from fossil fuels have major environmental impact [13], primarily through the emission of carbon monoxide, carbon di-oxide and sulphur di-oxide and suspended particulate matters. The solution lies in:
1) Minimizing the fuel consumption.
2) Developing cleaner technologies.
3) Searching for cleaner fuels.

For meeting the CPCB norms, one way is to use different pollution control equipments like high-energy scrubbers, bag filters, and electrostatic precipitators. However, they are expensive and also consuming more energy. The better alternative, as suggested by the Hon'ble Supreme Court is to clear up the emission of foundries by using suitable technologies to bring down the emission level.

Therefore technology used for the process industry must use minimum fuel and emission level of exhaust gases generated must be within the CPCB norms. This needs the design and development of an eco-friendly and energy efficient techniques for process industry [14]. It will also help in following the orders of Humble Supreme Court, and ultimately prevent the collapse of foundry industry in our country.

4.2 Pattern of Energy Input

Although there has been a marked change in recent years in the industry's attitude towards the introduction of energy saving equipment and the adoption of conservation measures, the national trends for the industry over the past decade, in the selected countries examined, indicate an upward swing in consumption of between 20-40 percent per unit of product in most cases [15].

Such a rise may be generally attributed to the introduction of highly mechanized equipment and automated systems, with the object of increasing production and reducing manning levels. Also, more mills are kiln-drying their sawn wood and the drying of chips is now becoming widespread in the particleboard industry, combined with an overall increase in product finishing.

5. Energy Saving Techniques

An analysis of survey undertaken in different process industries of India reveals that energy consumption of process industry is very high due to the following factors:
1) Diversity in shape and design of equipments for Process industry
2) Inappropriate use of refractory material
3) Inadequate insulation.
4) Deficiencies in combustion equipment.
5) Lack of temperature control equipments.
6) Poor maintenance.

Due to the above factors the efficiency of the process industry varied from 30 to 35% against the desired value of 50 to 55%. The important parameters to be considered for an increase in efficiency are –
1) Maximum energy utilization
2) Minimizing the down time
3) Reducing heat losses.
4) Controlling heat losses

The need is of maximum "energy saving" in the process industry [16]. This can also partially be achieved by adopting "Energy Conservation" techniques. By controlling heat losses suitably the 6-8% energy can be saved.

5.1 Technology up-gradation

The Indian process Industry is the blend of both modern and old technology. A large percentage of small scale process industry has now become obsolete due to use of old technology. The use of obsolete and primitive technology in such foundries result in:-
(1) Low productivity
(2) Inferior quality of product
(3) Unfavorable working conditions.
(4) More rejection
(5) More Energy consumption
(6) More pollution
(7) More Wastage of material

Several foreign countries like USA, U.K., Germany, Japan and Belgium are collaborating with Indian process industry for providing technical knowhow [17] and financial assistance. Most of Indian industries are manufacturing components for their foreign counter parts. Government Of India has encouraged technology transfer through joint venture with foreign companies.

6. Conclusions

It is clear that even though industries realize the importance of energy conservation as an area to minimize production cost there are number of obstacles which hinder the rational use of energy. These are inhibiting attitudes, insufficient technical know-how, market distortions, capital shortage etc. There is hence a need to design interventions in terms of policies and institutions which address these issues and create incentives for energy conservation in such industries [18].
Equipment suppliers have been playing a major role in demonstrating energy savings through retrofitting inefficient system in industries. They have in turn gained from such aggressive campaigns and also contributed to creating awareness of energy efficiency in Indian industries. This however, has taken place in a few instances only. Manufacturers believe that the market is not yet ready for energy efficiency and hence limited opportunities for business. One of the reasons cited for this belief is the buyer's concern to minimize the initial investment.

References

[1] Mahapatra, S. and Mohanty, S. (2007). Lean Manufacturing in continuous process industry: An Emperical Study. Journal of Scientific and Industrial Research, 66, pp.19-27.

[2] Rossiter, A. and Jones, B. (2015). Energy management and efficiency for the process industries. New Jersey: Wiley.
[3] Bhattacharjee, K. and Tyagi, A. (2001). Industrial energy conservation: issues for improving industrial operations. TERI Newswire, 7(17).
[4] Energy Management and Energy Optimization in the Process Industry. (2011). White paper.
[5] Energy Management For Process Industries. (2011). Control Engineering Asia, pp.16-17.
[6] Energy Management Solution For Process Industries. (2009). cpmPlus Energy Manager, pp.1-12.
[7] Fact Sheet: Energy use in the steel industry. (2014). World Steel Association.
[8] Porzio, G., Fornai, B., Amato, A., Matarese, N., Vannucci, M., Chiappelli, L. and Colla, V. (2013). Reducing the energy consumption and CO2 emissions of energy intensive industries through decision support systems – An example of application to the steel industry. Applied Energy, 112, pp.818-833.
[9] Energy Consumption in the UK. (2015). Department of energy and Climate Change, pp.1-12.
[10] Kenny, W. (1984). Energy Conservation in the Process Industries. 9th ed. Orlando: Academic Press.
[11] Li, H., Bao, W., Xiu, C., Zhang, Y. and Xu, H. (2010). Energy conservation and circular economy in China's process industries. Energy, 35(11), pp.4273-4281.
[12] Edgar, T. (1987). Current problems in process control. IEEE Control Syst. Mag., 7(2), pp.13-15.
[13] Jaber, J. (2002). Future energy consumption and greenhouse gas emissions in Jordanian industries. Applied Energy, 71(1), pp.15-30.
[14] Global Industrial Energy Efficiency Benchmarking. (2010). United nations Industrial development organization, pp.1-58.
[15] Energy Intensive Process Portfolio. (2011). Industrial Technologies Program, pp.1-11.
[16] Villar, A., Arribas, J. and Parrondo, J. (2011). Waste-to-energy technologies in continuous process industries. Clean Techn Environ Policy, 14(1), pp.29-39.
[17] Madlool, N., Saidur, R., Hossain, M. and Rahim, N. (2011). A critical review on energy use and savings in the cement industries. Renewable and Sustainable Energy Reviews, 15(4), pp.2042-2060.
[18] Boyd, G. and Pang, J. (2000). Estimating the linkage between energy efficiency and productivity. Energy Policy, 28(5), pp.289-296.

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