Discussion on Energy efficiency

The discussion revolves around several innovative ideas to improve energy efficiency and reduce heat losses in rotary kilns used for sponge iron production. Key points include:

1. Utilizing Shell Heat: Participants explored methods to harness heat from the kiln shell, such as using cantilevered panels to generate power from radiation, installing solar panels or dual-shell designs to preheat air or water, and using this heat for power generation or to reduce coal consumption.

2. Refractory Issues: There were debates on refractory materials, with some favoring Andalusite for its low thermal conductivity and high strength, but noting its high cost. Others discussed the pros and cons of castable linings versus brick linings for smaller kilns, highlighting the trade-off between initial performance and long-term durability.

3. Energy Losses: A major focus was on radiation losses from the kiln shell, which are significant (potentially 33% of total energy input). Participants suggested several strategies to reduce these losses, including thicker castable linings, improved refractory materials, and potential R&D on new technologies.

4. Hot Charging and Process Improvements: There was also mention of hot charging sponge iron to steel melting units to save power, and the need for R&D to test and implement such concepts at a pilot scale, particularly in small kilns. Over all, the discussion emphasizes R&D, technology trials, and energy recovery as crucial steps to improve kiln efficiency and reduce environmental impact.

1. Heat Insulation & Radiation Management: There were suggestions to insulate the kiln shell from the inside and use materials like microcarb boards to reduce shell temperature, which has shown slight improvements. The importance of addressing radiation losses from the kiln shell, which are considered significant, was emphasized, with ideas for using solar panels or other methods to capture and utilize this heat.

2. Refractory Materials: Several refractory materials were discussed, including MC 45 castable (which can lower shell temperature to 150°C) and Andalusite, which showed promise in reducing shell temperatures by 50°C but had a shorter lifespan. It was suggested that thicker castables could help extend the lifespan of the kiln linings and reduce shell temperature

3. Screening and Yield Improvements: There was also discussion about improving ore yield and reducing fines generation, particularly with Karnataka ore, by experimenting with different feed size distributions and screening methods. Challenges with screening at high temperatures were noted, but a grizzly installation has been successfully running in one plant to screen out smaller particles at 900°C

4. Research and Development Needs: The group highlighted the need for a dedicated R&D plant to test and validate new technologies, including energy-saving ideas, refractory materials, and improvements in kiln operations. Several members offered to take up R&D projects and emphasized the importance of collaborations with manufacturers and government bodies (e.g., BEE and SIMA) for broader implementation.

5. Future Steps: The idea of creating an R&D paper to formalize the concepts discussed and to approach relevant organizations for funding and implementation was also suggested. Overall, the conversation underscores the need for practical testing, collaboration, and investment in R&D to implement new ideas for reducing energy consumption and improving the efficiency of rotary kilns in the sponge iron industry.