# Assessment of Energy Requirement by 2030

## Steps to be Taken in Casting Sector

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Energy is the most important economic, environmental and developmental issues facing the world today. It is therefore essential to review the energy consumption both on global basis as well as for India. Primary energy is the energy found in natural resources like coal, crude oil, natural gas, uranium etc. According to the information furnished by British Petroleum in Statistical Review of World energy consumption was 11.3 billion tons of oil equivalent in 2008 which corresponds to a per capita consumption of about 1,700 Kg oil equivalent where as it was 1,338 Kg in 1971. Keeping in mind the same trend, we can predict that the global per capita of consumption of primary energy by the year 2030 would be 2000 kg oil equivalent, which is about 10% higher than the current level of per capita consumption considering world population of about 8.3 billion as predicted by United Nations, the total primary energy consumption could touch 16.6 billion tones of oil equivalent by 2030.

A study made by US Energy Information Administration (USEIA) which was reported in 2006 states that the share of oil has gone down and the shares of natural gas, coal, hydro energy, nuclear energy, wind, solar energy and bio-mass have also enhanced their contributions between 1980 to 2006. It is also predicted that the share of oil will further go down and the shares of nuclear energy has also shown significant growth and the use of other sources like wind energy, Bio-mass has enhanced.

As predicted by so many authorities, India and China would be the major driver of world energy consumption in near future. The growth in per capita energy consumption in India between 1971 to 2010 raised from 112kg of oil equivalent to nearly 360 kg of oil equivalent. If the same trend continues the per capita primary energy consumption would be 630 Kg of oil equivalent in 2030. Almost same prediction has arrived considering compounded annual growth rate of 5.5% for GDP and population growth rate of 1.15% between 2007 to 2030, the per capita GDP by 2030 is likely to be in the region of US$ 1,800 (at constant 2000 prices) and adopting the relation between per capita energy consumption and per capita GDP it is predicted that the per capita primary energy consumption would be 630 Kg of oil equivalent in 2030. Based on the above discussion , it would be reasonable to assume that by the year 2030 , the per capita primary energy demand in India is likely to be in the region of 615-630 Kg of oil equivalent. This would translate into total primary energy requirement of about 900 Million Tons of Oil Equivalent by the year 2030 .

It has been reported by B.K.Ray et al that in case of India, the share of the energy consumption in industry sector is gradually declining over the years due to application of improved process/ technology of manufacturing /

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generation and use of power saving attachments etc. Although in absolute terms the energy consumption by this sector has gone up due to industrialization. They also mentioned that the Iron and Steel industry is accounted for about 25% of the total energy in 2005. It can be predicted that the energy demand by industry sector for India would be in the region of about 300 Million Tons of Oil Equivalent.

It has been reported in so many journals / Newspapers that the Indian primary energy of consumption is expected to grow at enhanced rates over the next two decades in consonance with the anticipated economic development and industrial progress of the country. However, in absolute terms there would substantial increase in primary energy consumption and there is likely to be some lowering in the energy intensity of the economy expressed as ratio of per capita energy consumption to per capita GDP . This is mainly attributed to improved energy efficiency in manufacturing activities. The demand of the electrical energy will be of the order of 3.045 TWh, which will translate into a per capita yearly consumption of about 2,100 kWh. With a view to reduce the use of fossil fuels from for power generation [at present over 80% of the power generation in our country is based on fossil fuel] as well as to reduce the green house gas like CO2 emission [specific CO2 emission is about 0.83 kg per kWh of generated power] and in this context nuclear power, hydro power and various renewable sources like solar, wind, bio-mass etc will have greater roles to play.

It is also reported that in 2007, 1330 Million Tons of Crude steel was produced globally out of that India produced 54 Million Tons and occupied sixth position in the world. Very recently it was reported that India was going to be the second largest producer of Crude steel in 2013 with production quantity 120 Million Tons per annum and already second largest casting producer in the world in 2010 with production of about 8.5 Million Tons per annum. At present per capita steel consumption is about 50kg whereas world average is 203 kg, it is expected that this will go up to 150 kg in India and world average will be 285 kg in 2020 which certainly indicates more urbanization, improved life standard and development of infrastructure. The specific energy consumption for making steel has declined 10.7 Gcal/tcs to 8.4 Gcal/tcs in past ten years from 1985 to 1995 and in 2008 it has decreased to 6.9 Gcal/tcs which is still in higher side compare to world average; which was 4.5 Gcal/tcs in 2008. So there is huge potential of energy saving as most of the steel plants were established during 1960-1970 and the technology is outdated, inferior raw material, high alumina and silicon ratio in the iron ore and high ash content in the coal. If we assume that in 2020 , India will produce 200 Million Tons of crude steel [reported by SAIL,

JSW, TATA STEEL etc.]. Then, the estimated energy saving potential is about 484 Million Gcal/year. At present India reserves 84.41 Billion Tons which will last for 200 yrs and oil reserve is 734 Million Tons in 2001 will last for 22-25 yrs gas reserve is 750 Billion Cubic Metric Tons in 2001 will last for next 25-30 years. A conservative estimate shows that in most iron/steel making foundries in India about 20-60% energy consumption is possible. It is possible by adoption of new technologies/ processes, adoption of energy saving techniques and installation of proper pollution control devices.

We know that Iron and steel sector is very much energy incentive sector. Greater attention will have to be given at the national level for creating general awareness in regard to enhancing energy efficiency at all levels and reducing wastages.

- It is reported that one ton of castings approximately produces one ton of $CO_2$ emissions and half a ton of landfill waste
- It has been estimated that if average yield improvement occurs for about 6,000 + foundries about 15% whose annual production is about 9 Million Tons, it will save annual metal about 1.35 Million tons which will save energy about 4.05 X 10 ^ 9 kWh and in terms of money it will be near about 20.25 X 10 ^ 9 INR = Rs. 2025 CRORE
- There may be huge saving in trial castings. It has been estimated that another Rs. 1200 CRORE to 1450 CRORE is getting wasted per year. It is a huge National Loss
- Imagine Environmental impact of rejected Castings. For no reason for the production of GHG(Green House Gases)
- The most important aspect for zero defect casting production is the prime objective
- A manufacturing system that produces total sound, clean, neat and totally reliable cast component as per the desired specifications continuously on sustainable basis.
- Data on factor levels such as sand/material properties, chemical compositions, process parameters, design changes done, operator, machines should be recorded and analyzed
- One of the main challenge is discovering the most response factors involved in the process
- Finally Domain Knowledge, Literature Review, solidification simulation and Design of Experiments definitely help to reduce defects from 20-30% to 4-5

## Conclusion

It is needless to mention that our prime duty is to produce castings with minimum involvement of energy which means proper use of molten metal in the shop floor. Otherwise we could not sell our products at competitive price and finally it will be difficult to sustain.