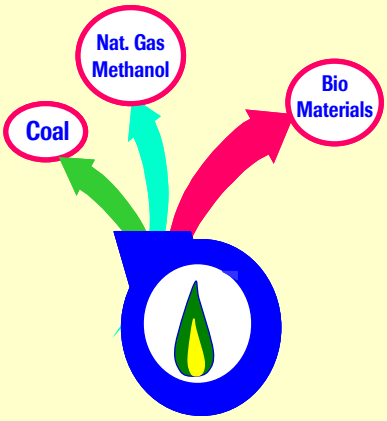
Alternative Feedstocks

FOR PETROCHEMICALS AND POLYMERS



Volume 1 Issue 3 ✿ Comments by Chemical Market Resources Inc. Staff ✿ Feb 12, 2007

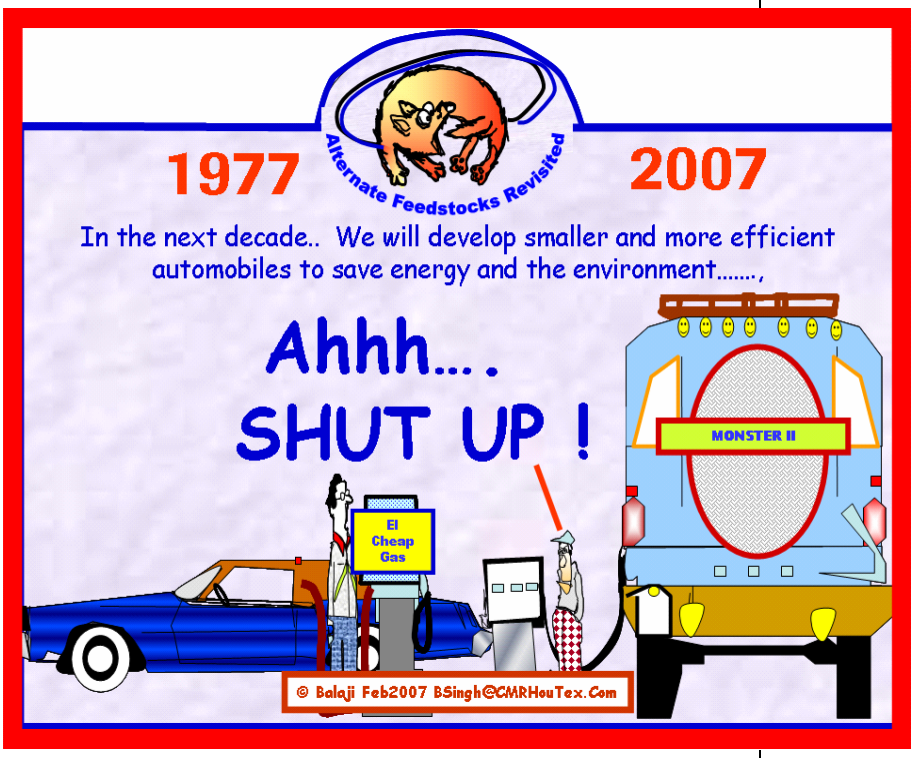
Welcome to Alternative Feedstocks for Petrochemicals and Polymers

Welcome to "Alternative Feedstocks for Petrochemicals and Polymers – Strategic News Analysis" another unique service by Chemical Market Resources, Inc. providing the analysis of latest developments for our clients in the petrochemical and polymer industry.

For Details, Just click on

✿

Next to Individual News highlight!



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joint venture for dimethyl ether production ✿

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1. Northwestern China's largest coal-chemical project starts off

The Huating Zhongxu Coal Chemical Co. Ltd.'s 600,000 tons/year coal-based methanol project obtained approval from the State Environmental Protection Administration and will begin construction soon. This is the largest project in northwest China and is located in the Gansu province of China. The total investment in the project is expected to reach USD 375 million and is scheduled for completion by June 2008.

Comments: Another of the many coal-chemical projects announced in China in recent times. The product from this plant will cater to the fuel and chemical market. The Huating Coal Group has also announced plans for a second coal-methanol plant with capacity of 1.2 million tons/year, to be followed by a methanol-to-propylene unit and finally a 300,000 tons/year polypropylene unit.

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2. Medicine Bow Fuel & Power LLC signs deal with Sinclair Oil Corp. for supply of diesel fuel from its coal-to-liquids (CTL) plant

Medicine Bow Fuel & Power LLC has signed a long-term deal to sell the diesel fuel from the planned coal-to-liquids (CTL) plant to Sinclair Oil Corp. According to the schedule issued by DKRW Advanced Fuels, the plant is expected to start construction by the end of the year and be up and running by 2010. The plant is being developed at a Greenfield, mine-mouth facility near Medicine Bow, Wyoming.

The project is expected to use an indirect liquefaction process to convert coal to refined product such as synthetic gas, from which both sulfur and carbon dioxide can be removed. Refining the synthetic gas more will result in ultra low-sulfur diesel. The coal to syngas technology will be licensed by General Electric (GE) and the Fischer-Tropsch technology will be licensed by Rentech, Inc.

The Medicine Bow plant is expected to produce a number of byproducts, including carbon dioxide and other chemicals, which can be used in other ways.

Comments: The project is one of the first large scale CTL projects in the US. The project will have a capacity of around 13,000 barrels per day with a potential of 35,000 barrels per day after expansion.

Though several companies have shown interest in CTL projects in the US, not many projects had been announced in the past. The beginning of 2007 saw a spur of activity with two US senators trying to revive a legislation aiming at tax credits for CTL plants in the US. Albermarle announced an alternative fuel technologies division focusing on catalysts for the oil sands, coal to liquids, biomass to liquids and gas to liquids technologies. Rentech announced a new CTL project in West Virginia and BNSF Railway is considering a CTL plant in Montana.

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3. Liquid phase methanol project kicks off in China

Construction of the liquid-phase methanol and Integrated gasification combined cycle (IGCC) project recently started with a total investment of USD 890 million in Economic Development Zone of Pei County, Xuzhou, Jiangsu province. The project is being funded by Hong Kong Luheng Energy Co., Ltd. and uses the world's most advanced technologies for coal gasification, liquid-phase methanol synthesis and IGCC power generation.

The project is part of an integrated mega methanol and IGCC facility. In the first stage, the company invests around USD 450 million, to build a 760,000 tons/year methanol plant and a 120 MW IGCC power facility. It is expected to start up by 2009. In the second stage, the methanol capacity will be expanded to 1.5 million tons/year by 2011.

The Xuzhou government is planning a Coal Chemical Park in the same site, and a 1 million tons/year DME project is also being considered for the purpose of developing methanol downstream industry.

Comments: The project uses gasification and liquid phase methanol synthesis process. The gasification technology is sourced from GE Energy (former Texaco Gasification), and liquid phase methanol synthesis process is licensed from Air Products. GE Energy will also provide technology for the IGCC power unit.

Air Products successfully demonstrated the Liquid Phase Methanol (LPMEOH™) technology in 2003 in Kingsport, Tennessee jointly with Eastman Chemical Company.

Outside the US most of the interest in LPMEOH™ technology has come from China, because of China's abundance of coal, historic dependence on domestic chemical production, and the amenability of the LPMEOH™ process to coal-based syngas. The commercial application of the LPMEOH™ technology with the greatest long-term potential continues to be the co-production of methanol within an IGCC power plant.

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4. Sasol plans two coal-to-liquid projects in China

Sasol, the top energy firm in South Africa, is entering the second stage of feasibility studies for

its two giant coal-to-liquid (CTL) projects in China.

Sasol began planning with Shenhua Group Co. Ltd and Shenhua Ningxia Coal Ltd for the two CTL projects in 2004. It finished preliminary studies at the end of 2005. Sasol's two projects, one in Yulin, Northwest China's Shaanxi Province and another in the Ningxia Hui Autonomous Region, are designed to produce 80,000 barrels of liquid fuels per day and will be the company's largest investment outside of South Africa.

Each plant is expected to cost USD 5-6 billion and should these CTL projects be approved, they would begin operation by about 2013.

Comments: Coal liquefaction technology for fuel development developed during the seventies was sidetracked because of the alternative source availability. Coal liquefaction under pressure with a solvent produces the most efficient capture of hydrocarbon value, simultaneously reducing the ash and other minerals.

Sasol had always been in the forefront of coal liquefaction technology. Under the current global feedstock situation, China is leading in coal based feedstock development.

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5. Single step methanol-to-gasoline production process developed in China

The one-step methanol conversion technology for the gasoline production jointly developed by the Institute of Coal Chemistry CAS and China Second Design Institute of Chemical Industry has completed pilot test in the energy chemical pilot test base.

The scale of the pilot test this time is 0.5 tons/day methanol processing, the gasoline selectivity is 37-38%, the LPG selectivity is 3-4%, the catalyst single-pass service life is 22 days and the consumption of methanol per ton of gasoline plus LPG is 2.48 tons. Product gasoline has low olefin content, low benzene content and no sulfur and the RON is more than 93. ZSM-5 molecular sieve catalyst used in the pilot test is developed by the Institute of Coal Chemistry CAS itself.

Compared with other methanol downstream technologies, the methanol conversion technology for gasoline production is relatively simple and has advantages in oil product post-treatment and oil product quality. Gasoline produced through methanol conversion can be directly used after simple processing and can also be used as high-quality gasoline ingredient in the blending of high-clean gasoline.

Comments: MTG – Methanol to Gasoline originally developed by Mobil using ZSM-5 in 1975 is still the standard in the industry. Mobil ZSM-5 process was tried on a pilot level at various locations around the world.

The major drawback of the ZSM-5 based process was that it could not produce aromatic components in enough quantities to be used as is in the Otto engines – common in most automobile engines. The restriction of this gasoline as a blending component and the changing alternate feedstock scenario of the 80s essentially put most of the related programs on the back burner.

The renewed interest in the ZSM-5 technology to produce gasoline is rising and everyone including ExxonMobil, the current owner of the Mobil's MTG process has plans to commercialize the technology.

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Exhibit 1

Then & Now

1979

Alcohol: The Fuel of the Future?
By MARSHALL SCHUON
New York Times (1857-Current file); May 22, 1979; ProQuest Historical Newspapers The New York Times (1851 - 2003)
pg. C1

Alcohol: The Fuel of the Future?

By MARSHALL SCHUON

WITH gas lines in California and spot shortages and ever-higher prices at pumps across the country, the gasoline shortage is generating some energy of its own — primarily in new research on

everybody's paying attention, and reams of reports are coming in from all over the world."

What those reports show is that gasohol and straight alcohol are feasible substitutes for gasoline with a great many technical advantages — as well as a great many drawbacks that are not only technical but economic.

supply.

The alcohol additive, called ethanol, also raises the gasoline's octane rating — eliminating engine knock — and lowers some types of exhaust emissions. Other performance claims, though, can be true or untrue, depending on the vehicle using the gasohol.

Since oxygen accounts for about half

Substituting Methyl Alcohol (Methanol) for Gasoline

Major Oil Companies Testing Gasohol
New York Times (1857-Current file); Aug 28, 1979; ProQuest Historical Newspapers The New York Times (1851 - 2003)
pg. D5

Major Oil Companies Testing Gasohol

By The Associated Press

Gasohol — the mixture of gasoline and a substance similar to vodka — is becoming big business as Americans seek a way out of their reliance on imported oil.

modifications in the automobile. Its backers say that it burns cleaner and sometimes improves mileage.

Most of ethanol in gasohol is made from corn, although sugar cane, wheat,

state taxes in several states. In fact, Texaco said it chose the Indianapolis area for its pilot project because gasohol does not come under Indiana's 4 percent sales tax.

Nearly three decades later…

THE WALL STREET JOURNAL.
Hot Topic: Very, Very Big Corn
Wall Street Journal. (Eastern edition). New York, N.Y.: Jan 27, 2007. pg. A.8

President Bush made a big push for alternative fuels in his State of the Union speech Tuesday night, calling on Americans to reduce [illegible] 20% over 10 [illegible]

THE WALL STREET JOURNAL.
Biomass Movement
John Deutch. Wall Street Journal. (Eastern edition). New York, N.Y.: May 10, 2006. pg. A.18

on by to

Today, we use corn to produce ethanol in an automobile fuel known as "gasohol" -- 10% ethanol and 90% gasoline. [illegible] subsidies

THE WALL STREET JOURNAL.
Fuel for Thought
Luiz Inacio Lula da Silva. Wall Street Journal. (Eastern edition). New York, N.Y.: Jul 14, 2006. pg. A.12

With the continual increases in oil prices, ethanol has become even more important for our country. We now add at least 20% ethanol to all gasoline sold

6. M5000 methanol plant in Trinidad shut down unexpectedly

Methanol Holding Trinidad Ltd (MHTL) was already running its M5000 methanol operations at Port Lisas at reduced rates after suffering a partial outage earlier in January when it suffered an unplanned outage and was shutdown on February 2nd. However, the plant is expected to restart in a week's time.

MHTL suffered a similar outage at the M3 unit for 12 days at the beginning of the year. The plants at M5000 were running well although they were running at reduced rates. One of the plants with reduced rates was the M1 unit, which will undergo a maintenance turnaround in April.

Besides the operational problems at the plant, gas supply was expected to be curtailed intermittently in the near-term because of work being performed upstream in Trinidad.

Comments: The MHTL M5000 plant was the second mega scale methanol plant to be constructed in the world. The plant uses the Johnson Matthey/ Davy Process Technology (DPT) syngas (steam reforming) and methanol (improved low pressure methanol) technology.

Operations at the 1.8 million MT/year methanol plant at Port Lisas, Trinidad, were similarly interrupted last year, which led to an extended shutdown and shortage of methanol that sparked a run up in US methanol spot prices.

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7. Nine companies in Japan form joint venture for dimethyl ether production

Mitsubishi Gas Chemical, ITOCHU, Japan Petroleum Exploration, Taiyo Oil Company, TOTAL Di-Methyl Ether Japan, Toyota Tsusho, JGC Corporation, Mitsubishi Heavy Industries and Mitsubishi Chemical announced plans on February 1 to establish a joint venture company for (dimethyl ether) DME production, and to construct an 80,000 tons/year DME plant within Mitsubishi Gas Chemical Company Niigata Factory.

The plant operation is scheduled to start from June 2008, and its production capacity is expandable to a 100,000 tons/year. JGC Corporation will be in charge of the construction of this plant, and Mitsubishi Gas Chemical will be delegated to plant operation.

Mitsubishi Gas Chemical will own 29.15% of the venture; Itochu, 13.25%; and JPE, 12%. The other partners and their respective shares are: Taiyo Oil Co. (10%); Total Di-Methyl Ether Japan Ltd. (10%); Toyota Tsusho Corp. (10%); JGC Corp. (5.3%); Mitsubishi Heavy Industries (5.3%); and Mitsubishi Chemical Corp. (5%).

Japanese government has mentioned DME promotion to be an important matter in their 'Basic Energy Plan', and has supported technology developments for DME production and application. These nine participants will be developing further promotion in line with this national policy.

Comments: Most DME is produced via a two-stage process that converts syngas (from a variety of feedstocks) to methanol, and then dehydrates that to produce DME. Some companies—Total among them—are working on a more efficient, one-step process for the direct synthesis of DME from syngas. The first

fuel DME production plant will use the methanol process.

Currently, the main use for DME in Japan is aerosol propellant for cosmetics and paints. However, it has already been commercialized in China as a liquefied petroleum gas (LPG) substitute because of its similar properties. It is also expected to be the future clean energy for fuel use, since it does not produce soot when used as diesel substitute, and could easily be produced from natural gas/coal via methanol.

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8. Lantian Chemicals in China starts up dimethyl ether plant

The first phase of the 20,000 tons/year natural gas based DME (dimethyl ether) project by Meishan Lantian Chemicals Co., Ltd. was put into operation upon completion of construction. The plant is located in Nanchong, Sichuan province of southwest China and required a total investment of USD 15 million.

As a clean energy alternative, DME is extensively used as alternative for LPG and diesel and also as a raw material for chemicals. Major products of Meishan Lantian Chemicals Co., Ltd. include anhydrous sodium sulfate and alkaline proteinase.

Comments: Lantian Chemical Co. will be the first DME producer in Nanchong. With the use of DME as a fuel rising in China, this one of the many DME plants coming up in China.

The other major DME projects include (1) the DME facility proposed by the Lutianhua Group in the Inner Mongolia Autonomous region with a capacity of 1 million tons/year, (2) the 200,000 tons/year XinAo Group and Methanex DME plant in Shanghai (methanol supplied by Methanex), and (3) the largest coal-DME project by China National Coal Group Corporation, China Petroleum and Chemical Corporation and the Shanghai-based Shenergy Group, with a capacity of 3 million tons/year.

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9. Coogee Resources to move forward with methanol FPSO project

Coogee Resources has announced that it will be moving forward with its methanol floating, production, storage and offloading (FPSO) project that would commercialize its own stranded gas resources off Australia's north-west coast.

The development concept is based around the construction of a floating production, storage and offloading vessel with methanol output capacity of 1.3 million tons/year. If the project is approved, first production is planned for 2012. It would be the world's first methanol FPSO. Coogee does not foresee any major technical hurdles in using compact methanol technology on a FPSO, as “a number of FPSOs with similar levels of processing weight and complexity have been commissioned in recent years internationally”.

Coogee has nearly 835 billion cubic feet of contingent gas reserves and would use the FPSO to commercialize this gas.

Discussions are on with KBR and Johnson Matthey about conducting a front-end engineering and design study at a cost of $22.5 million. The FEED would study the viability of the project, and prepare Coogee for a possible final investment decision at the end of 2008.

Coogee's parent company Coogee Chemicals owns an onshore methanol plant in Laverton, Victoria, Australia. Coogee Resources would own 80% of the methanol FPSO with Coogee Chemicals holding 20%.

The company is also developing the Montara oil project and has already awarded the major contract for the FPSO Montara Venture for completion in the second quarter of 2008. Coogee is the operator of two FPSOs located at the Jabiru and Challis oilfields off north-west Australia.

Comments: The methanol FPSO technology is best suited for remote, stranded gas assets - perhaps, with some associated liquids, however it could also be applied in the circumstances of oil accumulations with associated gas, but no gas infrastructure. Hence, it mitigates the resource (feedstock) risk by allowing facility relocation between resources. The reason not many FPSO methanol projects have been announced compared to other GTL projects is mainly because the process is capital intensive. Starchem Technologies is another company promoting FPSO methanol technology.

The Coogee FPSO plant will be based on Johnson Matthey's Leading Concept Methanol (LCM) process suited for offshore operations due to its compact design of the reformer (for syngas production).

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10. Exxon Mobil to finalize agreement with Qatar Petroleum for the Palm gas-to-liquids project

Exxon Mobil aims to reach an initial investment agreement with state-run Qatar Petroleum (QP) and issue engineering tenders for the "Palm" gas-to-liquids (GTL) project by the middle of 2007, with the intention of completing the facility by the first quarter of 2012. Exxon Mobil would then award the main construction contracts, with actual construction starting around mid-2009.

Exxon Mobil had signed a preliminary agreement with Qatar in 2004 to explore the construction of a 154,000 barrel per day (bpd) GTL plant – Palm, which would become the gas-rich state's third GTL endeavor. South African Sasol's 34,000 bpd Oryx GTL began production early this year, while Royal Dutch Shell's 140,000 bpd Pearl GTL is moving onto the construction phase.

The company already spent $600 million and issued 3,500 patents in early work researching and defining the scope of the project. It also drilled two appraisal wells last year at Qatar's North Field. The project will produce base oil stocks in addition to the synthetic fuels.

Comments: Qatar Petroleum is actively pursuing a number of world-scale gas-to-liquids conversion projects for the production of synthetic fuels and base oil stocks, with the intention of making Qatar the GTL capital of the world. Since the late-1990s nearly every major oil company including, Chevron, ConocoPhillips, Exxon Mobil, Statoil, and Texaco have announced plans to build pilot plants or commercial plants to produce synthetically derived diesel fuel through the "improved GTL process" (process with increased reactor capacity compared to older processes). The untested nature of the technology (for large scale GTL plants), the rising costs of contractors and the sheer size of the plants is something these companies should be cautious about. Shell recently admitted that the initial cost estimates of the Pearl GTL plant in Qatar had more than doubled from USD 12 billion to USD 18 billion.

The advantages of GTL fuel is that it significantly reduces the sulfur, carbon monoxide and other pollutants that are emitted from car tailpipes. The end product, depending on how it is processed and what is added, contains no sulfur and fewer nitrogen compounds than standard fuel. Although more expensive than regular fuel, it should help reduce air pollution. GTL fuel can be blended with non-complying CARB diesel fuel to make a cleaner diesel fuel complying with stringent diesel fuel standards.

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11. Chevron and Sasol explore viability of gas-to-liquids project in Australia

Sasol and oil/gas major Chevron is conducting a feasibility study into a world-scale gas-to-liquids (GTL) plant that could help Australia overcome a looming transport energy deficit.

The project estimated to cost as much as USD 10 billion, is in early stages of consideration and would be based on the 4 trillion cubic feet of gas estimated to be contained in the Wheatstone field in Western Australia.

Chevron will be leading the upstream gas field development while Sasol Chevron will be responsible for the downstream element.

The two companies have a 50-50 joint venture – the Oryx GTL in Qatar which is expected to begin deliveries of clean diesel this month.

Comments: Australia, with its vast quantities of uncommitted natural gas, offers tremendous opportunity for the development of a domestic GTL industry that could potentially provide a significant share of the Australia/ Asia fuel market. The Wheatstone field gas was discovered in 2004 in Chevron's 100% owned retention lease, which lies close to both the North West Shelf Venture gas fields and Barrow Island.

The Sasol and Chevron joint venture, Sasol Chevron has been involved in GTL projects like the Oryx in Qatar and projects in Africa.

Sasol is actively pursuing GTL/ CTL projects across the globe in countries like Africa, Qatar, China, India and now Australia. All these plants will be based on inexpensive feedstock like stranded natural gas and coal.

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12. Oryx GTL begins production

Qatar announced that production has begun in its first gas-to-liquids (GTL) plant and that fuel products will be ready for marketing from the end of March.

The one-billion-dollar project, a joint venture of Qatar Petroleum with South African company Sasol, was inaugurated in June 2006. The plant, which is 51-percent-owned by Qatar Petroleum and 49 percent by Sasol Chevron, is located at the Ras Laffan industrial city.

It will be fed from the country's massive North Field -- part-shared with Iran -- to produce 24,000 barrels per day (bpd) of diesel, 9,000 bpd of naphtha and 1,000 bpd of liquefied petroleum gas that will be sold mostly in Europe.

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13. Fraenkische selects Arkema's Rilsan® PA11 for launch of its automotive fuel lines

Fraenkische has selected Arkema's bio-based Rilsan® PA11 for the launch of conductive automotive fuel lines enhancing end-user safety.

The market leader for automotive corrugated tubing systems, Fraenkische has launched enhanced safety fuel lines for fuel pump modules using Rilperm® 2101 technology, based on PA11 Rilsan®. The new material Rilsan® PA11 would help these new fuel lines to comply with the demanding SAE automotive standards which is designed to increase passenger safety by inhibiting spark ignition in the fuel system, thus decreasing the risk of accidents.

General Motors has already replaced its non-conductive fuel-pump modules with these new conductive modules for its recent North American car models.

Arkema's patented multilayer fuel line technology Rilperm® 2101 was chosen for conductive corrugated tubing due to its unique combination of retaining a high level of conductivity in fuel contact, cold impact resistance, and excellent fitting retention.

Comments: "No surprise here! Thanks to its excellent chemical resistance, low fuel permeability and durability, Rilsan® PA (polyamide) is ideal for fuel systems applications. Rilsan® PA11 conforms to the vast majority of fuel assembly specifications of OEMs globally, including Society of Automotive Engineers (SAE) J2260. Generally, the fuel assembly components not only require excellent resistance to fuels but also need exceptional resistance to harsh fluids and chemicals. Rilsan® PA11 delivers superior resistance against these chemicals and more, overcoming the stress–cracking failures of lower performing polyamides such as PA6. Beyond fuel resistance, specifications require good impact resistance at –40° C and good mechanical resistance. Resistance to vibration, abrasion and fatigue are additional key requirements for reaching the needed durability performance. Safety is the key word for such applications. Rilsan® PA11 conforms to most of the global specifications and standards, not the least of which is SAE J1645 for fuel vapor line applications. Thanks to its superior performance properties Rilsan® PA11 is clearly a reliable alternative to rubbers (especially fluoroelastomers) and metals.

Arkema's products are "green" - based on the bio-born Rilsan® PA11. Recently, Rilsan® PA11 won a European 2006 Bioplastic Award for its impressive compatibility with Biofuels and other aggressive fuels. Arkema has also developed another product for use in biodiesel lines - "M-BESN Noir P210TL" offering outstanding chemical and mechanical aging resistance to bio-diesel at high temperatures. The bio-based PA, which is derived from castor seeds, can be mixed with conductive grades of PA to develop products that require electrical conductivity. This "green" product has already been approved by the automotive contractors in Europe and Brazil."

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14. Fujifilm to switch to plant-based acetic acid for its cellulose triacetate film

Fujifilm Corp. is stepping up research to switch from petroleum-derived to plant-based acetic acid as raw material for the manufacture of its triacetyl cellulose, or TAC, film. The film is

currently made mainly from natural cellulose from cotton and pulp, and acetic acid produced by a petrochemical process.

The company's efforts to increase its use of plant-derived raw materials stem from a capacity expansion in October 2006, when it established its new production base Fujifilm Kyushu, raising its capacity of the film to 330 million sq.m/year.

Plant-based acetic acid can be produced by reacting biomass-derived methanol with carbon monoxide or by oxidizing bioethanol. The company said that it considers it "more realistic to use bioethanol, which is increasingly produced from biomass," and will launch a study for bioethanol oxidization technology on a preferential basis.

Fujifilm intends to select a suitable raw material for bioethanol this year and establish a production process for commercialization after two years. The company thinks with regards to cost, they will be on a par with the existing process once a certain production volume is reached.

Comments: Using the petrochemical route, acetic acid is produced from methanol via natural gas/ coal. Another process to manufacture acetic acid is via butane oxidation. There are several producers of acetic acid who either produce it on-purpose or recover it as a by-product during the manufacture of PVOH, EVOH or cellulose acetate.

In the alternative routes via natural resources, there has been research conducted in the area of production of acetic acid via fermentation. Under this research, a seven-year plan for technical evaluation, process development, and piloting of fermentation-derived acetic acid production technology was developed, with the target of commissioning the first plant in 2010.The four major project tasks include: (1) Economic and energetic valuation of acetic acid production, (2) Bioconversion of C1 feedstocks and acetate, (3) Separation and purification, and (4) Integration of the production and purification. Manufacture of acetic acid via bioethanol or biomethanol is another route to manufacture of acetic acid via natural resources.

Acetic acid is the only raw material that is produced from petrochemical feedstock that is used in the manufacture of triacetyl cellulose.

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15. Lyondell signs bio-ethanol supply agreement with CropEnergies AG

Lyondell Chemie Nederland B.V., a European subsidiary of Lyondell Chemical Company, has signed a multi-year bioethanol supply agreement with CropEnergies AG, Mannheim.

Under the agreement, Lyondell will purchase bioethanol from CropEnergies AG's facility in Zeitz in Saxony-Anhalt, Germany, to be used in the production of bio-ETBE at the Lyondell plant in Botlek, The Netherlands.

This agreement would help satisfy the recent German and Dutch bio-fuel blending obligation laws that resulted from the 2003 EU Bio-fuels Directive.

Bio-ETBE is produced by reacting renewable bio-ethanol from agricultural materials, such as grain and sugar beets, with isobutylene. The resulting product is a clean-burning and high-octane bio-fuel component for blending into gasoline.

Lyondell first began producing bio-ETBE in the late 1990s at its Fos-sur-Mer, France, facility and in 2006 increased its production by 300 percent. Lyondell supplies bio-ETBE to major oil companies and independent gasoline producers

and retailers throughout Europe. Lyondell expects to begin production of bio-ETBE at its Botlek facility during the first quarter of 2007.

Comments: CropEnergies is a European producer of bioethanol for the fuel sector. It has subsidiaries in Germany, France and Belgium and operates the Europe's largest bioethanol-producing plant at Zeitz, in Saxony-Anhalt, Germany.

The company believes that bioethanol is an attractive alternative to fossil fuels, high-performing and economical. Other factors that make bioethanol attractive include: (1) bioethanol is produced from regenerative raw materials and will therefore be available on a long-term basis, (2) bioethanol is a climate-friendly solution: a source of energy which contributes to the reduction of CO_2-emissions and the greenhouse effect and thus improves the quality of life, (3) with bioethanol, the dependency on fossil fuels, and thus on the continued inflation of oil and petrol prices, is reduced, and (4) by constructing domestic bioethanol production facilities, a new branch of industry is created which will have positive effects of the whole range of economic value-chains as well as on the labour market. In particular, the agricultural sector profits from this development, since the farming industry is presented with new perspectives.

The bioethanol will be used by Lyondell to produce bio-ETBE. Bio-ETBE (ethyl-tertio-butyl-ether) is a fuel produced on the basis of bioethanol. The percentage of bio-ETBE that is calculated as biofuel is 47%. ETBE in gasoline contributes to a better air quality by reducing emissions of, amongst others, carbon monoxide and volatile organic compounds. ETBE is also recognized as a valuable high octane gasoline blending component. In March 2006, SABIC Europe announced the start of production of bio-ETBE at its Geleen site in the Netherlands.

These investments are prominent in Europe due to the European Union's implementation of the Bio-Fuels Directive within its member states.

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16. Alcar Chemicals firms up its international licensing program

Alcar Chemicals Group Inc. announced that it was firming up its international licensing program with intensified negotiations in South East Asia.

According to the company, Alcar Chemicals Group is being courted by a number of companies based in Europe, India and South East Asia to license its proprietary technology for the manufacturing of ethanol and polyols from biomass such as non-food crop as well as agricultural and forestry waste. Alcar Chemicals Group was asked to the negotiating table by an Asian licensor with plans for an initial four full scale ethanol plants in Thailand and Malaysia, where a vast amount of waste from sugar cane, rice and other fast growing crop still remain completely unutilized. The potential licensor plans the production of ethanol from cellulose under a licensing agreement using the proprietary technology developed by Alcar. In addition to licensing, the interest was expressed to participate in the funding process in order to accelerate the scale up engineering and implement the planned facilities.

Comments: Alcar Chemicals has a proprietary technology to manufacture plastics and polymers raw materials from renewable natural resources, specifically non food crop, and agricultural and food industry waste. The company converts biomass to polyols, ethanol, and water which are then separated and dehydrated. Polyols and ethanol are then used to synthesize plastic raw materials, polymer intermediates, and biodiesel. The raw materials

produced from this method include glycerol, ethylene glycol, propylene glycol, ethanol, and biodiesel.

Alcar Chemicals claims that its technology is economical with an investment requirement of $22 million for 120,000 ton production capacity. In addition the company believes that it has lower operating costs due to: (1) high conversion rate and efficiency, (2) lower pressures and temperatures, and (3) non-food crop and organic waste as main feedstock.

The company is based in Canada and is now firming its international licensing program. The company is licensing its technology and selling the required reactors for production outside Canada. The target areas will be countries that are looking for technologies based on alternative feedstock to maintain competitive advantage.

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17. Gujarat State Fertilizer and Chemical Ltd. explores possibility of manufacture of lactic acid and poly-lactic acid

The state-owned fertiliser company Gujarat State Fertilizer and Chemical Ltd (GSFC) has embarked upon an expansion drive involving an investment of USD 100 million (Rs. 440 crore). The company is examining the possibility of manufacturing lactic acid and poly-lactic acid for the production of biodegradable polymers. Considering the higher demand of melamine in the domestic markets, GSFC plans to set up third melamine plant with an investment of USD 31 million (Rs. 140 crore).

The company is also considering expansion and debottlenecking of some of its plants. Also, the ammonia-1 plant will be converted into a methanol plant, for which the company is infusing USD 60 million (Rs. 260 crore). GSFC has entered into an agreement with Tunisian company for procuring phosphoric acid. The total project cost of this joint venture is USD 202 million. He added that the management of the company has accorded in principal approval for setting up sulphuric acid plant at the cost of USD 10 million (Rs. 40 crore). This plant will cater to the needs of company's Sikka plant. In addition, the company has also decided to focus more on Clean Development Mechanism (CDM) projects.

Comments: This will be the first biopolymer plant in India. Among the different types of biopolymers, polylactic based biopolymers have established their market presence compared to others. The different types of biopolymers developed include (1) Starch-based biopolymers, (2) Lactic acid based biopolymers, (3) Biopolyesters, and (4) Polyvinyl alcohol based biopolymers. GSFC is one of the public sector companies in India involved in fertilizers (45%) and chemicals (55%). Due to the company's association with fertilizers, this is a good fit for the overall strategy.

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Exhibit 2
Capacity/ Expansion Announcements

Company	Location	Capacity KT/Year	Plant Type	Expected Start-up
Togliattiazot	Russia	1000	Methanol	2007
Huaibei Linhuan Coal Coking Plant	Anhui,China	200	Coal-to-methanol	2007
Huating Coal Group	Beijing, China	600	Coal-to-methanol	2008
Luheng Energy and Chemical Engineering Ltd.	Xuzhou City, Jiangsu Province, China	1,500	Coal-to-methanol	2011
Townstar Industry Co. Ltd.,	Shanxi, China	200	Coal-to-methanol/DME	2008
Shaanxi Chemical Industry Company Ltd.	Shanxi, China	30	1,4-Butanediol	2008
Fuel DME Production Co.	Niigata, Japan	80	Fuel DME	2008
Shenhua Ningxia Coal Ltd	Ningxia, China	210	Coal-to-dimethyl ether	2013
		600	Coal-to-methanol	2013

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