PLAN FOR ECONOMIC REVIVAL AND EMPLOYMENT GENERATING THROUGH HIGH TECH MANUFACTURING CELL SYSTEM

SOCIO-TECHNOLOGICAL DEVELOPMENT
IN LOW INCOME COMMUNITIES
INCOME ENHANCING
&
COST SAVING
TECHNIQUES
BY
PARTICIPATORY ACTION

Muhammad Shoaib Hashmi
(Member Planning & Development, Task Force)
Pakistan Foundation for the Advancement of Engineering and Technology
1-A, Aibeck Block, Garden Town, Lahore, Pakistan
Tel: 5838142 Fax: 5838901
Website: www.pfaet.com www.pfaet.com.pk www.pfaet.org
Email: info@pfaet.com info@pfaet.com.pk info@pfaet.org

- **HIGH TECH MANUFACTURING CELL SYSTEM**
- **Situation**
- Industry provides our society with the goods we desire, and has evolved as we have become more developed. The manufacturing industry is the creation of wealth. This should be used to improve the quality of life of population.
- Pakistan is a country that which has scattered population (urban and rural) which is desirable for national security reasons. The rural areas of Pakistan suffer from severe unemployment, while in its cities is a growing labour shortage.
- For security and economic reasons, the Pakistan Government does not want the rural population to move to the cities. The Pakistan Government's industrial policy has been to encourage the setting up of small-to-medium-scale industrial units throughout the country to generate additional employment and development opportunities, particularly in under developed rural areas. To motivated industrial units to locate in these areas the government has declared a number of such regions to be "back ward areas".
- The Pakistan Government has continually attempted to move labour-intensive industries to under developed rural areas in order to increase employment development and social stability.
- **High Tech Manufacturing Cell System Technology**
- The Task Force for High Tech Manufacturing Cell System Projects have carried out study on plan for economic revival and employment generating through cell system technology. The Manufacturing Cell concept is introduced by the Member planning & development of Task Force for High Tech Manufacturing Cell System of Pakistan.
- To understand the Cell System technology concept it is necessary to understand certain current economic and social conditions in Pakistan. For security and economic reasons, the Pakistan Government does not want the rural population to

- move to the cities. The proposed solution was to bring mini plants of manufacturing to the rural areas. This was the original manufacturing cell system concept. Under this cell system concept, the manufacturing operations are broken down into separate cells, each at a different mini plant. A manufacturing cell is the means of creating the product identified by C/C (Classification and coding) processes relating to various sub sectors. The cell is autonomous manufacturing unit, capable of producing finished parts and will contain one or more machines. The cell is interconnected by a network of material and finished parts transports. However, High Tech Manufacturing Cell System wages are among the highest in Pakistan, Therefore, in order for the Pakistani Cell System project to be competitive in the World or Pakistani market, its productivity must be high. This brought the second concept in the plan; to provide each mini plant with a high technology core. In the Cell System of the future, raw materials will be transformed into finished products completely by automation. An important aspect of this system of the future will be manufacturing flexibility. By simply changing the program and an appropriate simple setup, one will be able to change the finished product. The flexibility of the system gives the cell unit greater freedom to meet different specifications for given product line and to introduce new models more quickly. A Pakistani company which applied flexible production line was able to ship our new models products less than half a year after receiving specification from the marketing department.
- In the High Tech Manufacturing Cell System of the future this time will be shorter, even for more time will be shorter, even for more complex products. Tomorrow's Manufacturing Cell System Projects must adjust readily to fluctuation in market demand and to changes in designs, materials, and tooling. New roles are developing for cell system, and for the people who use them. This revolutionary change in production techniques will require updating engineering education. There are four ingredients that universities need to educate the engineers required for modern manufacturing cell system

- 1. Equipment, 2. Suitable curriculum, 3. Academic staff and 4. Books to use in the instructional programs.
- **The** process of “High Tech manufacturing cell system Technology” required knowledge of many sciences. It takes years to acquire a fundamental knowledge of the high tech manufacturing cell system process and this learning process tends to never ending. There is always something new in this industry; new types of equipment, new operating techniques and conditions that require great effort to bring about change. Failure to accept this as a requirement of the job could lead to stagnancy instead of progress. Unfortunately for anyone that has chosen a career in the high tech cell system, this knowledge cannot be acquired in a classroom or behind the desk. Instead, to become familiar with the process, one must acquire experience out in the field. This is an interesting technical field to work in and is always full of the unexpected. It takes a special kind of individual who can tackle new problems head-on. It is a credit to Task Force that it has so many individuals that can salvage an apparently hopeless situation and keep, figuratively speaking, the train on the track. I would like to see a Task Force that would establish a Venturing Research & Development and Training Centre of “High Tech Manufacturing Cell System Technology” here in the Pakistan. Such a centre would enable our industry to develop the required pool of new engineers needed to maintain a progressive technological growth in Pak Industry. My opinion that such a centre could contribute a great deal toward making the Pak Industry less dependent upon foreign technology. There are many unique processes that were invented and develop by the Pak Industry. Perhaps in the future we ca again take a leading role in improving and advancing the technology of making High Tech Cell System.
- **B**ut to do so requires a financial commitment and a great deal of effort from all of us.

DEVELOPMENT CELL SYSTEM MARKETING PLAN

- So far you have been concerned with borrowing and spending money. Now it is time to consider plans for earning money. Beginners in small business often neglect this aspect of planning. They tend to assume that if they do everything else right customers will appear. But it is not enough to rent a location, purchase fixtures and equipment, organize and manage operations. Without customers, these efforts are meaningless. It is not enough to offer a product or service that you find attractive. For your business to succeed, people must decide to spend their money with you- to become customers. It is your responsibility to make that happen.

APPLICATION OF HIGH TECH MANUFACTURING CELL SYSTEM

- Industrial, Agricultural & Commercial Machinery Component & Accessories
- Domestic & Office Appliance.
- Sporting Goods & Toys.
- Hardware For: Furniture, Doors, Kitchens, Bathrooms, and luggage.
- Automotive & Transpiration
- Electrical & Electronic Components.
- Jewellery, Novelty, Buckles & Decorative Items.
- Modern Defence Hardware / Weapons, Vehicles and Spare Parts for defence forces in private sector.
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PURPOSE OF SMALL SCALE MANUFACTURING INDUSTRY

- The purpose of small scale manufacturing industry is the creation of wealth. This should be used to improve the quality of life of population. What, then, is the purpose of an individual manufacturing organization within this industry? In line with the industry goal the individual cell must also have wealth creation as its target. Just as GDP or GNP measures wealth at a national level per head, so the success of the manufacturing cell is measured by how well it performs at making money. In practice, this is measured by the profit it makes, by the ratio of this profit to the value of the resources it has to employ i.e. its 'return on investment,' and by other factors such as the percentage share it has of the total possible market for its products.

- **COLLECTIVE SPIRIT CAN BE DEVELOPED BY:**

- With particular reference to income generating through High Tech Manufacturing Cell system Technology
- **Purpose**:

- The purpose of this program is to develop a team of Social Workers and Volunteers within a low income community who can generate sufficient collective spirit and movement so that people can help themselves in practising income enhancing and cost saving techniques achieving a quality of life with particular reference to housing and environment, income generating system through High Tech Manufacturing System Technology.

- **High Tech Manufacturing Cell System Technology**

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- completely by automation. An important aspect of this system of the future will be manufacturing flexibility. By simply changing the program and an appropriate simple setup, one will be able to change the finished product. The flexibility of the system gives the cell unit greater freedom to meet different specifications for given product line and to introduce new models more quickly. A Pakistani company which applied flexible production line was able to ship out new models products less than half a year after receiving specification from the marketing department. In the High Tech Manufacturing Cell System of the future this time will be shorter, even for more time will be shorter, even for more complex products. Tomorrow's Manufacturing Cell System Projects must adjust readily to fluctuation in market demand and to changes in designs, materials, and tooling. New roles are developing for cell system, and for the people who use them. This revolutionary change in production techniques will require updating engineering education. There are four ingredients that universities need to educate the engineers required for modern manufacturing cell system: - 1). Equipment 2).Suitable curriculum 3).Academic staff 4).Books to use in the instructional programs.
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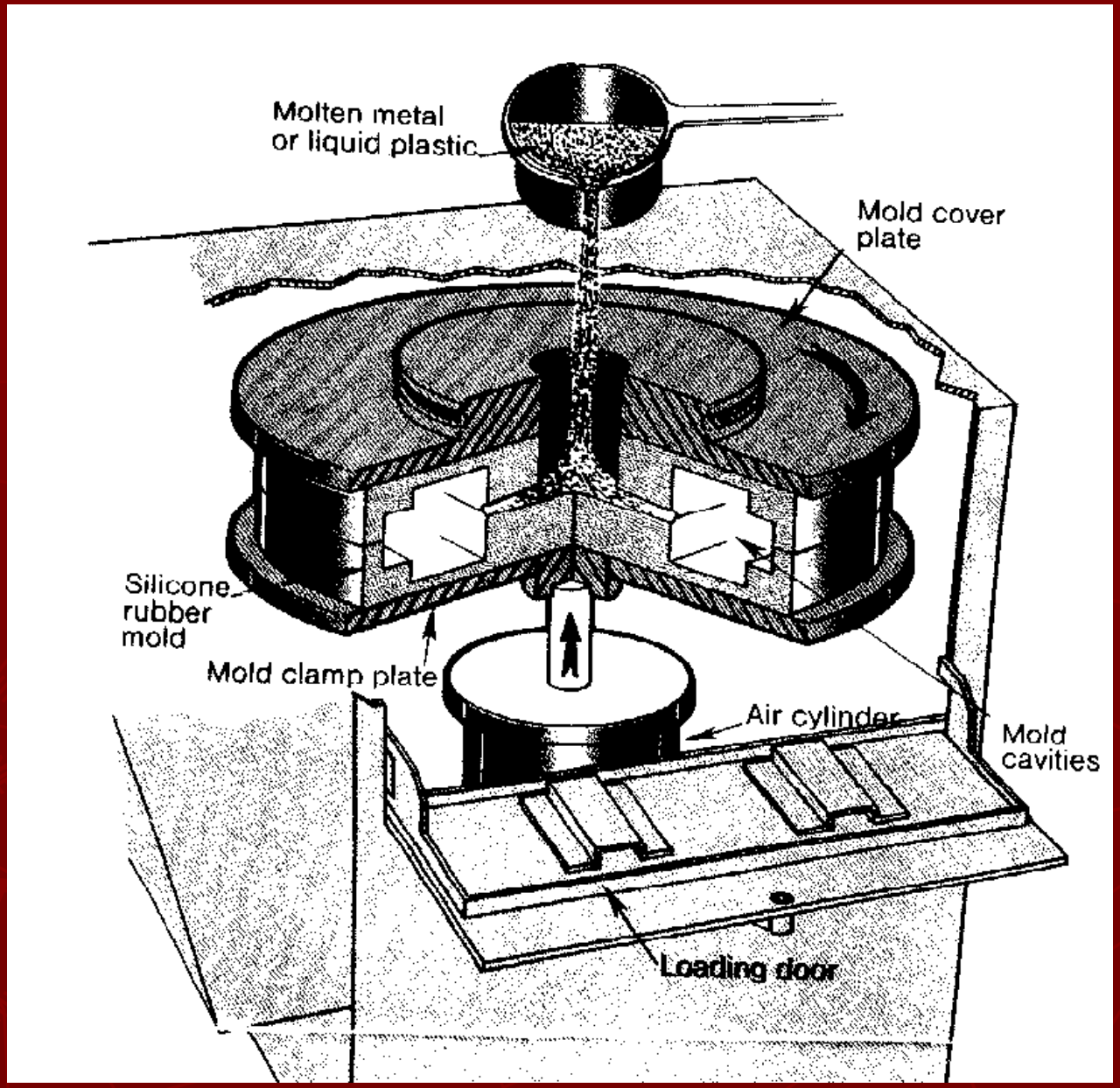
- **Advantages of High Tech Manufacturing Cell System**
- It should first be noted that High Tech Manufacturing Cell System, when applied properly, will increase the wealth creation ability of country and therefore make its existing work force more secure and better paid. The creation of this wealth will be passed on to the nation through taxes and the spending power of the workforce. Thus the government obtain more money to pay for public services, and the suppliers of goods to the worker from the successful company obtain additional sales. Also the suppliers of the cell system equipment will require engineers, technicians and crafts men to build the equipment, which the use of manufacturing cell system must improve labour productivity, i.e. the cost of labour is reduced while the value of goods produced either remains constant or increase. However, if improvements in total productivity are to be gained then the investment in the cell system equipment must be made wisely, with realistic acceptations of the equipment's capabilities. The predictability and consistency of cell system means that the flow work can be more easily monitored and controlled. Consequently this means faster through put times and reductions of work in progress; this makes the cell system unit more competitive by reducing costs and the time between order receipt and delivery of goods.
- **Assistance required from Government**
- Access and use of government R&D establishment, laboratories, workshops and classrooms at the educational and training institutions.
- Borrowing of resource persons, technology providers and experts working in the government.
- Cooperation from foreign mission abroad export promotion bureaus, poverty alleviation programmes and credit banks.
- Tax rebates for up-starts, quality performers, and new technology acquirers, trainers and innovators.
- Security of intellectual capital and patent rights.
- ***THE SPIN CASTING PROCESS***
- The spin casting process relies on centrifugal force to create the pressures that force the casting material into the cavity. In the case zinc alloys, this force is crucial in obtaining low porosity, medium density castings. For plastics, centrifugal force helps eliminate voids.
- The casting processes begin in a machine called the spinner. A mould is manually loaded into the spinner and clamped down with 20 to 40 pounds of pressure. Once secured by the clamp, it begins to spin at a pre selected speed ranging from 200 to 1000rpm. Molten metal or liquid plastic resin is then poured into the centre of the mould called spur, while the mould is rotating. This rotation forces the material outward, through the ingots, and into the cavity. When the material enters the cavity, it back fills. This forces the entrapped air back towards the spur and eventually out through the vents.
- Once the material has entered the cavity, there is a waiting period while the casting material solidifies.
- This will vary depending on the casting material used. After the material has set, the spinner is opened. This stops the spinner from spinning. The clamp pressure is released, and the mould is removed from the machine. The mould is opened and the castings are carefully removed. This is all done manually. Once the casting process is complete, the mould is prepared for the next cycle.

- **Permanent Moulding**
- Although most casting is made in sand moulds, which are only used once, it is possible to use permanent moulds made of metal for the production of a series of castings. The use of these permanent moulds or dies is more common for aluminium, zinc alloy, lead and brass castings than for other metals. The metal mould, which may be constructed from steel or from high quality cast iron, must be produced accurately. A well equipped tool room or machine shop is needed. The die should be designed by an experienced tool-or pattern-maker, ensuring that there is adequate taper, proper location, sufficient thickness of metal to withstand the heat of pouring, correct gating and feeding arrangements for clamping the mould together. Permanent moulds may be coated with clay-silicate or graphite mixtures before use, and are preheated.
- Many die-cast, permanently moulded parts are produced on special purpose machines which inject the metal into the mould under high pressure. Pressure die-casting tooling and pressure, die-casting machines are specialized. The process is suitable for the mass production at low unit cost of very large numbers of components in zinc or aluminium.
- For smaller scale production the gravity die-casting process may be used. The moulds are arranged to open and close and clamped together manually or mechanically, as they are likely to be too hot and heavy for hand operation. Metal is poured manually and after solidification the casting is removed.
- Gravity die-casting of aluminium, brass, lead or cast iron is a process which particularly suitable for the production of simple casting shapes in large quantities. Although the cost of the metal moulds is high (higher than the cost of patterns for sand moulding) the fact that no sand preparation or sand-handling equipment is needed may make the process more economical in some circumstances.

- **NEW HIGH TECH APPLICATIONS**
- One of the exciting modern applications of Casting Technology is its use in rapid prototyping and product development. It is ideal for quickly and economically producing numerous, fully functional parts in high strength metal or plastic from any fragile computer generated stereolitography models. Product designers can then subject multiple parts to thorough testing and evaluation in their intended applications.
- With silicone and P/M mold materials, molds can be made prototypes or development parts cast in as little as three hours, or for complex parts, rarely more than one day. Design changes in size, function fit or appearance are quickly reproduced without making or wasting large investment in tooling or machine time.


Molten metal
or liquid plastic
Mold cover
plate
Silicone
rubber
mold
Mold clamp plate
Air cylinder
Mold
cavities
Loading door

- **POWDER METAL**
- **MANUFACTURING PROCESS**
- **Powder Metallurgy – or P/M** – is a highly developed method of manufacturing very useful ferrous and nonferrous components his is done by mixing element or alloy powders and compacting the mixture in a die, the resultant shapes are then sintered or heated in a controlled-atmosphere furnace to bind the particles metallurgic ally. Basically a "chip less" metalworking process, P/M typically uses more than 97% of the starting raw material in the finished part, and as such the product Because of this, P/M is both energy and materials conserving process.
- The P/M process is cost effective in producing simple or complex parts at, or very close to, to final dimensions at high production rates, which can range from a few hundred to several thousand parts per hour. As a result, only minor, if any, machining is required.
- P/M parts also may be sized for closer dimensional control and /or coined for both higher density and strength.
- Most P/M parts weigh less than 2.27kg (5 pounds), although parts weighing as much as 15.89kg (35 pounds) can also be fabricated in conventional P/M equipment. Many of the early P/M parts, such as bushings and bearings, were very simple shapes, as contrasted with the complex contours and multiple levels, which are often produced economically today by this process..
- **Advantages of the P/M Process**
  - Eliminates or minimizes machining
  - Eliminates of minimizes scrap losses
  - Maintains close dimensional to losses
  - Permits a wide variety of alloy systems
  - Produces good surface finishes
  - Provides materials which may be heat-treated for increased strength or increased wear resistance
  - Provides controlled porosity for self-lubrication or filtration
  - Facilitates manufacture of complex or unique shapes which would be well neigh impossible with other metalworking processes
  - Suited to moderate –to high volume components production requirements
  - Offers long-term performance reliability in critical applications
  - Cost effective.
- ***KNOWLEDGE OF PRODUCT***
- Advanced high tech metal parts in following application: -
- Fluid Power, 2. Home appliance, 3. Power tools, 4.Lawn and Garden,
- 5. Construction, 6. Automotive 7. Gear case 8. Electric motors 9. Compressors
- 10. Transmissions, 11. Recreational vehicles 12. Super gears 13. Helical gears
- 14. Bevel gears 15. Sector gears 16. Sinter brazed assemblies 17. Pulleys
- 18. Adaptors 19. Mechanical clutches 20. Bearings 21. Agricultural equipment and trucks 22. Aerospace 23. Sporting goods 24. Hand tools, 25. Pollution control systems 26. Surgical implants 27. Sophistically medical instruments 28. Electrical relays with magnetic parts. 29. Printing hardware for computer systems 30. Speed controls 31. Exhaust systems. 32. Business machines 34. Off-highway equipment
- 35. Commercial and industrial application 36. Cam, gears, spur gears, pinion gears,
- Connecting rod used in engines. 37. Parts for rocket engines. 38. Aircraft parts,
- 39. Aircraft break parts, 40. Hydraulics, 41. Porous Bearings, 42. Non-Porous bearings. 43. Filters, 44. Diamond Tools,