

Energy Efficiency and Productivity Improvement initiatives conducted in Mohali-Panchkula-Chandigarh Engineering Cluster

Upinder S. Dhingra
Research Associate
Industrial Energy Efficiency
The Energy & Resources Institute (TERI)



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New Delhi 13 January 2012

Structure of the presentation

- About TERI
- MSME Sector and its features
- TERI intervention
- About the MPC Cluster Project
- Project Activities
 - Energy Efficiency
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 - Skills Development
- Activities for Up Scaling



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About TERI

- Independent not-for-profit research organization having more than 1000 professionals
- Regional centres in Bangalore, Goa, and Guwahati, & presence in Dubai, Malaysia, and Japan. Affiliate institutes: TERI-NA, USA & TERI-Europe, UK
- Mission is to develop and promote technologies, policies, and institutions for efficient and sustainable use of natural resources.
- Supports the work of different Ministries of Govt. of India & the Corporate Sector, and the international organisations such as EU, UNDP, UNEP, UNFCCC, IPCC, WB, ADB, etc.



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MSME Sector

- About 30 million units in India
- Providing employment to about 60 million people
- Contributing to about 45% of manufacturing output
- Share of export is about 40%
- Contribution to GDP is 8-9%



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MSMEs -Salient features with regard to energy and environment performance

- Energy efficiency generally low
- Significant polluters
- Low level of awareness
- Continue to use obsolete technologies
- No standard solutions available (technologies are sector/region specific)
- Lack of capability to identify/adopt energy efficient technologies
- Inadequate financial resources for technology innovation
- Increasing competition due to globalization



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which implies.....

- Need to develop sector/region specific technological solutions
- Substantial scope for technology up-gradation and CO2 reduction
- Potential to develop standard solutions for a group of industries
- Better chances of replicability
- Scope for human and institutional development



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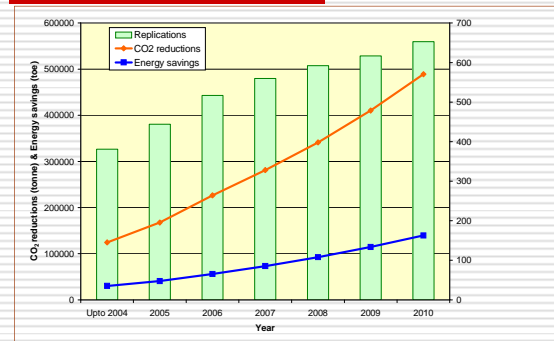
MSME Sectors-TERI

- Foundries
- Glass Melting furnaces
- Brick kilns
- Engineering Industry
- Ceramic industry
- Gasifier applications in various small and rural industries
- Food processing industry
- Silk dyeing, silk reeling, rubber processingand many more



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Impact of TERIs initiatives



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Implementing Business Development Services (BDS) in Mohali-Panchkula-Chandigarh Engineering Cluster: A TERI SIDBI Initiative



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About the Project

- Title-** Implementing BDS in MPC Cluster
- Location-** Mohali-Chandigarh-Panchkula
- Time-** 2.5 years
- Funding agency-** SIDBI (Foreign Partners- World Bank, DFID)
- Field partners for execution-** Industries Association of Chandigarh, Mohali Industries Association, Haryana Chamber of Commerce and Industry, local service providers



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Project Objectives

The project activities focuses on the following areas:

- Building the capacities of existing and potential **BDS providers** to serve the cluster SME market more effectively
- Facilitating networking between SME industry/business associations and BDS providers
- To make SMEs highly efficient through energy audits and process enhancement and productivity improvement
- Developing and creating a pool of skilled workers in the cluster through high quality, affordable training
- Providing SMEs with better access to improved technology and process enhancement
- Facilitate use of government schemes for MSMEs



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MPC Cluster Background

- Setting up of major engineering plants Swaraj Enterprises (Punjab Tractors, Swaraj Mazda, Swaraj Engines, Swaraj Combines) and HMT (Hindustan Machine Tools) in the region during 1970's led to the basic industrial development in the cluster
- There are around 6,000 SME units in the MPC cluster, out of which around 2,600 are engineering units.
- Light engineering industries such as machining, sheet metal components including ancillaries of railways and tractor industries, fastener manufacturing and steel fabrication are important engineering industries in the cluster.



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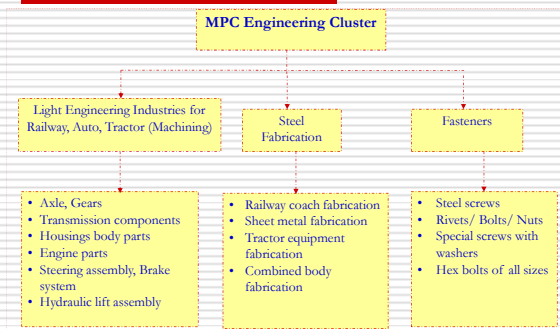
Major Engineering Sectors

- Tractor/Auto Parts
- Railway Components
- Sheet Metal Fabrication
- Fasteners
- Sanitary Fittings
- Scaffoldings
- Electrical Equipments
- Wires & Pipes
- Plastic products



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MPC Engineering Cluster Products



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Project Activities



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Energy Efficiency

- Eight BDSPs introduced in this service category
- Conducted workshop on energy efficiency that witnessed more than 120 participants
- 52 detailed energy efficiency studies conducted in the cluster- *units nominated by the industry associations*
- Cumulative savings – Over Rs. 25,00,000



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Activities Conducted

- Energy use and technology analysis
- Detailed Energy Audit exercise in 52 SMEs units in the cluster
 - Tractor Parts Manufacturing
 - Sheet Metal Works
 - Fasteners Manufacturing
- Examine the existing energy efficiency, process technologies and ground situation of the units
- Energy use and technology audit to understand the energy productivity
- Selection of the energy efficient equipments/ technology provider.
- Calculation of the energy saving potential & investment required



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Activities conducted..contd

- On hand energy audit (EA) capacity building of local service providers
- Implementation of energy efficient measures
- Providing the technical support for the implementation of the EE measures
- Assist to selection of EE equipments /technologies
- Assist to prepare the case for getting the subsidy/ loans under various governmental /institutional schemes



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Technology status & Energy Use

- The majority of the engineering SMEs in the MPC cluster use conventional manufacturing technologies such as lathes, milling (horizontal and vertical) machines, drilling, shaping machines, MIG (metal inert gas) and TIG (tungsten inert gas) welding,
- The main raw materials and inputs used are steel (in the form of wire rods, rounds, MS sheets, plates), stainless steel, alloy steel, aluminium, copper, bakelite powder, plastics, etc.
- Electricity provides the main source of energy for almost all of the tractor/auto/railway parts manufacturers in the cluster. The average connected load per unit is 80 kVA.
- Total annual electricity consumed is 159.12 million kWh



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Energy Use

Main energy usage areas in light engineering units

| Energy/other inputs | Areas/utilities |
|-------------------------|---|
| Electricity | All equipment/machinery like motors, air compressors etc. |
| High speed diesel (HSD) | Diesel generator (DG) sets |

Electricity consumption areas in a typical auto/tractor/railway parts unit

| Area | Percentage of total electricity consumption |
|---------------------------------|---|
| Lighting | 7% |
| Induction motors | 85% |
| Air compressors | 3% |
| Distribution & capacitor losses | 5% |



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Critical Observations During Audits

- Poor loaded electrical motors are used in the units
- Most of the drives are old, rewound and inefficient
- Poor power distribution system which lead to losses up to 6% of the total power consumption
- Inefficient and old types of lamps (incandescent lamps) and lighting (conventional ballast) are in use
- Inefficient use of air compressor and electrical ovens



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Basic Energy Conservation Measures

- Replacement of conventional tube lights of 52W and 46W with energy efficient tube lights of 30W (*energy savings potential: 34-42%*)
- Use of PVC corrugated sheets for day lighting instead of conventional lights
- Installation of an Automatic Power Factor Controller (APFC) in the main panel.
- Replacement of old motors with more energy efficient IE3 motors
- Prevention of leakages in compressors



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Overall Energy Savings Potential

- The measures suggested by the energy audits would reduce electrical energy consumption by up to 20%
- The estimated total annual energy savings potential in the cluster is 16.35 gigawatt-hours (GWh)



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Lean Manufacturing / Vendor Development



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Vendor Development/Lean Manufacturing

- ❑ Conducted 4 workshops on lean manufacturing with over 300 participants
- ❑ Two SPVs comprising 22 member units created to avail lean manufacturing competitive scheme of MoMSME-one already approved by NPC (facilitated grant of Rs 20,00,000)
- ❑ Five BDSPs introduced in this service category
- ❑ Vendor development programme executed in 10 selected vendor units
- ❑ Implemented lean manufacturing techniques like 5S, kaizan, kanban, value stream mapping, poka yoke etc.



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Vendor Development Programme: Wastes Identified

- ❑ Overproduction
- ❑ Excess Movements
- ❑ Waiting Time
- ❑ Excess Inventory
- ❑ Unused Creativity of workforce



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Vendor Development Programme Tangible benefits – Improvement in Productivity

| S1 & S2 Benefits summary | |
|--|--------------|
| Average space saving per unit | 30% |
| Value of space saved | Rs. 4,80,000 |
| Value realized from items scrapped | Rs 15,00,000 |
| Average reduction of searching time (tools, parts etc) | 25% |

| Mini Kaizen Benefits Summary | |
|--|----------------|
| Total mini Kaizens undertaken in cluster | 20 |
| Average mini Kaizens per industry | More than 2 |
| Total monetary benefits of cluster | Rs 40000/annum |
| Average monetary benefits per industry | Rs 4000/annum |

| Kaizen Events (Case Studies) Benefits Summary | |
|--|-------------------|
| Total number of Kaizen events | 07 |
| Number of units completed Kaizen event | 06 |
| Total monetary benefits by Kaizen event of cluster | Rs 8.5 lacs/annum |
| Average Benefits per industry per annum | Rs 0.85 lacs |



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Before



No identification of raw material

After



Identification of raw material with color coding



Tool box before



Tool box after



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Implementation of lean techniques in fasteners manufacturing units

- ❑ Implemented as a pilot in five selected units
- ❑ Techniques implemented:-
 - 5S
 - Kaizen
 - Layout study
 - Brainstorming
 - Visual Management:
 - Target charts
 - Reverse Engineering
 - Business Process Re-engineering
 - TPM



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Skill Development

- ❑ 240 candidates in the shape of unemployed youth trained on skills like:-
 - Operations of CNC machines
 - CNC Programming/Auto Cad
 - Fasteners manufacturing machine operations- An innovative approach
- ❑ Candidates mobilized through nearby rural areas
- ❑ Candidates successfully placed in over 100 MSMEs
- ❑ Machinery Supplier becoming a trainer- Sam Techno School

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Success Story-Adoption of Advanced Manufacturing Techniques (AMTs)

- ❑ 35 units acquired CNC/VMC machines
- ❑ AMT's worth 7 crores adopted by cluster SMEs
- ❑ The Case of Raj Engineers- *Availability of CNC operators led to adoption of Advanced Manufacturing Techniques*
- ❑ BDSP coupled marketing of technology with training on the technology to motivate SMEs to adopt AMTs

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Success Story-Linkages with government schemes

- ❑ SPV created in Panchkula Tractor Parts/Auto Parts Cluster to set up a CFC- *approved under MoMSME-CDP Scheme*
- ❑ Two SPVs created in Mohali to avail Lean Manufacturing Competitive Scheme of Ministry of MSME- one approved
- ❑ Handhelded Industries Association of Chandigarh to avail funding under capacity Building of associations scheme-Rs 5 lakh worth of project cost approved by DCMSME
- ❑ Facilitated IAC to avail grant under International Cooperation scheme twice
- ❑ Liasioned with Haryana Industries Department for development of micro scale fasteners industry of Chandigarh

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Activities for Up Scaling

- ❑ Implementation of lean manufacturing tools in more vendor units (*cluster has more than 1500 vendors*)
 - ❑ Most of the units in the cluster still operate with inefficient production techniques and technologies; resulting in significant wastages of resources
 - ❑ The activity can target streamlining processes such as flow optimization, workplace organization, inventory management, human error reductions, quality checks etc. into the current operations of the MSMEs
- ❑ Skill Development
 - ❑ There is still a huge shortage of skilled manpower – Deficiency of more than 1000 CNC,VMC operators/CNC programmers coupled with a shortage of 500 fasteners manufacturing machine operators.
 - ❑ An NGO to be engaged for mobilization of candidates from nearby rural areas

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Contact at...

For more information contact:

Upinder S. Dhingra
Research Associate
The Energy & Resources Institute
IHC, Lodhi Road
New Delhi
upinder.dhingra@teri.res.in
M- 9953089309



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Thank you !

**The Energy & Resources Institute, New
Delhi, INDIA**

Tel. 0091 (011) 24682100, 51504900;

Fax. 0091 (011) 24682144, 24682145

www.teriin.org

