been pointed out earlier.

A new technique of coating the refractory walls with silicon carbide base materials with improved emissivity properties has been reported to improve the thermal efficiency of furnaces.

I have so far dealt with the various developments that are taking place in the advanced countries in this field. However, when we look around us, the picture is not that bright, yet efforts are being made to meet the demands of the industry to the extent possible. I understand that the manufacture of fusion cast refractories has already commenced in one of the plants in our country on a commercial scale. I hope that the quality of products produced in this plant would be comparable with the imported goods. This will help in eliminating the need for importing this quality of refractories needed by the Steel Plants.

Recently good quality abrasion resistant high alumina bricks have been developed and successfully used in one of the steel plants. The life obtained was found to be quite comparable if not better than that of the imported bricks.

With regard to the use of castables, mouldables and plastics, although the necessary know how is available in the country, I am perturbed to note that

extensive use of these materials is not being made in our furnace construction and maintenance jobs. I presume that this is largely due only to the communication gap that may be existing between the producers and consumers and I hope that this bottleneck gets removed in due course. I would also suggest that steps be taken to establish a continuous rapport between them in the interests of ensuring the wider application and further developments in this field.

Similarly, I would also like to point out that despite the various advantages of ceramic fibres, they are still not being used extensively in our furnaces mainly due to non-availability of indigenously developed materials in the country. I am sure that initiative would be taken by the National Laboratories engaged in the research and development work of this nature, to develop these materials soon.

I am sure that this seminar will provide sufficient innovative suggestions and result in steps being initiated for the development of new materials and techniques. In conclusion, while hoping that this seminar will help to bridge the communication gaps of the type referred to by me earlier, I would like to suggest that effective follow-up action be initiated by the Local Chapter of the Indian Ceramic Society so that the various suggestions emanating out of this seminar ultimately get fully implemented.

I now have the great pleasure in inaugurating this seminar on "Refractories for Reheating and Heat Treatment Furnaces.