M.N. DASTUR & CO (P) LTD

ALTERNATE IRON AND STEEL TECHNOLOGIES

LIKELY TRENDS AND SUTAINIBILITY ASPECTS

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PRESENTATION INCLUDES

- PRESENT STATUS OF INDIAN STEEL INDUSTRY
- CONVENTIONAL IRONMAKING
- ALTERNATIVE ROUTES OF IRONMAKING
- STEELMAKING
- ENVIRONMENT AND SUSTAINABILITY
- CONCLUDING REMARKS

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PRESENT STATUS OF INDIAN STEEL INDUSTRY

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- Fifth largest steel producing nation

- Around 65 million tons crude steel production in 2010

- Accounts for around 5% of world's total steel production

- World Steel Association estimates that India's steel demand is likely to grow almost by 14 percent annually till 2011.

  Prime focus of steel policy

  - To attain levels of global competitiveness in terms of global benchmark of efficiency and productivity.

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CONVENTIONAL IRONMAKING

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- The performance level of blast furnace has enhanced remarkably during the last 2 decades leading to higher cost efficiency.

- Presently, a single large size furnace produces more than 10000 tons of hot metal per day (tpd).

Notable features of the efficient BF in good International scenarios are:

Productivity, t/day/cu m (UV/IV*)	..	>2.5
Coke rate, kg/ton of hot metal (thm)	..	<300
Coal rate, kg/ton of hot metal (thm)	..	~200
Silicon content, %	..	0.3
Sulphur content, %	..	0.020
Utilisation, %	..	>98%
Campaign life, years	..	>15

* UV/IV – Useful volume/Inner volume

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- The performance level of Indian blast furnaces compared to global benchmark is low due to:

  - Lower size of blast furnace
  - Inferior quality of raw materials and coke
  - low level of top pressure
  - Lower hot blast temperature
  - Lower coal injection rate with inadequate oxygen enrichment of blast.

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- Measures to improve performance level of Indian blast furnace
  - Installation of large size modern blast furnaces
  - Upgradation of several existing blast furnaces
  - Improvement in raw material quality
  - Use of high proportion of good quality imported coking coal for coke making.
  - Installation of bell less top charging system
  - Improvement in cooling system
  - Effective monitoring and control system

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ALTERNATIVE ROUTES OF IRONMAKING

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Major objectives of the Alternative Ironmaking processes are:

- To provide an alternative to traditional BF ironmaking
- To do away with the requirement of metallurgical coke as prime reductant and heat source.

There are two types of alternative processes available:

- ❖ Direct reduction (DR) processes
  - Coal based
  - Gas based
- ❖ Smelting reduction (SR) processes

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DIRECT REDUCTION PROCESSES

- Commercial coal based DR processes adopt either rotary kilns or rotary hearth reactors; capacity limited.

- ITmk3 plant (Cap. 500,000 tpy iron nuggets) based on rotary hearth process has been commissioned at Minnesota, USA in 2010.

- Commercial gas based DR processes adopt a single vertical reactor; have higher thermal efficiency & greater benefit of economies of scale compared to coal based DR processes.

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SMELTING REDUCTION

- SR is the process which carry out reduction of iron oxides, followed by melting where refining takes place in the liquid phase.

- SR process is to provide an alternative to the traditional BF route of ironmaking, and do away with the use of metallurgical coke.

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STEELMAKING

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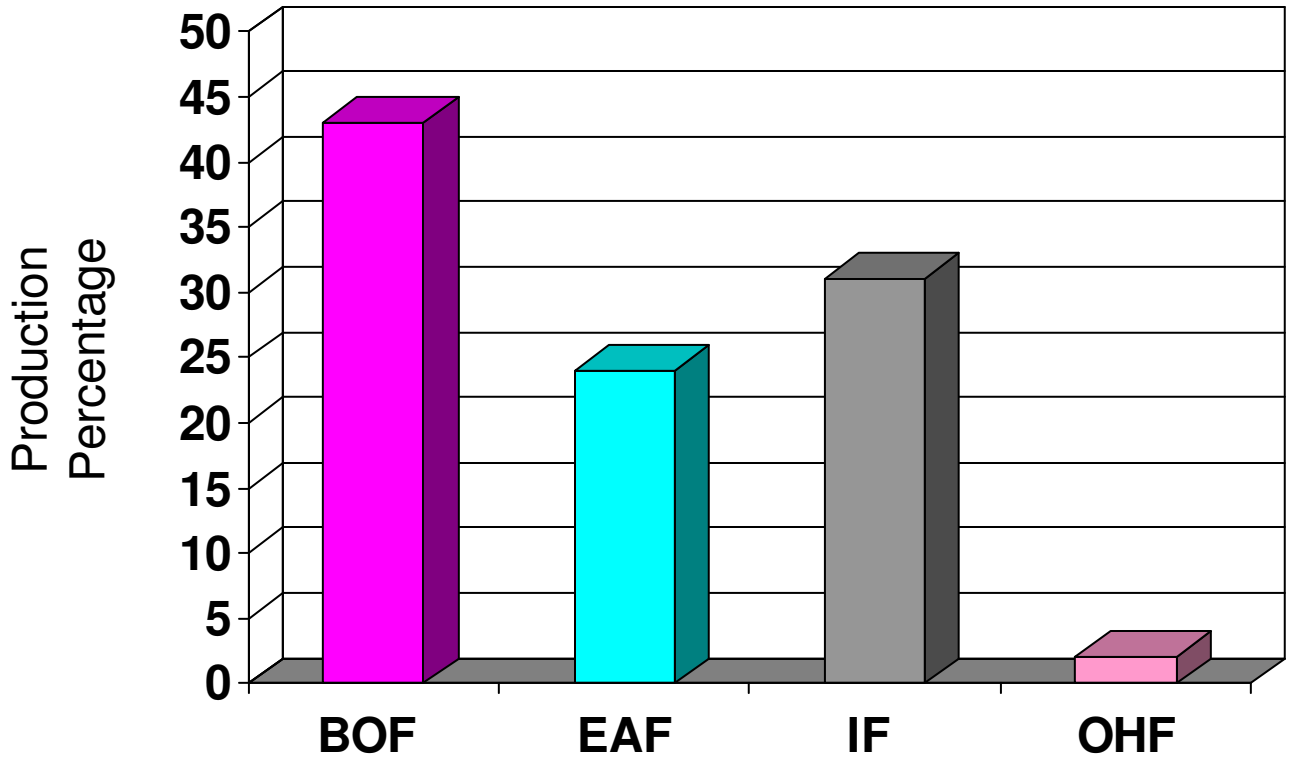
PRESENT STATUS

PROCESS-WISE CRUDE STEEL PRODUCTION IN INDIA



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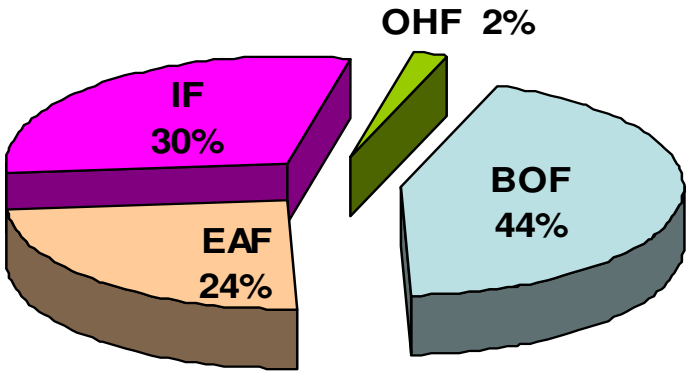
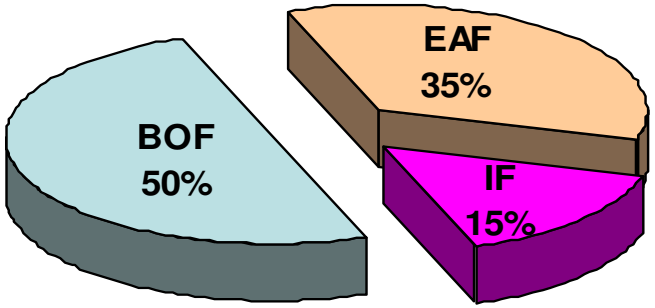
PRESENT AND LIKELY FUTURE

Present



Likely future



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AREAS OF IMPROVEMENT

BOF

Improved gas cleaning system

- Reduction in dust content (10-20 mg/Nm3)
- Economical dust recycling
- Lower energy consumption

Online measurement of temp. and com.

Increased post combustion

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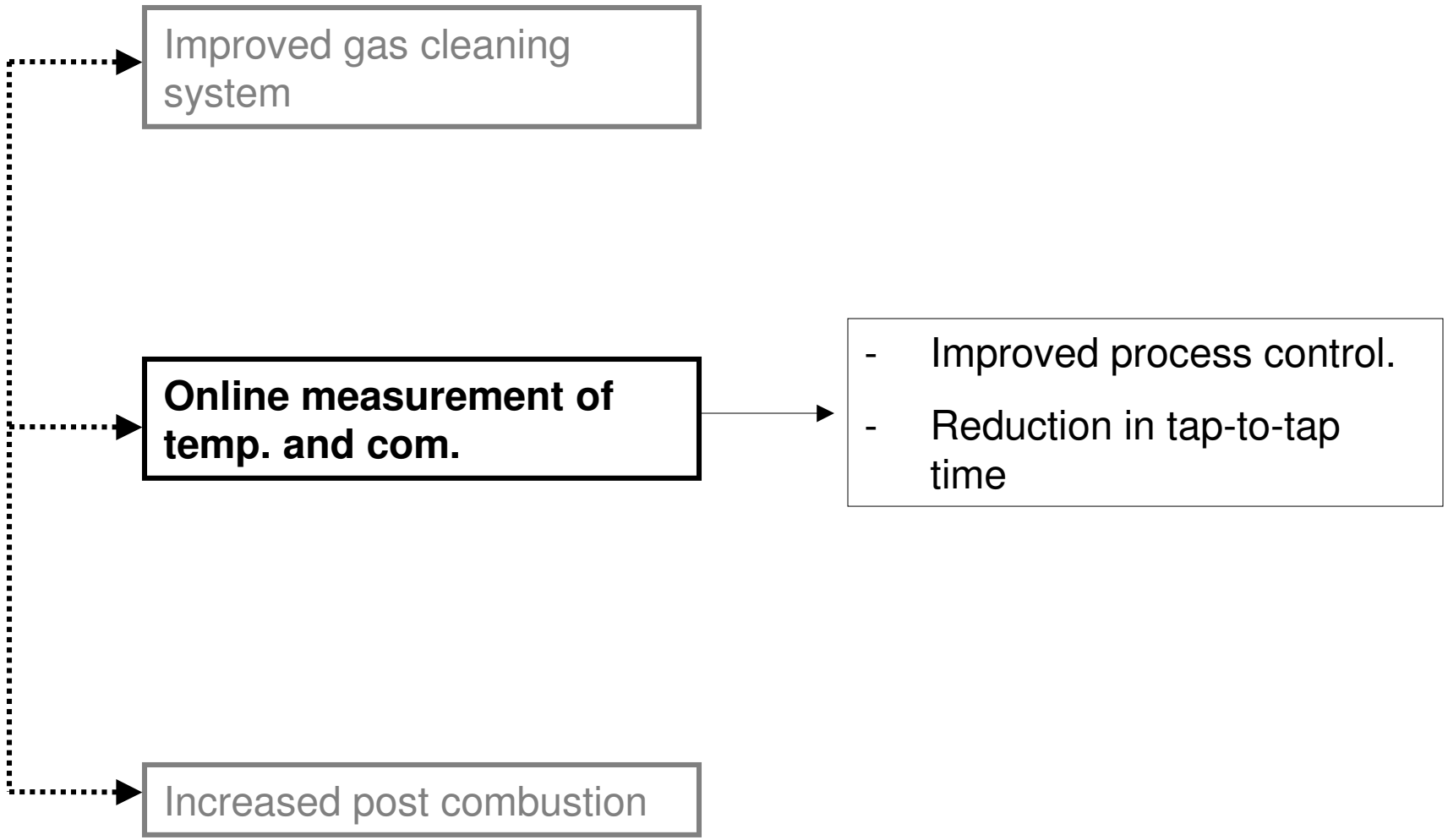
AREAS OF IMPROVEMENT (Cont'd)

BOF



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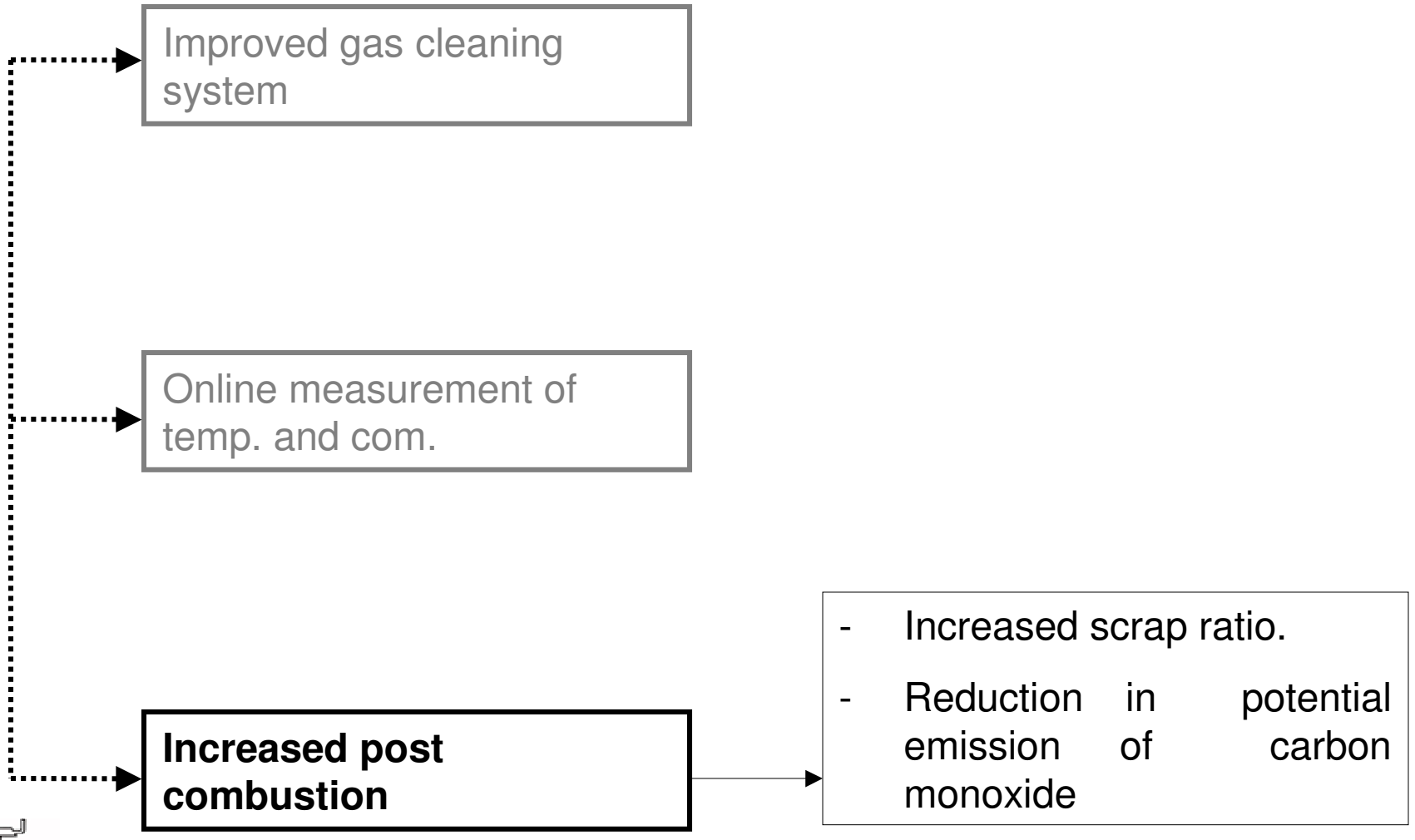
AREAS OF IMPROVEMENT (Cont'd)

BOF



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AREAS OF IMPROVEMENT

EAF

Oxyfuel burners and high speed oxygen jet

- Fast refining of melt
- Reduced power consumption
- Reduced tap-to-tap time

Online gas temperature and composition analysis

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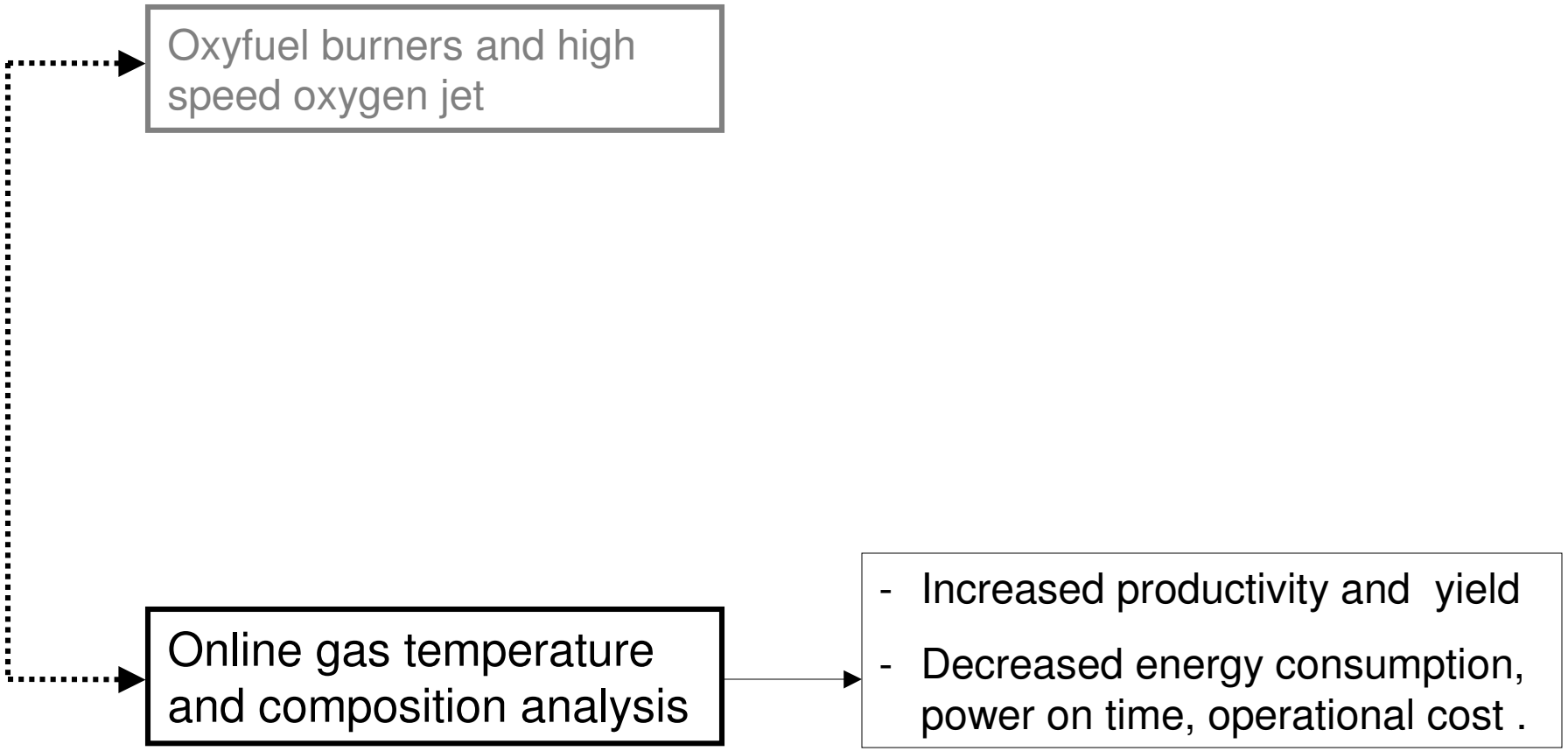
AREAS OF IMPROVEMENT (Cont'd)

EAF



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AREAS OF IMPROVEMENT
SECONDARY REFINING

Production of steel with low residual element → - Better metallurgical properties like better crack propagation resistance, better tensile strength

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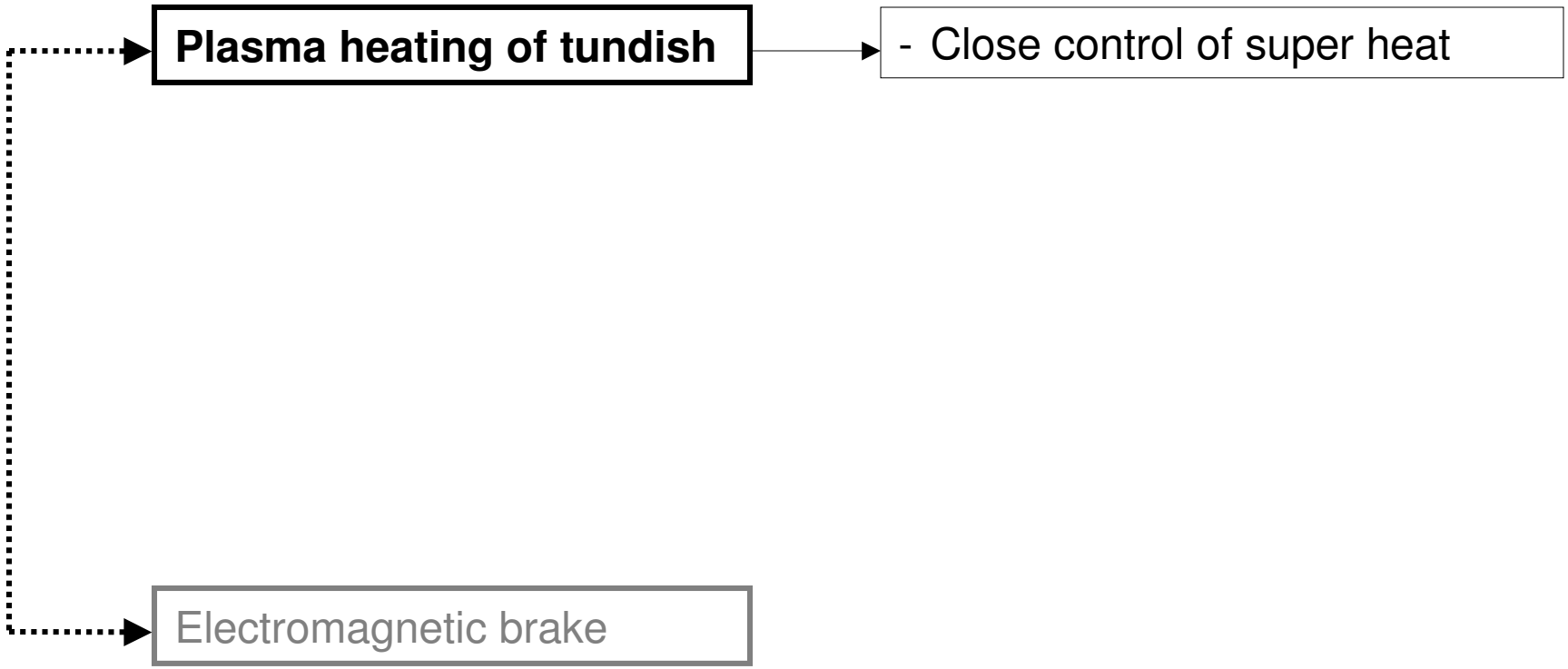
AREAS OF IMPROVEMENT

CONTINUOUS CASTING



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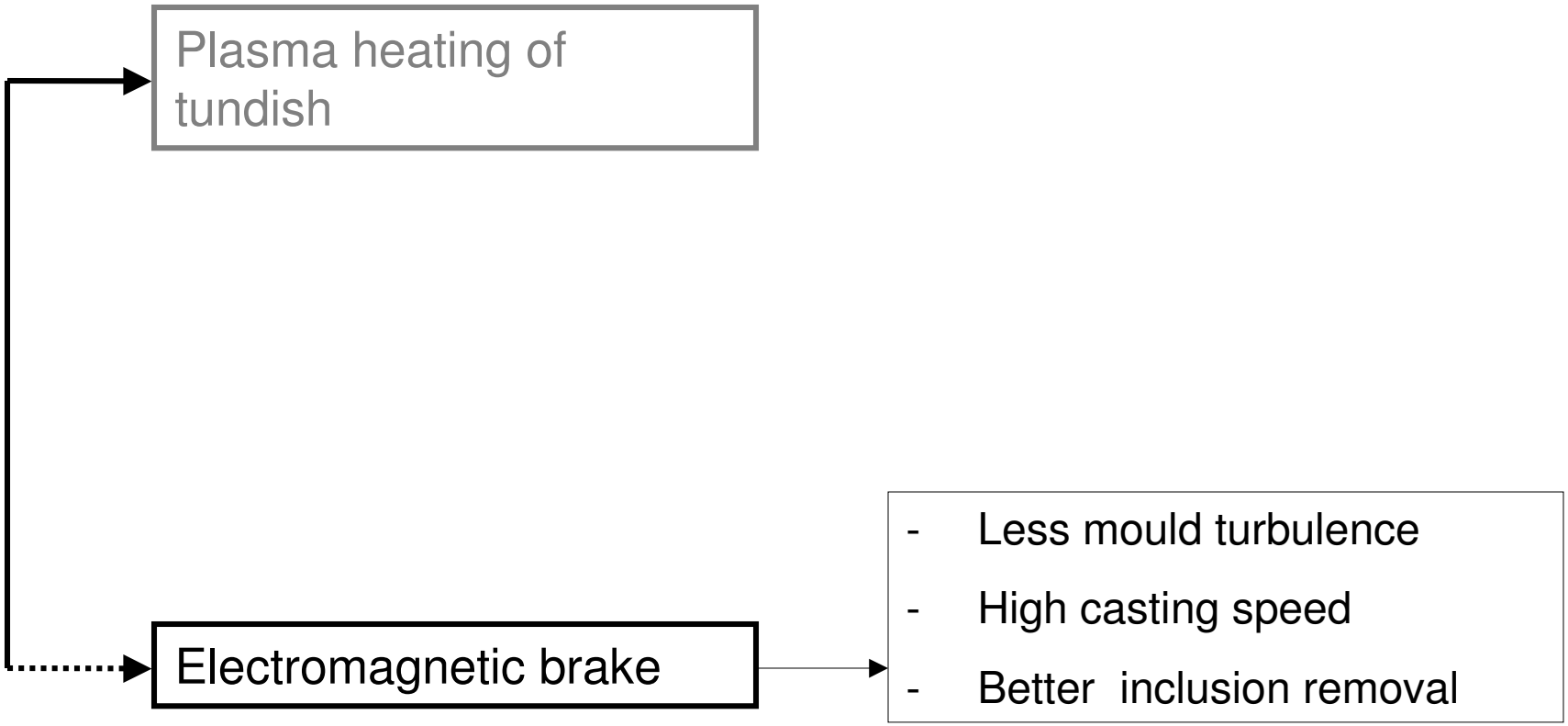
AREAS OF IMPROVEMENT (Cont'd)

CONTINUOUS CASTING



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DEVELOPMENT OF ADVANCED STEELS

Steels for automobile industry

Basic property requirements:

- High strength
- High formability
- High strength to weight ratio

TRIP (Transformation induced plasticity) steel, IF (Interstitial free steel), Dual phase steel , Advanced high strength steels (AHSS) fall in this category.

In India , bulk production of TRIP steel is yet to take off.

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DEVELOPMENT OF ADVANCED STEELS (Cont'd)

- ✓ Steel for oil and gas transportation
  Steels having
  - Higher corrosion strength
  - Better crack propagation toughness at low temperature
  - Better corrosion resistance

  are being produced

- ✓ Steel for boiler and supercritical application
  Steels having
  - Higher temperature resistance
  - Higher strength
  - Higher oxidation resistance

  are being produced.

- ✓ Transformer steels
  - Steels having lower core loss (Cold Rolled Grain Oriented)

  are being produced.

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ENVIRONMENT AND SUSTAINABILITY

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Sustainability is optimal use of natural resources and adoption eco-friendly processes to minimise environmental impact.

This can be attained in three ways:

- Reduction in use of resources in steelmaking itself through development of new production and processing methods.

- Development of new generation of steel with improved properties to meet the stringent requirement of the customer with reduced consumption.

- Environment friendly operation

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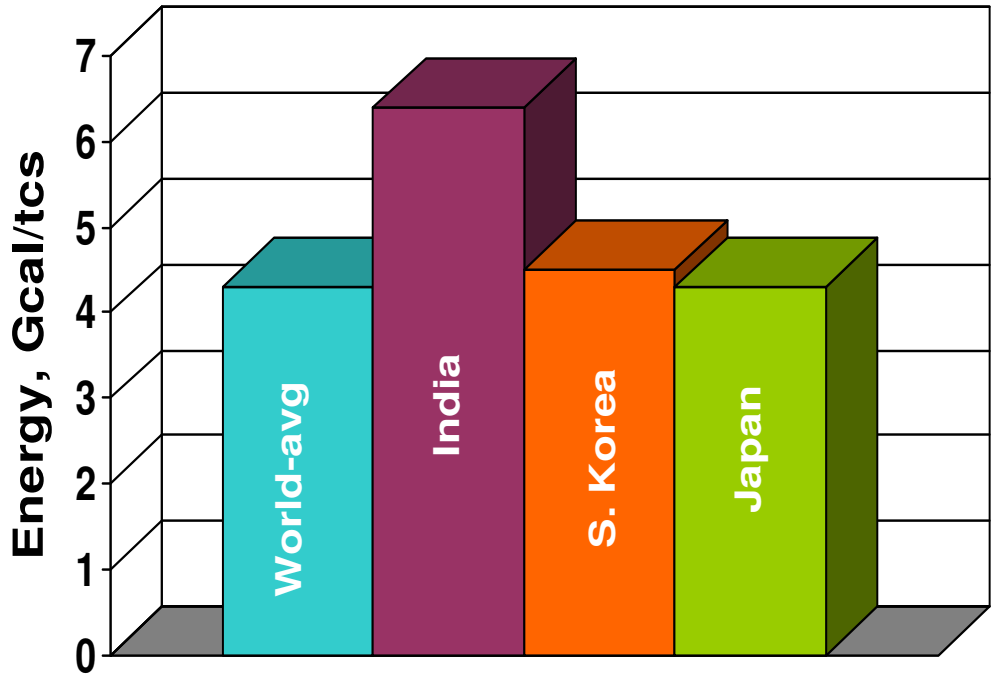
SPECIFIC ENERGY CONSUMPTION – INDIA VS OTHER COUNTRIES (2008/2009 FIGURES)



Considerable potential to reduce energy intensity in India.

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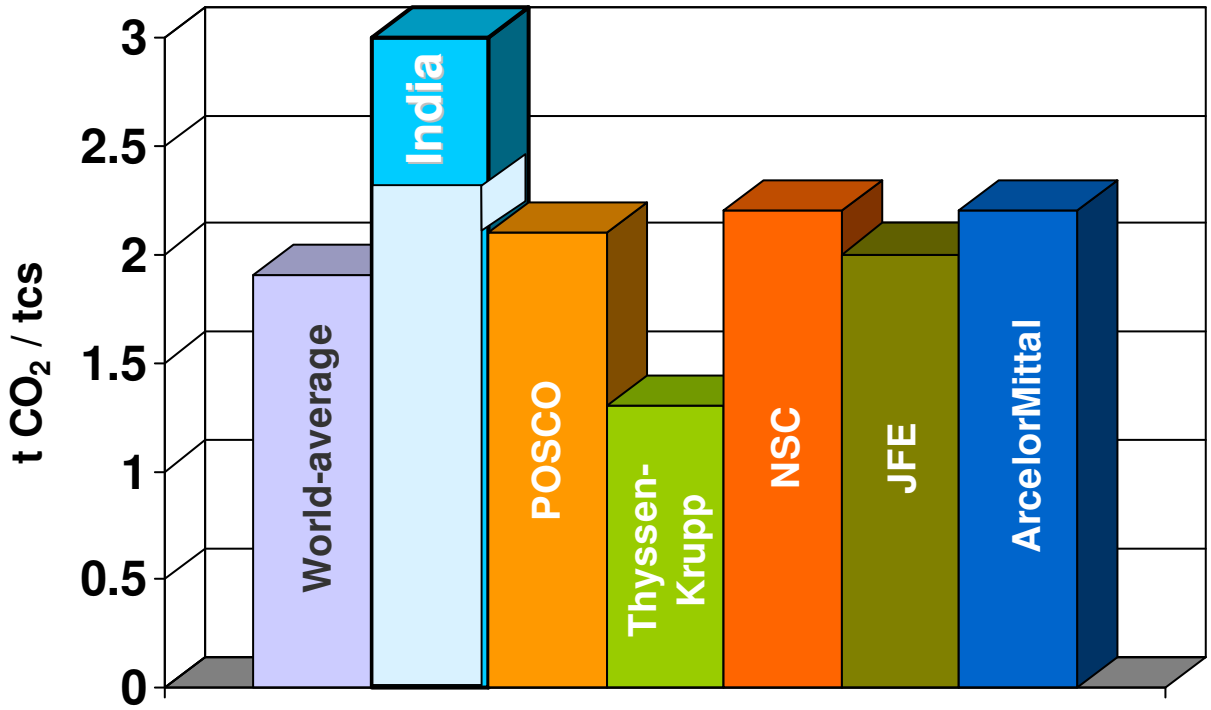
CO_2 EMISSION BY STEEL INDUSTRY– INDIA VS OTHER COUNTRIES (2008/2009 FIGURES)



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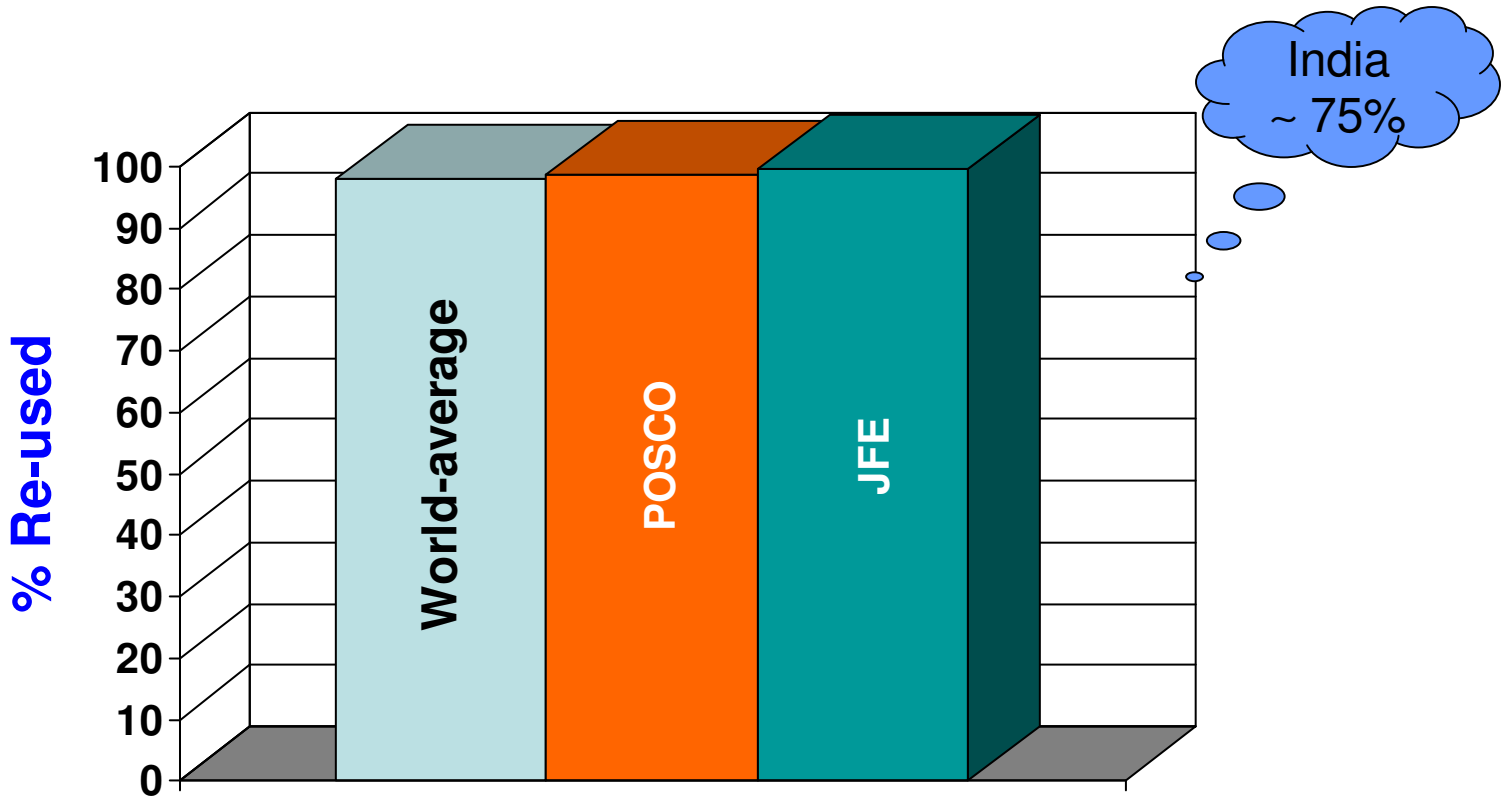
EXTENT OF BY-PRODUCTS REUSE– INDIA VS OTHER COUNTRIES (2008/2009 FIGURES)



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CONCLUDING REMARKS

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- Indian steel industry on a robust growth path
  - Maintained a upward swing in spite of the global recessionary trends.
  - By recent estimates, country's steel production could rise almost three fold by end of this decade.
- The increase in capacity needs to address environmental issues for long term sustainability.

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THANK YOU

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