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INFUSION OF TECHNOLOGIES

IMPERATIVE FOR GLOBAL COMPETITIVENESS*

Rajan Skhariya**

INTRODUCTION ABOUT MECPRO

Mecpro, one of the leading ISO certified technology providers and turnkey plant and machinery suppliers in the field of oils & fats, oleochemicals and surfactants, has successfully commissioned over 150 projects, both in India and abroad. It has earned a reputation not only in India but abroad as a dynamic consulting and manufacturing organization having core competence in designing, engineering, planning, coordinating and manufacturing.

Mecpro has a team of skilled and well qualified professionals who cater to the exact requirements of clients and provide prompt and timely service. It offers an array of services such as solvent extraction, cotton seed processing, delinting & dehulling, pre-treatment & conditioning, oil milling, vegetable oil refining, de-acidification, hydrogenation of vegetable oils, margarine & fat splitting, fatty acid distillation, glycerin, stearic acid, soaps & detergents manufacturing.

Mecpro strongly believes that R&D is an important activity for achiving global competitiveness. It has developed a number of patented technology like Vent Air Purification System, Low Temperature Miscella Separation, Waste Water Recycling System, Twin Bleaching, Continuous Deodorization cum Deacidification, Continuous Hydrogenation besides Wax Purification and Oil Extraction for Palm Fiber and Spent Bleaching Earth which are helping in industrial development and commercialization.

Some of the prestigious clients of Mecpro are Tata Oil Mills Co. Ltd., National Dairy Development Board, Indian Oil Corporation, Bhatinda Chemicals Ltd., Mantora Oil Products Ltd., Kanpur Edible Ltd., Millars India Ltd. and Blue Star Ltd.

Mecpro has been also instrumental in operational consolidation and improved cost competitiveness of various clients based abroad like Farzat Alimentary Co. Ltd., Syria; Sibahi & Arbou Co., Syria; South Baghdad Power Plant, Iraq; Misr Oil & Soap Co., Egypt; AFEDCO, Egypt; Nile Oil Co., Egypt; Eonchem Technology Sdn Bhd, Malaysia.

COMPETITIVE EDGE THROUGH PATENTED TECHNOLOGY

A. Vent Air Purification Technology

The vent air purification system allows hexane to be recovered in the solvent extraction plant instead of letting it escape to the atmosphere. This innovation results in a hexane loss of below 1 kg per metric ton of feed material processed, which is an achievement unparalleled by other methods.

Type of Losses

The hexane losses in solvent extraction plants can be classified into four types:

(i) Excess losses

(ii) Fugitive losses

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*The article published in this Issue is based on a presentation made by Mr. Rajan Skhariya for DSIR-IIFT-TEDO Technology Exports Lecture Series-II, on 12 September 2006.

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(iii) Purging losses
(iv) Functioning losses

Excess Losses

The maximum losses of hexane that occur in solvent extraction plants are excess losses, which are the amount of additional loss through discharge of vent air, defatted meal, excess water and final oil. It is found that 80 per cent of the losses occurring in solvent extraction plants are a result of such excess losses.

Fugitive Losses

The fugitive losses are the amount of solvent loss from the process equipment, through leakages from flanges, doors, packing glands, valves and sight glasses. This generally amounts to 10 per cent of the hexane losses occurring in the plant.

These losses occur when the pressure in the vessel is greater than atmospheric, which causes solvent vapours to leak out through the above mentioned orifices.

Purging Losses

The purging losses are defined as the amount of solvent losses from the process equipment, resulting from evacuation of the solvent vapour for inspection or maintenance purposes, and generally 5 per cent of the losses occurring in the plant. This loss occurs as a result of using purge fans or ejectors to pull air or steam out of the process equipment. During normal operation this does not occur and is relevant only during the desolventising and start-up stages.

Functional Losses

Functional losses signify inefficient operation of the plant and inconsistency of production due to inferior quality of the mechanisms or because of low skill levels of the operators. The losses are around 5 per cent and not all plants experience such losses.

To create vacuum in the toaster, conveying equipment, extractor and other equipment except in the distillation section, we use ejector or fans at the final vent at a pressure of about 0.5 kg per cm^2. By adopting the new system this pressure can be increased up to 7 kg per cm^2 without any additional loss to the atmosphere. As a result, all the equipments will be under an adequate vacuum. And the desolventization efficiency can be improved. Thus, solvent losses will be at the minimum. We have observed that during continuous operation out of the total hexane losses 35 per cent are through vent air, 40 per cent through the desolventising toaster, 5 per cent through oil, and 20 per cent through leakages. By adopting the new system, all these losses except through oil can be reduced by up to 90 per cent.

In our new system, the vent air is taken back into the vent air purification system instead of discharged to the atmosphere, where the air is dissolved in the water by high pressure mixing method. Hexane is arrested by water, which is then taken into the water separator and hexane is recovered for re-use. The final traces of hexane and air that escape from the purification system are taken to the extractor where the hexane is absorbed by the raw material and the air is discharged.

With the adoption of the vent air purification system, there is no need of a refrigeration unit in the project to condense the hexane.

Estimated Saving from Vent Air Purification System

Assuming that the cost of hexane is 'c'. If the average hexane loss in a plant is 'l' per metric ton (l > 1) then the reduction in loss will be (l – 1). If 'W' is the quantity in metric ton process per annum then the saving 'S' S = cw (l – 1)

Current hexane cost	-	Rs 20
Average hexane Loss 11.11 Ltr/Ton		
Raw material processed	-	250 Ton/day
Total Hexane Loss (250x11.11)	-	2777.5 Ltr.
Total working days	-	300 days
Total cost of Hexane (Rs. 2777.5x20x300)=		**Rs. 1,66,65,000/-**
Modified with Vent Air Cracking (1 Ltr.)		
Average Hexane Loss	-	1 Ltr/Ton
Cost of Hexane (Rs. 250 x 20 x 300)	=	Rs. 15, 00,000/-
Saving in Solvent Extraction Plant (capacity 250 t/day) per year (Rs. 1,66,65,000 – Rs.15,00,000)	=	**Rs. 1,51,65,000**/-

B. Low Temperature Miscella Separation Technology

This is a process of separating hexane from the miscella at low temperature. This is achieved by means of azeotropic distillation using a reflex column. A reflex column is designed to perform the most efficient distillation of hexane from the miscella so that the maximum possible amount of hexane is recovered at a lower temperature.

After conducting a detailed study of the conventional process of hexane separation and the excessive losses of hexane, deterioration of oil and development of non-hydratable phosphatides therein, MECPRO has developed a new process named azeotropic distillation. It refers to a process in which a component (known as the solvent or entrainer) is added at the top of the column to form a homogeneous complex known as an azeotrope, which is removed as distillate itself. The other component free from the solvent is collected at the bottom of the column. In this case, the process is quite different from the normal stripping distillation because the solvent that appears as distillate can be separated at lower temperature and reflexed at the top of the column for augmentation of the process.

The reflex column consists of a number of trays fitted with bubble caps, curb plates and down comers. Their area and number depend upon the mass balance and heat balance calculated on the basis of isothermal distillation, where no physical or chemical changes take place to any of the compo-nents present. The complex formed in the vapour filter is fed to the reflex column where the hexane separation takes place isothermally at 65°C, the vapourising temperature of hexane.

By means of the reflex column, miscella separation at 65° C for non-frothing oil and 75°C to 80°C in frothing oil like soybean and mustard is achieved. Plants not using the reflex column separate the miscella at an elevated temperature of 120°C with sparged steam, due to which oxidation of oil and degradation occur. Also steam sparged at this elevated temperature in the stripper increases non-hydratable phosphatides which increases the refining loss. At a lower temperature with a reflex column water degumming is possible provided harvesting and storage of the seed was proper.

The process has been perfected in a series of laboratory trials and actual implementation in India and abroad. With this it is possible to improve the colour of the oil and reduce the steam consumption besides reducing the consumption of chemicals in the refining process.

Cost Benefit of Low Temperature Miscella Separation

Steam Saving

Capacity of the plant	= 250 MT/Day
Oil extracted per day @20% yield (250x20%)	= 50,000.00 Kg.
Saving due to lower temperature (120°C-80°C)	= 40°C
Specific Heat	= 0.5 Kcal
Miscella circulation	= 9000 ltr/hr.
Heat saving per day	= 9000 × 0.5 × 40 × 24 4,320,000.00 Kcal
Heat available for utilization from 1 kg. steam	= 500 Kcal
Therefore, consumption of steam reduced by	= 4320000/500 = 8640 Kg
Assumed cost of steam	= 0.70 Rs/Kg.
Total saving in a plant per annum	= 8640 × 0.7 × 300 = Rs 1,814,400.00/-

Oil Saving

The total oil processed per day	= 50,000 Kg.
Saving due to prevention of oxidation	= 0.5%
Quantity of oil saved per day (50,000 x 0.005)	= 250 Kg.

Refining loss saved (250 x 0.02)	=	5 Kg.
Total oil recovered	=	255 Kg.
Cost of Refined Oil	=	Rs. 24/Kg.
Therefore, saving per annum	=	255 × 300 × 24
in a plant	=	**Rs 18,36,000/-**

C. Enzymatic Degumming Technology

Efficient enzymatic degumming technology for rice bran oil with commercially available enzyme, ensures a residual phosphorus level of 0 to 5 ppm after bleaching and dewaxing. This oil, if refined in a well-maintained physical refining unit, will produce good quality edible rice bran oil.

Advantage of Enzymatic Degumming Process

- This technology produces gums and waxes separately. Hence lecithin and lysolecithin from gums, and bleached wax and triacontanol from crude wax can be easily obtained.
- The oil loss during enzymatic degumming process is lower than in the conventional phosphoric acid degumming. The yield of the gums in enzymatic degumming is about 1.5 per cent against 2-4 per cent in the conventional degumming. The oil content of the enzymatic degumming gums is only 30-35 per cent compared to 50-60 per cent in the conventional gums. Thus there is a saving of about 0.6 to 1.4 per cent of oil during the enzymatic degumming of the rice bran oil.
- The enzymatic degumming process does not alter the fatty acid composition of the rice bran oil.
- The oryzanol present in crude rice bran oil remains almost intact during the enzymatic degumming.
- The enzymatic degumming is an eco-friendly process, as it does not generate effluent water. Effluent water is generated in the water wash step after conventional phosphoric acid degumming, whereas, water wash is not necessary after enzymatic degumming. Thus the possible oil loss in water washing step is also avoided in this process.

The important prerequisite for successful physical refining is to keep the phosphorus content in the oil <10 ppm. The presence of phosphorus-containing components cause colour fixation in the final oil during its exposure to the higher temperature of physical refining. After degumming is the simplest method for removing phospholipids (lecithin) from vegetable oils.

However, only hydratable phospholipids can be removed during water degumming leaving 80 to 200 ppm of phosphorus in the oil, depending upon the type and the quality of the crude oil due to the presence of non-hydratable phospholipids. Presently, many refineries are pretreating rice bran oil with phosphoric acid or an organic acid (such as citric) for removing non-hydratable phospholipids. However, these methods failed to reduce the phosphorus content to < 5 ppm and no method is known which can reduce phosphorus level up to 5 ppm.

Enzymatic process is the answer for the entire problem as it catalyzes the conversion of non-hydratable phospholipids into water-soluble lyso phospholipids, which are then removed by centrifugation, yielding degummed oil low in phosphorus.

D. Simultaneous Degumming & Dewaxing Technology

In simultaneous de-gumming and de-waxing the phosphorous content is brought down to less than 5 ppm because the only addictive used is $CaCl_2$ as against phosphoric acid and caustic in the conventional process. $CaCl_2$ being more effective in precipitation of gums and easily supportable from oil during centrifugation and bleaching the oil this process makes the oil highly suitable for physical refining to produce superior quality edible grade Rice Bran Oil rich in micronutrients.

Gums and waxes present in Rice Bran Oil in the form of hydratable and non-hydratable are separated in single step so that the neutral oil losses are minimized in comparison with conventional de-gumming and de-waxing.

Hydratable gums are first precipitated using water followed by precipitation of new hydratable phospholioids using $CaCl_2$ and by crystallization subsequent centrifugation of oil removes the crystallized wax and gums. This process brings down a phosphorous content to a very low level. De-gummed and de-waxed oil is further bleached by using bleaching earth and activated carbon, under controlled conditions. The oil is further de-odorized and de-acidified to get a superior quality refined edible rice bran oil.

This process is a combination of de-gumming, de-waxing, bleaching, winterization and de-acidification. Crude Rice bran oil's temperature is evaluated to 75°C to make it homogeneous and subjected to fine filtration to remove suspended impurities. Filtered oil will have around 1 per cent suspended particle (high melting hard wax, insoluble particle) and moisture 1 to 2.5 per cent phosphatides 2 to 6 per cent wax.

E. Twin Bleaching Technology in Refining

To improve over the conventional system, some modifications have been carried out. A method is provided for absorptive cleaning of oil in multistage counter current process, where the raw oil is encountered with used absorptive agent and fed to the filtration stage. Now, in second stage this oil is put into contact with fresh absorptive agent for final bleaching and from here it is passed for further processing with constitutes removed from oil. Wherein said constituents removed from oil are obtained and/or prepared as pumpable sludge which can be fed through a pipe to first stage with air excluded.

Adoption of Twin Bleaching System is to make a good quality of oil by adding silica gel as adsorbant to remove the trace metals. In the existing Bleaching System, the neutralized oil is heated at the desired temperature for bleaching in the plate heat exchanger, then pumped to a bleacher, where fresh bleaching earth is added as per requirement, which is then filtered out. In this process the bleaching earth consumption is higher than the modified system. Over and above in the single stage bleaching it has been found that it is very difficult to remove the silica gel added as adsorbant to remove trace metals or phospolipids.

In the modified system the crude oil along with silica gel is pumped into a plate heat exchanger where the temperature is raised as required for bleaching and the oil is then taken to the first bleacher, where the discarded bleaching earth will be added from the second electric filter, which will absorb all poisonous metal from the crude oil.

After filtration the oil is taken into second bleacher, where the fresh catalyst is added for final bleaching, the same is taken to the electric filtration, where the final oil will be discharged to the Bleached Oil Tank.

Benefit of Twin Bleaching

Competitiveness can only be secured through continuous improvements in existing technology. Hence, full exploitation of adsorptive capacity leads to a reduction of up to 40 per cent in the consumption of bleaching earth.

Cost Benefit from Twin Bleaching System Based on 100 TPD Edible Oil Processed

Bleaching earth consumption	=	70 Kg/MT
Saving due to twin bleaching 40%	=	28 Kg/MT
Cost on bleaching earth (Average)	=	Rs 25
Savings per day = 28 x 25 x 100	=	Rs 70,000
Savings per year = 70,000 x 300	=	Rs 2,10,00,000
Total oil processed in the country	=	8000000 Tons
Total savings for the nation	=	8000000 × 700
	=	**Rs 560 crore**

F. Deodorization cum Deacidification Technology

There are three existing process parameters for deodorization, namely (1) stripping, (2) desorbtion and (3) thin film evaporation.

There are certain disadvantages in the existing processes like for instance in stripping, there is high steam consumption, low heat transfer coefficient, deterioration in oil quality, etc. like in desorbtion also, similar disadvantages are also noticed, however it is slighty better than stripping.

By adopting thin film evaporation, there is less steam consumption and is highly mechanised system wherein the limitation of stripping of ffa of less than 2.5 per cent is also eliminated.

Modified Deacidification-cum-Deodorization System

In this new modified Deodorizer the open steam sparging is reduced by 70 per cent in Deacidification/ Deodorization stage. The economization capacity is increased and thin film effect is created without mechanical drive results in better heat transfer and efficient separation of undesired matters from the oil. Easy maintenance is possible since heating and cooling coils are providing from outside.

The bleached oil is pumped to the economizer, where the economizer is fitted from outside and the same can be taken out for maintenance purpose as and when required. Here, the oil is passed for longer duration in eight paths. The economization efficiency will be higher than in existing system. From the economizer the oil is taken to the deaerator, where an efficient spraying system is provided, the same will remove the desolved oxygenate.

The oil is heated at desired temperature in deaerator, which will circulate without any pump or open steam. From there most of the low molecular fatty acids are removed. The heated oil is pumped to a flash column to create a thin film effect without any mechanical agitation to help separate maximum free fatty acid as well as other odourous material.

After that the oil will come into Deodorizer, where the final desorption takes place.

In that column also there is an internal circulation system without any mechanical drive and open steam. In deodorization stage we will be giving steam sparging in limited quantities alongwith circulation system. Scrubber & condenser provided will further purify the fatty acid traces as well as reduce the vapour load on booster ejector.

As you know once you reduce the sparging steam, it automatically reduces the booster ejector steam quantity and increases vacuum. The fatty acid circulation system, which will be controlled electronically will discharge the excess fatty acid collected in the circulation, automatically. Even one can adopt the new vacuum system, which is available in the market at a marginally higher cost as direct cooling system with caustic circulation can reduce the effluent substantially in the refining process.

Cost Benefit from Deacidification- cum-Deodorization System

Total heat energy required for Deacidification of 1 MT oil	= 115000 KCAL
Heat recovered through economization	= 57500 KCAL (50%)
Calorific value of LSD	= 11000 KCAL/Ltrs.
LSD saved per MT of oil	= 6 Ltrs.
Total oil processed	= 8000000 MT
Total LSD saved	= 48000000 Ltrs.
Cost of LSD	= Rs. 26/Ltr.
Net savings for the nation	= **Rs. 124.8 crore**

CONCLUSION

In this competitive world, companies are fighting for survival and only the fittest survives. Modern management concepts and technological developments have resulted in tremendous changes. Customer has become the key to the survival of companies. The customer wants products of the highest quality at the lowest cost with easy availability. MECPRO has been able to demonstrate that with infusion of technologies it is possible to offer superior process technology at competitive prices.

Thus, there is a need to encourage more and more firms for R&D and technology development so as to enable them to penetrate 'niche' markets abroad.

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JOINT VENTURES

L&T Inks Joint Venture Agreement in Kuwait

LARSEN and Toubro (L&T) has signed a joint venture agreement with a subsidiary of the Kuwait-based Bader Al Mulla group.

The new venture will be known as 'Larsen & Toubro Kuwait Construction WLL' and will be registered as a local company in Kuwait. The company will deal with construction projects in oil & gas, power and infrastructure, with a primary focus on electro-mechanical construction. Both companies hope to benefit from the construction boom in Kuwait, specifically in the sectors of oil refining and infrastructure development.

The joint venture comes after Shri A.M. Naik, Chairman & Managing Director of L&T, led a high level delegation to Kuwait. The company was keen on developing long-term relationships with the industry in the GCC region, and was actively scouting for alliances with companies that shared its vision and had a complementary capability profile.

Major projects that L&T have executed in Kuwait over the past few years include building of the Indian Embassy by their Construction Division, ECC and supplying of various units to the oil and gas industry by L&T's Heavy Engineering Division.

(www.blonnet.com)

GAIL to Set up LPG Plants in Uzbekistan

GAIL (India) Ltd. is to set up liquefied petroleum gas (LPG) plants in Uzbekistan. The LPG plants with a capacity of 0.1 million tonnes per annum each will be set up in western parts of Uzbekistan along with UzbekNefteGaz, a national gas major of that country. The estimated capital investment is in the range of $50-$60 million.

GAIL and UzbekNefteGaz signed the MoU of cooperation agreement. Under the agreement, the two countries would jointly pursue gas sector projects covering exploration and production, gas processing, production of petrol chemicals as well as training and R&D. UzbekNefteGaz is the state-owned holding company formed in 1998.

(*The Hindu Business Line*, 2 May 2006)

KALEIDOSCOPE OF INDIA'S TECHNOLOGY EXPORT EFFORTS

ENERGY & POWER

KEC International Bags Rs 284 cr. Contract

THE KEC International has bagged a Rs 284 crore ($62mn.) contract from Kazakhstan Electricity Grid Operating Company for installing a 500 KV transmission line, spanning 250 km from Yukgres to Shu in Kazakhstan; and Rs 229 crore ($49mn) worth contract from Abu Dhabi Water and Electricity Company for supply and construction of two transmission lines.

(*The Economic Times*, 22 July 2006)

ENGINEERING

PRAJ Industries Bags Orders Worth $20 mn.

PRAJ INDUSTRIES LTD. has bagged two orders from the US-based Cilion Group for $20 million. The order is for the supply of technology and machinery for the setting up of two ethanol plants. In total, Cilion is planning to set up eight ethanol plants.

It has also selected the company's technology for an additional two plants for which machinery orders are yet to be released. The first two plants, with a capacity of over 600,000 litres per day each (55 mn gallons p.a.), are scheduled to go on stream by mid-2007. The total capacity planned by Cilion is 440 mgpy in 2008.

(*The Hindu Business Line*, 28 June 2006)

PSL Bags Rs 85 cr. Oman Order

PSL Ltd., manufacturer of pipes and pipe coating, announced that it has bagged an order worth $18.898 million (Rs 85 crore) for supply of API quality steel pipes to the Sultanate of Oman.

PSL has been exporting pipes to the Sultanate of Oman and to other countries in West Asia, in the past. With this venture, PSL plans to consolidate its hold in this market. The current order will be supplied from PSL's plant at Kandla.

"PSL recently announced its decision to start its manufacturing operations in the lower Gulf region of West Asia. After the set up is complete, it will have 13 mills operating, 12 in India and 1 in the Gulf," the company said in a news release quoting Ashok Punj, Managing Director, PSL.

(*www.businessline.in*)

Kazakhs Invite Indian Industry to Invest in New SEZ for Textiles

INDIA'S buoyant textile industry has been invited by the Kazakhstan government to invest in a newly set up special economic zone (SEZ) for textiles. A zero per cent corporate income tax, full exemption from land & property tax and customs duty are some of the sops offered by the SEZ.

Making a presentation at an interactive session of the Confederation of Indian Industry (CII) held recently, Berdibek M. Saparbayev, special envoy of the Prime Minister of Khazakhastan, said that the 200 acre site would have 15 textile enterprises and would attract an investment of $500 billion.

Mr. Saparbayev said that the cost of setting up an industry was much less in Kazakhstan than setting up an industry in India, China, Turkey and Pakistan as far as power, gas and labour costs were concerned. He also pointed out that his country was a favoured destination for investment due to the connectivity it provides through rail and air transport to other countries as well as local transportation for the goods manufactured in the SEZ.

Located strategically between Russia and China and with its close proximity to cotton producing regions such as Tajikistan, Uzbekistan and Turkmenistan, Kazakhstan has been on the upward growth trajectory with a GDP of 9.4 per cent and an unemployment level of 8.1 per cent for the last year. Regarding security to investors, the special envoy said, ''the safety of investors in the country will be guaranteed and the labour courts of the land are there to take care of the disputes.'' A memorandum of understanding has been signed by CII and Republic of Kazakhstan with special focus on investment activity in the SEZ.

(*The Financial Express*, 13 June 2006)

HMT to Set Up Tech Centres in Zimbabwe

HMT (International) Ltd., the wholly owned subsidiary of HMT, would set up the Indo-Zimbabwe Technology Centre (IZTC) in Harare and India Technology Centre (ITC) in Bula Wayo. The project valued at Rs 22.5 crore would be implemented under the Indian Government to the Government of Zimbabwe. This project would help in the development of SMEs in Zimbabwe.

(*The Hindu Business Line*, 22 June 2006)

Gammon Bags 25.20 mn Euro Senegal Order

Gammon India Ltd. has bagged 25.20 million Euro order from Senegal for construction of a container terminal. The order bagged by a consortium of the company with Somagec SA and Drapor SA is for constructing the container terminal including dredging and back-fill at Senegal's Port of Dakar. The company informed the stock exchanges that a consortium of Gammon India with its subsidiary Gammon Infrastructure Projects Ltd has also bagged two orders worth Rs 1,080 crore from NHAI.

(*The Hindu Business Line*, 7 June 2006)

Engg. R&D Service Exports Grow 10-fold to $3.1 bn.

ENGINEERING and R&D services is an area of opportunity for India. According to Nasscom, export revenues from engineering and R&D services, product development and software product are estimated to have grown ten-fold from a little over $300 million in 2001-02 to over $3.1 billion in 2004-05. Revenues were projected to reach $3.9 billion by the end of 2005-06.

Of this, the total value of engineering and R&D services sourced from India was estimated to have grown from $1.7 billion in the financial year 2003-04 to over $2.3 billion in 2004-05. It was projected to reach $2.8 billion by the end of 2005-06, says Nasscom. The market potential is likely to be higher as well.

According to IDC, the total value of outsourced product engineering is currently estimated at over $27 billion and is projected to nearly double over the next four to five years. The past few years have witnessed growing levels of interest from clients across sectors such as high tech, telecommunications, automotive, aerospace, industrial products, heavy machinery, and construction and consumer appliances. Ketan Bakshi, MD, Neilsoft, said that the sector was crawling a few years ago, but now it looks that exports from engineering and R&D services could soon be more than $10 billion and could be bigger than the BPO industry. He pointed that a creation of panel by Nasscom was a good indicator.

(*www.economictimes.com*)

EXPORT POTENTIAL

Asian MRO Market to Grow 50% by 2011 – Study

INDIA, China and West Asia are emerging as the 'big drivers' behind the growth in aircraft maintenance, repair and overhaul (MRO) business globally. A study by Frost and Sullivan projected that the MRO market in Asia is bound to grow almost 50 per cent by 2011 from $8.7 billion to almost $13 billion.

The study, conducted by Subhranshu Sekhar Das, Senior Consultant, Frost & Sullivan, titled "Booming Aviation: Unleashes Opportunity for Aircraft Maintenance, Repair and Overhauling in Asia" revealed that the global investment community was actively assessing the Asian aviation scene with particular interest in aircraft and engine MROs.

The global MRO market at present stands at $39 billion, of which Asia has a market share of 22 per cent. In the Asian market, currently at $8.7 billion, India has a very small share of 8 per cent, which is less than half of China's market share of 19 per cent. (see Table)

ASIAN MRO Pie $8.7 bn	
Share of China	19%
Japan	19%
Australia	10%
India	8%
Malaysia	6%
Singapore	5%

The study attributed high air traffic growth, low-cost model optimization, increased demand for cargo operations, excellent fleet demographics and airlines engaging in long-term partnerships with MRO companies to deliver total maintenance solutions as the key drivers of the MRO market in Asia-Pacific region.

According to the study, outsourcing has been most favoured with regards to fleet maintenance. Led by the low-cost carrier commercial model drive, many airlines have sought to outsource maintenance activities so that they can focus more on the core activities. Also, cost effective high quality services are attracting foreign airlines to Asia.

(*The Financial Express*, 28 June 2006)

INDIAN INVESTMENT ABROAD

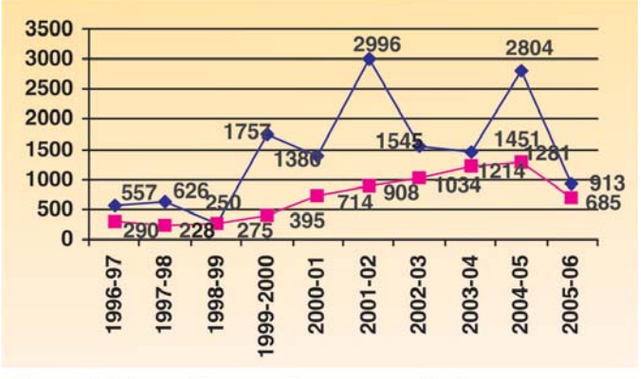
Indian Overseas Investment

THE overseas investment policy of India was streamlined in 1995 with the notification on guidelines on Indian Investment Abroad. The policy has since then been liberalized consistently. The objective of liberalizing Indian investment abroad was mainly to provide Indian industry access to new markets and technologies with a view to increasing their competitiveness globally and help the country's export efforts.

The success of Indian overseas investment policy could be seen from the surging investment approvals and outflows since 1996. From 290 in 1996-97, the number of approved Indian overseas investment increased to 1,214 in 2003-04, and further to 1,281 in 2004-05. Reflecting this, the value of approved Indian overseas investment has increased more than five-fold, from US$556.6 mn in 1996-97 to US$2.8 bn in 2004-05. During the period April-August 2005, the number of approved Indian overseas investment stood at 685, with an approved value of US$912.5 mn. (*Chart I*) On a cumulative basis, from 1996-97 to April-August 2005, a total of 7,024 Indian overseas investments have been approved, involving an approved value of US$14.2 bn and entailing an actual outflow of US$8.44 bn.

CHART 1

APPROVALS OF INDIAN OVERSEAS INVESTMENT



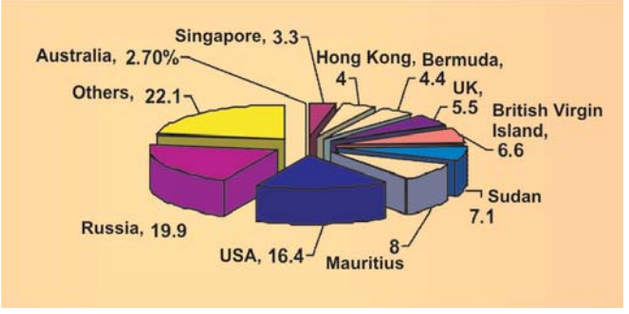
Source: Ministry of Finance, Government of India.

Country-wise Destination

The country-wise destination of cumulative approved Indian overseas investment during the period 1996-97 to April-August 2005 is represented in Chart 2. The top 10 destinations accounted for over three-fourths of cumulative total investment approvals since 1996. Russia is the leading destination, accounting for 19.9 per cent of total cumulative investments, followed by USA (16.4%), Mauritius (8.0%), Sudan (7.1%), British Virgin Island (6.6%), UK (5.5%), Bermuda (4.4%), Hong Kong (4.0%), Singapore (3.3%) and Australia (2.7%).

CHART 2

COUNTRY-WISE DESTINATION OF APPROVED INDIAN OVERSEAS INVESTMENT (1996-97 TO AUGUST 2005)



While countries such as Russia and USA have remained the leading destinations for India's approved overseas investment, countries such as Sudan, Australia, Malta and Iran have emerged among the top destination during April 2002 – August 2005 (see Table 1).

TABLE 1

CHANGING PATTERN OF INDIAN OVERSEAS INVESTMENT APPROVALS

Sl. No.		% share	(US$ mn)
	April 1996 to March 2002		
1	Russia	1748.68	23.18
2	USA	1540.83	20.43
3	British Virgin Island	776.53	10.29
4	Mauritius	618.34	8.20
5	Hong Kong	445.12	5.90
6	UK	410.62	5.44
7	Bermuda	232.63	3.08
8	Vietnam	228.79	3.03
9	Oman	204.88	2.72
10	Netherlands	157.92	2.09
	April 2002 to August 2005		
1.	Russia	1078.82	16.24
2.	USA	1006.71	15.15
3.	Mauritius	779.97	11.74
4.	Sudan	514.22	7.74
5.	UK	395.27	5.95
6.	British Virgin Island	375.57	5.65
7.	Australia	364.96	5.49
8.	Malta	321.16	4.83
9.	Iran	201.31	3.03
10.	Bermuda	154.31	2.32

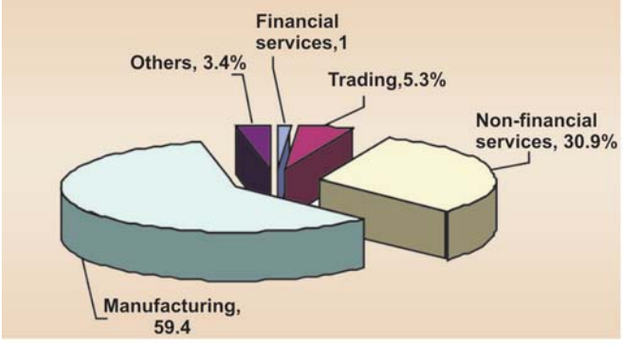
Source: Ministry of Finance, Government of India.

Sector-wise Distribution

In terms of sectors, manufacturing accounted for 59.4 per cent of total Indian overseas investments approved from April 1999 to August 2005, followed by non financial services (31%), trading (5.3%), and financial services (1.02%) (*Chart 3).*

CHART 3

SECTOR-WISE DISTRIBUTION OF APPROVED INDIAN OVERSEAS INVESTMENT (1999-2000 TO AUGUST 2005)



(Courtesy: Exim Bank of India, *EXIMIUS: Export Advantage*, March 2006)

Indian Investment in UK Up

INDIAN foreign investment projects in the UK were increased by a staggering 110 per cent in 2005-06. During the same fiscal, the UK recorded a total of 76 investment projects from India, creating 1,449 jobs. With a total investment of £1.02 bn, India emerged the third largest investor in the UK.

The *UK Inward Investment 2005-06 Report*, released by the UK Trade and Investment said in 2005-06, 1,217 foreign companies chose to invest in the UK – a 14.3 per cent increase over last year. The US with 446 projects, Japan with 84 projects and India with 76 projects are the top three investors.

The new projects from India include 39 from Mumbai, 10 from Delhi, 22 from Bangalore, Chennai and Hyderabad, and five from Kolkata.

While ICT remains the dominant sector for investment with 26 projects, there was strong growth in investments in pharmaceuticals and healthcare (12 projects), financial services (eight projects) and automotive and engineering (six projects), the *Report* said.

The key project investors include HCL, Nicholas Piramal, M&M, Godrej, Essel Propack, El Forge, DreamQuest and Apeejay Surrendra Group.

(*The Financial Express*, 6 July 2006)

REVIEW ARTICLE

"Pain and Excitement of Taking Technology to the Market" by R. Sunder, *VIKALPA*, Volume 29, No. 4, October-December 2004

In this Paper, the author an entrepreneur responsible for setting up Bangalore Integrated System Solution Pvt. Ltd. (BiSS) shares his experiences of entering a global technology-intensive niche market for durability and safety of technical equipments.

The necessity for setting up BiSS was felt following the experiences of National Aeronautical Laboratory (NAL), Bangalore. NAL felt an acute need to develop an in-house technology for safety determination of aircrafts during the 1961 and 1971 war period, as imported equipment was prohibitively expensive. Since the life of airframes is limited by metal fatigue, multi-actuator servo-controlled test rigs are needed to monitor safe service-life, which can cost the defence agencies several million dollars to import.

NAL's attempt to substitute the imports through in-house sophisticated facilities for aircrafts testing at a fraction of input cost worked well and within 15 years, NAL was successful in developing the country's first microprocessor-based test controller intended for use on general purpose servo-hydraulic Universal Testing Machines (UTMs). Such equipments are equipped to evaluate the strength, performance, and durability of materials and manufactured components such as shafts and axles, shock absorbers, springs, elastomer mounts, etc. The role of such test equipment is in ensuring competitiveness of materials and products and also in underlining the importance of testing in R&D.

The author took inspiration from this success story to take this innovation to the market. The motivation also came from the market as at that opportune moment, he saw a growing demand for testing equipment. Moreover, servo-hydraulic test equipment is produced by only a handful of companies around the world. Being a niche market characterized by high value and low volume, market competition is also marginal in comparison to large volume products.

Setting up a company to develop, manufacture, supply, and support testing equipment requires considerable investment and lead-time. The entry to a high-technology market that called for supplying

solutions that could not be tested in totality before accepting an order was a difficult proposition for BiSS. Since Mr. Sunder was used to developing concepts as a scientist rather than finished products, understanding of customer specification and satisfaction proved to be difficult in the initial years.

The author underlines that in any product development activity five per cent effort is needed towards getting the product to work and the remainder 95 per cent is needed towards converting it into a useful device that will meet the customer's requirements. This initially led to a lot of modification in BiSS, the software needed to be upgraded to make it user-friendly and the hardware easy to operate and maintain, even if it meant removing many of the frills that went with it.

The author also shares his experiences in logistics management. Their technology intensive products had no chance of being tested as a complete system prior to shipment because institutional clients are generally at a remote site and each project definitely involves some degree of on-site adaptation. The first few projects that the author and his team worked on, particularly one which needed to deal with a retrofit system for automotive propeller shafts never gave the desired results because the client's system required incorporation of signal conditioning circuitry which was not part of their technology. Therefore, putting the system in place for a remote client turned out to be a formidable challenge. The author advices that the start-off project for any such entrepreneurship should not be for a distant client, as the challenge of logistics may turn finishing a project to a nightmare.

Regulation and government rules also act as a hindrance towards growth. It took almost ten years for BiSS to acquire the wherewithal to export high technology equipment to the US, owing to the ill-conceived and patently discriminatory ground rules prevalent in India. The author suggests that by easing prohibitive rules and regulations for manufacturing, the Indian government can save foreign exchange by avoiding imports of expensive equipment and further improve the trade balance by export of such technology. He refers particularly to Chapter 10/97 Notification under excise rules, which allows R&D and academic institutions to procure locally manufactured equipments without paying excise duty, which is damaging to any such entrepreneurship. Chapter 10/97 makes things even better for foreign vendors by virtually eliminating local competition in India.

High risk financing for the technology intensive manufacturing sector is a rare commodity in India. Venture capitalists generally promote only IT technology ventures and banks view manufacturing technology as a liability. Mr. Sunder suggests that it is advisable to smoothen the initial financial hiccups by depending on own resources.

In terms of clients also, it is always beneficial to target the private organizations rather than government organizations, specifically because private companies offer almost 30% as advance payment which is enough to cover the initial expenditure.

Mr. Sunder believes that the BiSS experience is an illustration of the problems that one has to face and the eventual rewards one can expect – the profound professional satisfaction from having made an impact, not just on the market, but also on the industry, of participation in a process that makes the country a player to reckon in the global arena.

Mr. Sunder recommends the following steps for India's regulatory and government agencies for promoting technology intensive innovative enterprises in the country:

- Since technology intensive firms substitutes prohibitively expensive foreign imports, apart from exporting competitively in the international market, there is a growing need to recognize such products as "deemed exports" through suitable legislations.
- The need of the hour is promotion of risk-taking financing mechanisms from government and other agencies to support innovation and entrepreneurship in the manufacturing sector. This practice can support entrepreneurship in high technology manufacturing that will help in attaining global technology leadership.
- To nurture creative skills in engineering and innovation and ensure a level playing field for national and international competition.

– Santana Pathak

TECHNOLOGY/PROJECT OFFERS

LIST OF SELECT EXPORTABLE TECHNOLOGIES/PROJECTS FROM SMEs IN NORTHERN STATES OF INDIA

Sector	*Name of Technology/ Project offered*	*Name of company*	*Value of offer**
Agricultural Machinery	1. To Manufacture Combine Harvestors	Standard Combines Pvt. Ltd., Sangrur, Punjab	US$4.0 mn
	2. To Manufacture Tractors (30 HP – 60HP Category)	International Tractors Ltd., Hoshiapur, Punjab	US$5.0 mn
Auto Components	3. To Manufacture Precision Metallic Cold Coiled Springs (of Wire dia range 0.20 to 16.00mm)	M And M Auto Industries, Gurgaon, Haryana	US$6.0 mn
	4. To Manufacture Steering Column Components like Rack & Pinion Steering, Steering Column, Case Differential Assembly, Propeller Shaft Assembly	Sona Koyo Steering Systems Ltd., Gurgaon, Haryana	US$5.1 mn
Chemicals	5. To Manufacture Anti Oxidants for Polymers	High Polymer Labs Limited, Faridabad, Haryana	US$6.5 mn
Food Processing	6. Instant Coffee Powder Processing Plant	SSP (Pvt.) Limited, Faridabad, Haryana	US$4.0 mn
Knitwear	7. To Spin Cotton and Blended Yarns	Nahar Group of Companies, Ludhiana, Punjab	US$45.0 mn
Light Engineering	8. To Manufacture Toughened Glass	Gold Plus Himachal Safety Ltd, Sirmour, HP	US$5.0 mn Glass
Mechanical	9. To Manufacture Bicycles & Bicycle Parts	Hero Cycles Ltd., Ludhiana, Punjab	US$3.0 mn
	10. To Manufacture High Tensile and Special Types of Fasteners	Deepak Fasteners Ltd., Ludhiana, Punjab	US$10.0 mn
Pharmaceuticals	11. To Manufacture Pharmaceutical Drugs & Formulation such as Analgesics, Anesthetics, Antidiabetics, Cardio-vascular Drugs, Cough Expectorants, Ear drops, etc.)	Ind-Swift Limited, Chandigarh	US$10.0 mn
Telecommunication	12. To Manufacture Wireless Repeaters for following Networks: Global System for Mobile Communication (GSM), Code Division Multiplex Access (CDMA), Public Communication System (PCS), Universal Mobile Telecommunication System (UMTS)	Shyam Telecom Ltd., Gurgaon, Haryana	US$12.0 mn

* Value is excluding cost of land & building.

Note: The above list is an extract from the *Report on Profiles of Exportable Technologies from SMEs* of *Select Northern States in India* prepared by NAFEN for DSIR, Government of India, New Delhi. Complete Report can be viewed at http://dsir.gov.in/ – International Technology Transfer Programme – Report on Northern India. For any enquiries, please contact : spagarwal@iift.ac.in, ashwani@nic.in