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EVALUATION OF OIL REFINING AND RECYCLING TECHNOLOGIES

United States of America
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US - ASIA ENVIRONMENTAL PARTNERSHIP



WORLD ENVIRONMENT CENTER

DISCLAIMER

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I. EXECUTIVE SUMMARY

Mr. Harshad Tolia, Chairman of Vijayant Autocrafts Ltd (hereafter referred to as Vijayant), of Bombay, India participated in an Environmental Business Exchange (EBE) in the United States from November 11-23, 1994. The purpose of this EBE was for Mr. Tolia, as the representative of Vijayant, to gain an understanding of waste oil recycling and refining technologies available in the United States and identify possible joint venture partners. Vijayant Autocrafts, Ltd. is in the process of identifying the most recent technology and best resources available to develop a lubrication oil blending and lubricant refining plant. Over the course of his visit, Mr. Tolia was able to view a number of facilities in the United States and participate in discussions on the various oil recycling technologies.

Of primary interest to Mr. Tolia and Vijayant is the recovery of useful fuels from used lubricating oils. Along with fuel recovery, Vijayant is also interested in using used lubricating oils to relieve the problems of transporting and using low sulfur, heavy stock (LSHS) semi-finished crude -- a problem common in India. These LSHS fuels are waxy and semi-solid. Discussions from the individual meetings are detailed below (III. Discussion and Findings).

Three major categories of waste oil recycling technologies were investigated by Mr. Tolia -- the distillation process, the Mohawk/CPC process, and the Interline process. Of these three processes, Vijayant has identified the Mohawk process as the one they wish to pursue for use in India. The Mohawk/CPC process advocated by firms such as Evergreen Oil of San Francisco, California, in the first phase, involves the addition of chemicals to break down the structure of the waste oil, rather than atmospheric distillation. In the second phase vacuum distillation is then carried out, after which the oil is sent to third and fourth phases for micro-film evaporation and hydrofinishing. The final stages result in recycled fuel ready to be used for industrial fuel. Vijayant was particularly interested in pursuing such a process as there is a prospective market for heavy industrial or diesel fuels in India.

Funding for this project was provided through a Cooperative Agreement between the World Environment Center and the United States-Asia Environmental Partnership (US-AEP).

II. INTRODUCTION

From November 11-23, 1994, Mr. Harshad Tolia, Chairman of Vijayant Autocrafts, Ltd (Vijayant), traveled to the United States to investigate waste lubricant oil recycling and refining technologies. Mr. Tolia's secondary purpose of this Environmental Business Exchange (EBE) was to identify possible joint venture partners and funding sources for a recycling facility in Bombay, India.

In the course of intensive meetings and discussions with a number of American lubricant oil recyclers, Mr. Tolia was exposed to three distinct processes of waste oil recycling and refining. Although the first phase of these processes vary, the second phases normally involve some type of vacuum distillation.

The distillation process, advocated by Texaco and K.T.I., involves a first phase of atmospheric distillation prior to vacuum distillation. Following the second phase of vacuum distillation, Texaco utilizes this product as an industrial fuel. Further processing results in a low grade base oil, or with a final phase of hydrofinishing, a superior grade base oil can result. Depending on the type of final product desired, one can either stop at the second phase and use the distillates as fuel or continue with subsequent phases to obtain a virgin base oil grade product.

The Evergreen process or Mohawk/CPC process involves the use of chemical additives in the first phase of treatment rather than atmospheric distillation.

The Interline process utilizes the process of solvent extraction. This process is relatively new, but evolving. Interline plans to have their new plant operational by mid-1995.

Vijayant is currently assessing the options available to them in the field of waste lubricant oil recycling and plans further discussion with the firms of Evergreen Oil and K.T.I. Vijayant is hopeful that these discussions will result in a joint venture between Vijayant and an American firm.

III. DISCUSSION AND FINDINGS

A. November 12, 1994 -- UOP, Des Plaines, IL

Mr. Tolia met with Mr. Donald R. Hedden, Manager, Marketing and Sales, Environmental Control and Management Systems at the company's Des Plaines, Illinois headquarters. Following a tour of their facilities, discussion was held on various processes of waste oil recycling. Mr. Hedden suggested that Mr. Tolia visit the UOP office in New Delhi to get better acquainted with the processes and technologies developed by the company.

B. November 14, 1994 -- Interline Resources Corporation and Q-Lube, Salt Lake City, UT

Interline Resources Corporation has developed a unique process of waste oil recycling/refining which involves solvent extraction rather than the use of atmospheric distillation in the first phase of treatment. Mr. Tolia was introduced to this technology through a visit to Interline's new facility in Utah. This pilot plant is to be the first of its kind in North America. Although impressed by this facility and the technology utilized, Mr. Tolia was doubtful that its scope and use would be applicable to Vijayant's needs.

On a site visit to Q-Lube, a division of Quaker State, Mr. Tolia met with Mr. Shane Smoot, Quaker State compar / counsel. Quaker State is the appointed agent for the Interline technology process in North America. Discussions took place regarding prospective sites for the refinery where they will be installing the "Interline process." In addition, it was pointed out that Q-Lube also has a highly successful lube-blending facility.

C. November 15 & 16 1994 -- Bechtel Corporation, Enviropur, Inc., Evergreen, Inc., Romic Environmental, San Francisco, CA

Site visits were arranged to the above-named facilities by William Harris, President, PAN Pacific Environmental Services, Inc. Mr. Harris accompanied Mr. Tolia to Bechtel's corporate headquarters to meet with Mr. David Slocum, a Project Manager, who was able to give Mr. Tolia advice for the design of a lubrication blending plant.

At Enviropur Inc., Mr. Tolia observed a recycling facility in operation. On-site information was available regarding plant output and the oil customer collection system. Mr. Tolia believed this system to be quite applicable to the quantity and needs of Vijayant's. Discussions since this meeting have further progressed, with the help of Mr. Harris and Vijayant is considering purchasing Enviropur technology for their prospective plant.

A facility tour took place at Evergreen, Inc., along with a detailed review of laboratory analysis for incoming and outgoing oil streams. Evergreen management indicated their interest in pursuing a long-term relationship, similar to another joint-venture partnership they have with a firm in Indonesia. To promote further discussion, Evergreen presented samples of finished products for Mr. Tolia to analyze for potential in the industrial fuel market in India.

On a visit to Romic Environmental, Mr. Tolia met with Romic's Plant Manager, Ms. Vikesh Patel. As Romic's specialty is solvent recovery, this tour included an in-depth assessment of chemical treatment and vacuum distillation processes. Discussion was made on the costs associated with plant operation and potential capital requirements for employing particular processes.

D. November 17, 1994 -- Kinetics Technology International Corporation (KTI), San Dimas, CA

At KTI, Mr. Tolia met with Mr. Grant Shields, Vice President and Mr. Stanley C. Che, Manager, Technology Development. KTI is a firm specializing in re-lube processes and has indeed developed numerous recycling technologies over the years. In fact, the process utilized at Evergreen is a product of KTI. Since this meeting, KTI has put together a complete business plan for Vijayant Autocrafts and talks are ongoing through KTI's office in New Delhi.

E. November 18, 1994 -- Recon Environmental, Raritan, NJ

Mr. Tolia met with Dr. Norman Weinstein, President of Recon Environmental, an environmental management firm. Recon Environmental provides a wide range of environmental services to their clients, including, environmental testing, general consulting, and waste management facility design services. As an expert in the field of waste oil recycling, Dr. Weinstein agreed with Mr. Tolia that the conversion of used lube oils to fuels is an attractive idea, particularly so, given the high value of fuel relative to lubricating base stocks in the Indian market.

F. November 21, 1994 -- Texaco Fuel and Marine Marketing, Inc., Harrison, NY

Mr. Tolia visited Texaco corporate headquarters to meet with Mr. Thomas Reilly General Manager of Texaco's Fuel and Marine Marketing Department for the Pacific Rim. This discussion was an extension of earlier meetings between Mr. Reilly and Mr. Tolia in India. Texaco outlined the process currently in use in their Marrero plant in Louisiana. This plant utilizes Texaco's patented "Trailblazer" process of recycling used lube oil into marine fuel. Mr. Tolia observed this plant in operation the next day on his visit to New Orleans. Quite interested in the prospect of a joint venture in India, Texaco plans to introduce this technology worldwide.

G. November 22, 1994 -- Tri-Star Supply Co., New Orleans, LA

The last facility visited on this EBE was Tri-Star Supply Co. Mr. J.R. White, President of the company provided Mr. Tolia with a tour of Tri-Star's facilities and indicated his interest in expanding their business to India. As a leading oil products supply company, Mr. White was optimistic about the possibility of working with Vijayant, once they have a working facility.

IV. RECOMMENDATIONS AND CONCLUSIONS

Recommendations

Based on numerous discussions and in particular, discussions with Dr. Norman Weinstein of Recon Environmental, Mr. Tolia believes that a successful business for producing fuels from used lubricating oils requires the following:

1. Available sources of large quantities of waste lubricating oils at reasonable prices. Potential sources available to Vijayant Autocrafts include: railroads and other transportation facilities, and marine and industrial sources. (Other waste oils other than lubricating oils, could also be considered as feed stocks when producing fuels.)
2. Applicable process technology which will produce commercially acceptable fuels from used lubricating oils with high yields and minimum waste products. The choice of technology will depend on the quality of the fuel required, capital and operating costs, and other factors. A feasibility study would be the most appropriate method to assess the technology needed.
3. Reliable plant operation.
4. A successful fuel marketing program.
5. Capital to finance the proposed project. At least US\$5-10 million for the type of facility planned.

Conclusions

Vijayant has identified its choice of available waste oil recycling technologies to be the Mohawk process, developed by KTI and utilized by Evergreen. Vijayant plans to propose a facility which would employ this type of lube oil recycling. At the time of this writing, feasibility studies are being planned as are further discussions with both Evergreen and KTI.

Vijayant proposes to enter the Indian Capital Market sometime between April and June 1995 to raise approximately \$7 million for this project. Land has already been acquired and feasibility plans are being prepared. Mr. Tolia believes that another trip to the United States will be in order so that he may continue the exploration of various funding provisions for this project.

APPENDIX A

ITINERARY AND CONTACT INFORMATION

DATE	COMPANY VISITED	CONTACT
11/12/94	UOP 25 East Algonquin Road Des Plains, IL 60017-5017 tel. 708-391-2553	D.R. Hedden, Manager, Marketing & Sales, Environmental Control & Management Systems
11/14/94	Interline Resources Corporation 160 Canyon Crest Drive Alpine, UT 84004 tel. 801-756-3031 fax 801-756-8843	Mr. Steve Yeoman, Vice President, Marketing
11/14/94	O-Lube (Quaker State) 1385 West 2200 Salt Lake City, UT 84119 tel. 801-975-4742	Mr. Shane Smoot
11/15/94	PAN Pacific Environmental Services, Inc. 3154 Bali Lane Alameda, CA 94502 tel/fax 510-522-5101	Mr. William Harris, President
11/15/94	Professional Resource Management 2950 Camino Diablo Suite 310 Walnut Creek, CA 94596 tel. 510-945-6044 fax 510-945-8020	Mr. David F. Straihorn
11/15/94	Enviropur West Corporation 13331 N. Highway 33 Patterson, CA 95363 tel. 209-892-8670 tel. 800-874-4444 fax 209-892-8574	Mr. Tom Shinault, Plant Manager

11/15/94	Bechtel 50 Beale Street San Francisco, CA 94119 tel. 415-768-3339 fax 415-768-2925	David Slocum, Technology Manager
11/16/94	Evergreen Environmental Services 6880 Smith Avenue Newark, CA 94560 tel. 510-795-4400 fax 510-791-0126	Mr. Terry Wilson, Process Engineer
11/16/94	Romic Environmental Technologies Corp. 2081 Bay Road East Palo Alto, CA 94303 tel. 415-324-1638 fax 510-462-2377	Ms. Rhonda Rigenhagen, Community Relations Manager
11/17/94	K.T.I. 650 Cienega Avenue San Dimas, CA 91773 tel. 909-592-4455 fax 909-592-5347	Mr. Grant Shield, Vice President Mr. Stanley C. Che, Manager, Technology Development
11/18/94	Recon Environmental Services 5 Johnson Drive Raritan, NJ 08869 tel. 908-526-1000 fax 908-26-7886	Dr. Norman J. Weinstein, President
11/21/94	Texaco 2000 Westchester Avenue White Plains, NY 10650 tel. 914-253-7414 fax 909-592-5347	Mr. Thomas K. Reilly, General Manager, Asia-Pacific Region
11/22/94	Tri-Star Supply Co, Inc. 1906 Engineers Road Belle Chasse, LA 70037 tel. 504-394-4888 fax 504-394-5938	Mr. J.R. White, President

APPENDIX B

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