Materials Processing Institute

1944 - 2014 70 YEARS OF INNOVATION

Disstec Workshop

Future For Clean Steel Research

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Future For Clean Steel Research

- A steel mill has a uniquely high level of complexity that extends from physical chemistry to the very high production volumes that are produced
- The process of steel production includes significant amounts of unreliability and unpredictability, and therefore initiatives such as integrated intelligent manufacturing and Industry 4.0, which are eminently suitable for industries like car manufacturing, should include a strong warning
- Over the last 30 years or so, innovation drivers in the steel sector have matured and saturated (mass production; quality management; cost control; and product engineering)
- Research has not stopped but has slowed considerably being directed at maintaining the state-of-the-art in terms of improvements in process modelling; instrumentation and control; and developing existing robust technologies to meet new product challenges
- Large global companies do not fund R&D to the same extent as 20 to 30 years ago and instead use their research teams not to innovate in the process sector any more, but to ensure that the practices of their best mills, usually located in Europe, are transferred to the rest of the world

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- Conventionally, steel production selects the best possible set of resources to achieve a targeted property at the highest level. Sustainability issues are generally dealt with later - almost as an afterthought
- Except for a few alloying and reactant elements, major raw materials for steel production – mostly iron ore and coal, are neither rare nor scarce
- Even so, steel has world-record recycling rates being recycled to 83% and 36 years of average life, which is a considerable involvement in the circular economy
- Significant increases in steel industry output from 2000 (almost doubling to 1.6 billion tonnes in 2014), will ensure that large quantities of cheap, secondary raw materials (scrap), will be increasingly coming onto the market from ~2030 onwards
- When peak steel production is reached – probably towards the end of the century, a full circular economy will take over
- Until then, ore will continue to be used in high volumes but at increasingly lower purity leading to an increase in the energy needs for steel production
- The steel sector has achieved a high level of energy efficiency driven by cost cutting and therefore there is little further scope for energy reductions (energy costs currently account for ~20% of operating costs in an integrated mill)

Future For Clean Steel Research

- The long term future of the blast furnace is already compromised and will dwindle to niche production, eventually
- R&D focus should be on ‘Green’ Steelmaking via the EAF using cheap ‘Green’ energy
- A current limitation is Nitrogen!!