1998

South America Biodiesel Program

The National Biodiesel Board

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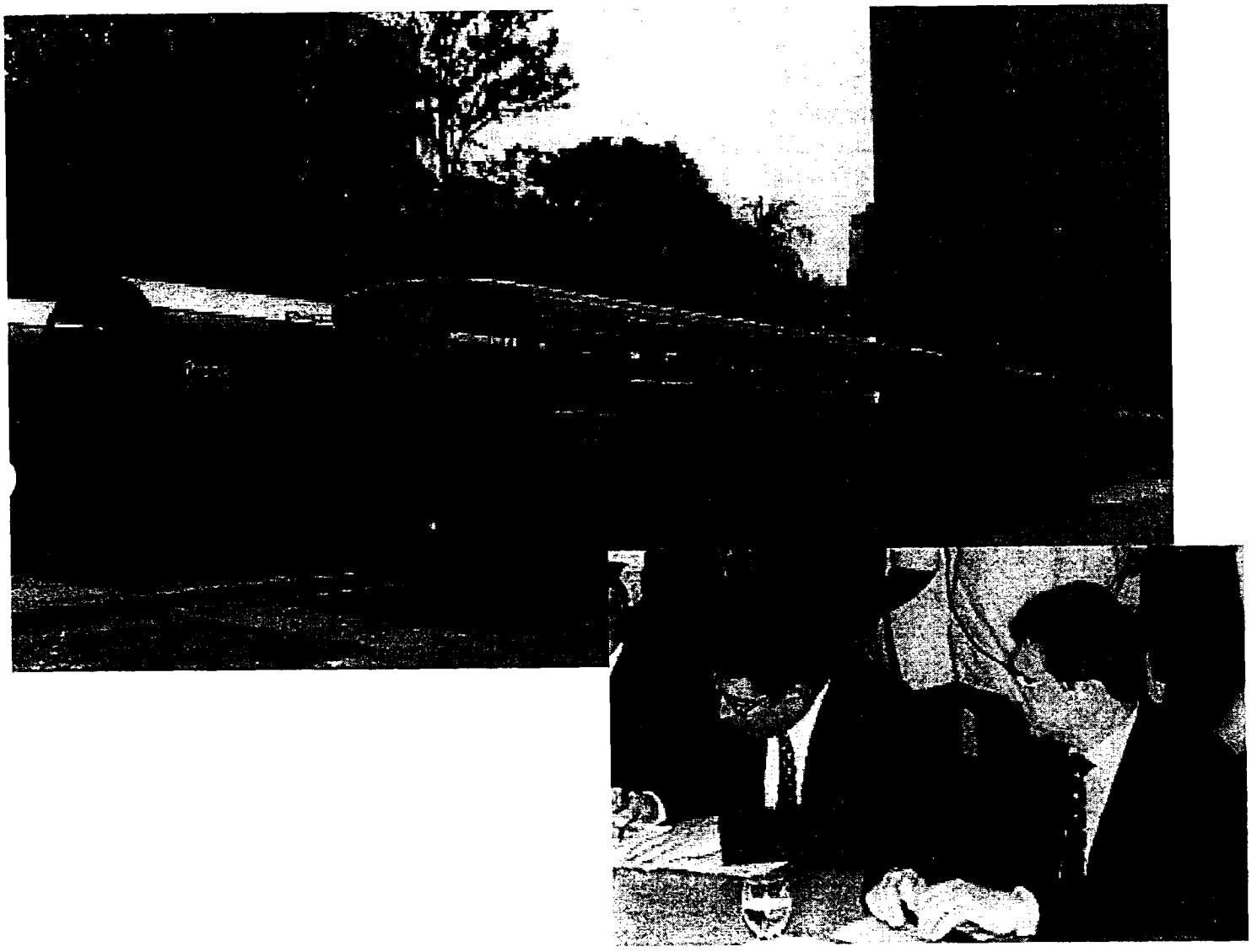

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Biodiesel, a diesel fuel substitute produced from renewable resources such as soybean oil, has demonstrated potential as a particulate matter and CO_2 reduction strategy for transportation markets. Although not currently in commercial production or use, biodiesel is not a new fuel to South America. In fact, research activities date back to the 1970s. As a result of the OPEC crisis, a significant amount of research on biodiesel and ethanol was conducted by the Brazilian government. However, the program was canceled before significant levels of research could be conducted. Concern over the environment and the amount of energy that is imported on an annual basis, combined with global soybean marketing issues, have spurred the recent activities to commercialize biodiesel in Brazil and Argentina.

Drawing from the US experience, various research, regulatory and marketing hurdles exist and must be addressed prior to biodiesel's introduction and acceptance into any market. The National Biodiesel Board (NBB) initiated this United Soybean Board (USB) sponsored program by developing an assessment for the South American participants to complete. The intent of the assessment was to determine issues which need to be addressed in order to introduce biodiesel into the transit market in Brazil and Argentina. In addition, the NBB was responsible for the following specific portions of the USB funded Mercosur Biodiesel Project.

- ✓ coordinate fuel logistics
- ✓ develop test protocols
- ✓ train South American in-country managers for the project
- ✓ ensure satisfactory fuel quality
- ✓ troubleshooting for the project
- ✓ preliminary examination of marketing issues for biodiesel use

The overall objective of the demonstration program was to collect reliable information that would allow transit companies and other interested parties to compare the performance of buses fueled with a biodiesel blend to petroleum diesel fuel. The NBB prepared a complete briefing book (see appendix II) for the in-country managers and conducted a training session in the US the first week of June, 1997. During this session, the Brazilian and Argentine managers were introduced to biodiesel's attributes as well as considerations for use. In addition to summarizing activities of the NBB for the USB funded Mercosur project, this report addresses general marketing issues for biodiesel production and usage in Brazil and Argentina.

Soybean production is a significant contributor to the Brazilian economy. In addition, the majority of Brazil's population resides in cities along the coast. This concentration of people has created serious pollution problems in those cities. Furthermore, Brazil is a net importer of energy sources and heavily dependent

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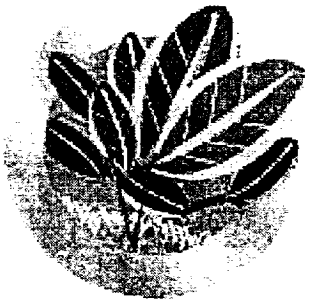


upon diesel powered vehicles to transport products. The combination of these factors create an environment which may be supportive of a biodiesel industry. With government support and proper handling of regulatory issues, biodiesel could become a viable product in Brazil. Much attention has been given to the level of government support afforded in the Brazilian market, specifically in the State of Parana. It should be noted, however, that while governmental support is an important factor in the adoption and implementation of biodiesel programs, it is not a primary factor for securing fuel sales. The adoption of biodiesel as a viable fuel source will eventually return to bottom line economics (what is the cost benefit analysis for biodiesel compared to other alternatives which can accomplish the same goals?).

The conditions in Argentina appear to be different from those experienced in Curitiba, Brazil. The primary market drivers for biodiesel commercialization in Argentina are weak compared to Brazil. The compulsion to create biodiesel markets is generally founded on one or more of the following elements: economic development; environmental improvement; and/or energy security. Of these factors, only economic development seems to be of interest to potential Argentine industry stakeholders.

In the Argentine case, if the environmental agencies begin enforcement of pollution limits then biodiesel blends will compete with compressed natural gas. If the agencies do not enforce emissions legislation then biodiesel blends will compete with the diesel fuel market. Given the strong level of interest from the agricultural industry, consideration should be given to including biodiesel into the petroleum infrastructure in low levels. This concept could be sold on the aspects of economic development by a strong agricultural contingent.

Biodiesel is not a new fuel to South America. In fact, research activities in South America date back to the 1970s. As a result of the OPEC crisis, a significant amount of research on biodiesel and ethanol was conducted by groups such as the Brazilian government. The general conclusion at that time was that vegetable oils needs to be esterified to be used with compression ignition technology. However, the research program was canceled before significant levels of research could be conducted. Concern over the environment and the amount of energy that is imported on an annual basis combined with global soybean marketing issues have spurred recent activities to investigate the commercial potential for biodiesel in Brazil and Argentina.

The purpose of the program completed by the National Biodiesel Board (NBB) was to coordinate fuel logistics, develop test protocols, train South American in-country managers for the project, ensure satisfactory fuel quality for the United Soybean Board (USB) funded biodiesel demonstration project, and a review of market conditions, favorable and unfavorable, for supporting a successful biodiesel industry in Brazil and Argentina. The purpose of this report is to assess the potential for a sustained Brazilian and Argentine biodiesel market. This report will also provide a summary of NBB's involvement with the South American demonstration activities.

While the overall business climate appears to be quite robust in Argentina at the time of this writing, there is currently no significant federal or state legislation, in place, that could contribute to the development of an alternative fuel marketplace founded on factors other than BTU (British Thermal Unit) based price-competitiveness. Argentina is currently a net exporter of both refined petroleum products and natural gas. The recently-privatized state petroleum company, Yacimientos Petroliferos Fiscales Sociedad del Estado (YPF), has become a symbol of the new national economic success. This industry would have to be placed in a disincentive position for bio-based fuels to successfully compete. Although supportive, the current agribusiness/farm lobby may not be strong enough to accomplish this within the framework of existing government priorities and policies. Initial research indicates that neither locally produced ethanol nor methyl-soyate could compete successfully with the more traditional transportation fuels based on price for BTU value. A focused agricultural lobby that harnessed all of the rural economic support and environmental benefits of biofuels, would still find success politically improbable.

Adding further complexity, there currently does not appear to be an organized agricultural body capable of asserting the kind of political pressure necessary to complete the basic regulatory and licensing procedures required. Even if support was obtained, success will also be dependent upon acceptance by the petroleum industry, specifically companies such as YPF. The government's current economic strategy ties the growth of transportation fuel exports to the overall economic growth and vitality of the country.

Brazil, on the other hand, appears to offer several opportunities for the development of a biodiesel industry. Without taking environmental factors into consideration, Brazil still exhibits two major drivers for the use of biodiesel. Energy security is a significant issue in Brazil. Brazil is a major importer of petroleum products; importing over 50% of its diesel fuel needs. In addition, Brazil is soon to be a major importer of natural gas from countries such as Argentina and Bolivia. Brazil is also a major producer of soybeans with an estimated 30 million MT crop to be harvested in 1998. By comparison, US soybean farmers produce approximately 70 million MT of soybeans each year. The countries of Brazil, Argentina, and the United States account for over 80% of the world's soybean production.

Energy needs and biofuel production potential appear to be magnified in the western states of Brazil such as Mato Grosso, Mato Grosso de Sul, Amazonia, etc. Consumers/farmers in these areas pay a premium for diesel fuel and soybeans are normally discounted by R$2/bag (60 kilograms) due to transportation costs. The majority of the Brazilian population resides within 30 miles of the coast resulting in cities with significant population thereby creating significant pollution. Regulations do exist in Brazil that limit the levels of pollutants from vehicles. These regulations are enforced to varying degrees. Alternative fuel use is currently limited. However, gasoline sold in Brazil does contain 23% alcohol by volume produced from sugar cane. In addition, new rules are prompting the use of compressed natural gas and the recent implementation of the governments "green fleet" program which is to operate on environmentally friendly fuels, demonstrate a movement toward non-petroleum sources.

This report will provide some insight into the potential for production and usage of biodiesel in Brazil and Argentina. Commercialization of a regulated product, such as biodiesel, is an enormous task. It requires significant effort and political support to establish a foundation for reoccurring production and sales. The USB project has been a stimulus for biodiesel advocates in these two countries. However, commercialization will require additional activity and South American resolution of several issues prior to biodiesel introduction and widespread commercialization.

Drawing from the US experience, research and regulatory hurdles do exist and must be addressed prior to biodiesel's acceptance by original equipment manufacturers (OEM's), regulating entities, and consumers. Prior to the initial trip to the cities of São Paulo, Curitiba, and Buenos Aires, NBB developed an assessment (see appendix I) for the in-country project managers to complete. This assessment was used to define the major issues that existed. Although many research issues have been addressed by US or European researchers, South American entities prefer to conduct their own studies. Although demonstrations occurred in Curitiba and Buenos Aires, some regulatory issues remain unaddressed. Technical acceptance must also occur before biodiesel will be accepted in these coun-

tries. These issues must be addressed prior to stimulating large levels of consumer opinion/support for the fuel. Therefore, the regulatory and technical issues must be resolved prior to further marketing activities being pursued.

The information that is presented in the following sections should be considered a preliminary analysis of the market drivers for biodiesel use and the issues that must be resolved. It is not intended to be a comprehensive market analysis or business case study for the use of biodiesel in Brazil and Argentina. South American groups that continue with the commercialization activities should be encouraged to expand this work and develop a commercialization strategy as the next step in the effort. Results from the demonstration activities will be summarized and provided by the ASA South American project managers.

Brazil is currently enjoying a strong and growing economy. It has been a decade since the end of military rule. Brazilian President Fernando Henrique Cardoso looks well placed to win another six years in power in the presidential election to be held next year. This is largely due to the transformation of the Brazilian economy. Capital retention and foreign investment are up significantly, not surprising since inflation has been under control for most of the 1990s. A vast privatization plan for government assets is well underway and, in spite of strong protest from some sectors, so far has been very successful.

For much of this century Brazil has been one of the world's fastest growing countries and now boasts the eighth-largest economy. On the measure of GDP it is in the same category as China and much bigger than Russia or India. Yet Brazil's consistent inability to perform up to expectations has denied it the recognition its size merits.

Most political scientists and sociologists feel that the core of Brazil's historical problem as an economic underachiever could be summed up in one word: inequalities. There are deep economic divisions within Brazilian society. Brazil's political parties are archaic and fragmented and the voluminous constitution drawn up a decade ago to escape from military rule is so unwieldy that government officials can easily use it to protect corruption while blocking any attempt at social change.

For awhile, during the swift industrialization of the early 1970s, it looked like Brazil might become the first developing country to join the ranks of the G7 (G8) countries. Then came the sharp rise in the price of imported oil, and the nightmare of a debt moratorium, hyperinflation and stagnation.

What has made a difference in the 1990s? The first big change has been the sweeping away of economic protectionism spawned by military nationalism of the 1970s and 1980s. At 14%, the average import tariff remains high by G7 standards, but it is low enough to give Brazilian consumers a taste for imported goods and to have exposed many local firms to international competition.

The second change has been curtailing state ownership. All developing countries go through privatization cycles, but most divest only token assets. The fervor with which the Brazilian government divested Companhia Vale do Rio Doce (CVRD) this last spring can be viewed as a measure of privatization sincerity.

But the third change is given most credit for the recent prosperity; Price stability. In mid-1994 Cardoso introduced his real plan, named after the new currency. At 10% last year, the country enjoyed its lowest inflation since the 1950s. It is hard to exaggerate the significance of that. Brazil had tried to deal with inflation not by attacking it but by seeking to live with it, through the world's most ingenious

system of indexation. Prices and wages were adjusted weekly by Banco Central do Brazil It encouraged businesses to rely on accounting profits rather than actual profits and, with half the work force outside of the official economy, the inequalities became sharply worse. Additionally, not surprisingly, in a world of conveniently shifting prices, it allowed government officials to enrich themselves relatively easy through different accounting techniques.

The end of inflation has brought with it notable positive benefits for the Brazilian economy. As many as 10 million people have been "readmitted to the ranks of consumers". Brazilian firms can plan for the longer term and can attract foreign capital to modernize. Perhaps as much as 20% of the workforce has returned to being paid in "over the table" wages. But, while there is no doubt that ending inflation has helped Brazil in the short run, critics suggest that current government policies are unsustainable.

The Real Program (designed around the Brazilian currency) is based on (1) a strongly supported currency, (2) a conservative fiscal spending policy and (3) lenient tax treatment for trade. In reality, the real is probably overvalued which means that imports are being sucked in at an alarming rate. The current account deficits are huge: equal to 4-5% of GDP for 1996 and 1997. This is also at least partially exacerbated by foreign investment in Brazilian CDs which will leave for greener pastures as soon as interest rates climb elsewhere. Critics feel that Brazil is headed for the kind of currency crisis that hit Mexico in December of 1994.

Supporters of the Real Program point out key structural differences between Brazil today and Mexico three years ago. Mexico's privatization plan had largely ended. Short-term borrowed foreign money was being used to cover current account deficits. Brazil has just begun to privatize and will offer perhaps 50 billion dollars worth of public sector companies in the next few years providing once-off receipts for settling current account deficits. By the time privatization is complete, foreign direct investment should become indistinguishable from local investment.

Monetary rigor, though, is usually hard to sustain. It will be interesting to watch what course Brazil takes. Governments traditionally find it difficult to resist the temptation of dealing with a trade deficit by either devaluing or increasing import tariffs. In the long run, Brazil will need to increase its exports and tighten internal fiscal policies. This will be difficult. Brazil's exports are just 7% of GDP which is even lower than India for example. Brazil has a large domestic market and historically this hinders exports.

In an attempt to deal with infrastructure problems in the transportation sector, the government plans to auction-off the remaining public railways and encourage private investment in some of the main roadways. Plans have been made to

privatize Santos, South America's largest and most inefficient port. It also is in the process of revising import/export financing requirements to discourage hard-currency sales for short-term import finance.

While long-term balance of trade strategies are at least promising, the most difficult fiscal problem facing Brazil will be to cut public spending even further. Roughly 80% of federal government spending goes to wages and pensions. Some well-paid federal employees and former federal employees have never even existed. The Brazilian constitution makes an overhaul of this system of posthumous patronage almost impossible. There are two constitutional amendments pending that could streamline federal payroll and pension programs but both are hopelessly bogged down. Eventually Cardoso will have to give-up something valuable to push these through.

Government spending will have to come down if Brazil wants to avoid the pointless currency devaluation of the past. Spending restraint would permit interest rates to fall by decreasing government demand for credit. It would also increase capital formation and local investment, the two most elusive commodities in all of Latin America.

Brazilian Energy Security

Brazilian Energy Production and Dependence on Petroleum Sources

The Brazilian economy is heavily dependent upon diesel fuel and other petroleum products. As a country, Brazil imports 50% of its diesel fuel. According to Dr. Nedo Eston de Nedo of Insituto de Pesquisas Tecnologicas, Brazil would like to limit diesel fuel imports in order to lower its dependence, however Brazil's refineries were built before diesel came into such high demand and the capacity doesn't exist.

Looking Past the Coast

Brazil's dependence on diesel fuel for the transport of freight in conjunction with the geographic location of the oilseed crushing industry and the vast distances in Brazil could create an opportunity for Brazil's alternative fuel industry. Brazilian farmers located away from the coast in states such as Mato Grosso must transport their fuel and protein needs from the coast and also transport their crops to market; typically receiving $2/bag less for their soybeans. Capturing these margins may provide favorable conditions for a biodiesel processing industry in these regions.

Legally, only vehicles with cargo capacity of 1000 kilograms and greater can have diesel engines. Therefore, de facto, diesel-powered vehicles are primarily used by agriculture, the military, freight transport and mass transit. According to the Associacao Nacional dos Fabricantes de Veiculos Automotors, ninety percent of all intercity cargo is shipped by diesel powered trucks and ninety percent of all passengers travel by

diesel buses between cities. The significance of diesel powered engines for the transport of Brazilian citizens can be highlighted by the number of buses that are required in key cities. Table 1 details the number of buses that operate in the cities of Rio de Janeiro, São Paulo and Curitiba. By comparison, the City of St. Louis utilizes approximately 700 buses and the Kansas City Area Transportation Authority operates 200 buses on a daily basis.

Table 1. Urban transits in major Brazilian cities.

City	Number of Bus Companies	Number of Buses
Rio de Janeiro		5,700
Sao Paulo	40	10,500
Curitiba	15	2,000

Alternative Fuels Programs

Brazil's concern with energy security became apparent in 1974 with the Middle East oil embargo. Prior to that point in time, there is considerable debate as to the extent of Brazil's energy policy, let alone an energy security policy. As a result of the oil embargo, Brazil launched two programs: Proalcool and Prooleo.

The Proalcool program, for Otto cycle engines, has resulted in 4 million cars operating on 100% alcohol. However the number of vehicles operating on 100% alcohol is on the decline. The Brazilian government no longer mandates that 50% of all new cars produced in Brazil be powered by alcohol. As a result only one percent of new cars sold today are designed to be powered by 100% alcohol; a decline from 95% over the last decade. This fact could influence the commercialization of biodiesel and will be discussed in a later section.

The Prooleo Program, for diesel cycle engines, was also launched in the 1970's. Several major OEM's participated with the program including Volkswagen, Scania, and Mercedes. This program was canceled in the early 1980s. Technically, research conducted through this program indicated that burning unrefined vegetable oils was not acceptable for long-term performance and vegetable oils should be esterified.

Brazilian Environmental Conditions

The City of São Paulo provides a prime example of the conditions that exist in Brazilian cities. São Paulo is truly a megacity and needs to be discussed almost as a separate entity. With 70,000 factories and 2.2 million skilled workers, São

Paulo produces more wealth, as measured in industrial GDP, than Argentina, Uruguay, Paraguay and Chile combined. São Paulo is a city that transacts 65% of all Latin America's stock market activity. Motor vehicles are responsible for 90% of a total of three million metric tons of annual pollution. Diesel powered vehicles are a major factor in this equation.

According to Alfred Schwarz, director of CETESB (the São Paulo state environmental authority), diesel powered trucks and buses (only 8.5% of all vehicles circulating in São Paulo) are responsible for 81% of NOx emissions, 28% of the carbon monoxide emissions, 30% of the particulate matter, 77% of the sulfur emissions, and 53% of the hydrocarbon emissions. CETESB has the ability to regulate which fuels or fuel additives are used by fleets in the city of São Paulo and is a powerful regulatory body. As in other major Brazilian cities, lines are purchased by bus companies, but the companies have little political control over CETESB.

Table 2. Brazil's production of trucks and buses (1994)

	Units Produced	Domestic Sales	Export
Trucks	64,137	60,722	22,816
Buses	17,435	10,313	8,284

Winter temperature inversions block the pollution into São Paulo, like in Los Angeles. These inversions have resulted in regulations which limit who's allowed to drive during daylight hours. Drivers are not allowed to drive one day a week, according to their license plate numbers. Recently, CETESB has become increasing strict on enforcing this regulation. During the summer of 1997, approximately 20 percent of the vehicles that passed through the city (total: 4 million daily) were not allowed to drive one day a week. The economic impact of this strategy could be measured against the added cost of biodiesel blend. CETESB has also created other programs to address pollution issues.

Table 3. Vehicle population in the city of Sao Paulo (percentage).

Diesel trucks	2.4
Diesel buses	6.1
Gasoline motorcycles	3.2
Cars (alcohol & gasoline)	88.3

PROCONVE

The greater São Paulo area, where 30% of the 14 million vehicles of the country circulate is a field test for PROCONVE - Program for Control of Air Pollution caused by Automotive Vehicles. This program was started at CETESB and was established at the federal level by Resolution 18, on May 6, 1986. PROCONVE created a plan for a gradual reduction of the emission of pollutants by light vehicles (cars) and heavy vehicles (buses and trucks). Following the steps of the best programs in developed countries, PROCONVE adopted diversified procedures for the feasibility of the industrial know-how, already existent, adapted for Brazilian conditions and needs.

Three years ago, CETESB began issuing smoke tickets, for the first time ever. The smoke tickets are issued by Proconve inspectors and/or policemen. It is a $100 on-the-spot fine for emitting too much smoke. How do they measure it? By sight. If the officer says your vehicle is smoking too much you are in violation. In Rio de Janeiro on the other hand, FEEMA maintains regular sites where city buses must stop and undergo occasional inspection including smoke tests.

For light- duty Otto cycle engine vehicles, PROCONVE has proposed three stages:

1. As of January 1, 1989, OEM standard of: 24.0 g/km (grams per kilometer) of carbon monoxide (CO), 2.1 g/km of hydrocarbons (HC), 2.0 g/km of nitrogen oxide (NOx), and, in low speed, having to show a 3% CO content. Utilitarian vehicles (not cars) had a longer time-limit, up to 1992 to show these emission levels.

Table 4. Relative emission offenders in the City of Sao Paulo.

	PM	CO	NOx
	-- percentage --		
Cars (gas only)	10	0	0
Cars (gas and ethanol)	0	68	16
Buses and trucks	30	28	81
Factories	10	2	3
Motorcycles	0	2	0
Other	50	0	0

2. 1992 - In that year, the new vehicle OEM standard: 12.0 g/km of CO, 1.2 g/km of HC, 1.4 g/km of NOx, and show a 2.5% CO content in low speed. Also in 1992, alcohol cars had to obtain, according to CONAMA Resolution 3, a limit of emission of 0.15 gram/km of aldehydes.

3. 1997 - It is the last stage of the plan to be carried out. The fixed OEM certification emission indexes are: 2.0 g/km of CO, 0.3 g/km of HC, 0.69 g/km of NOx, and the CO content in low speed shall reach 0.5%. For alcohol engines, the goal for 1997 for emission of aldehydes is 0.03 grams per kilometer.

For diesel engines the PROCONVE plan proposed three resolutions covering three stages to be met:

1. For higher control of particulate matter (soot), in 1987 regulations on total exhaust based on cylinder content were passed. Basically, a mandatory ratio between air-intake and soot exhaust.

2. In 1988, the new urban buses had to hit emission standards for carbon gases: CO, CO2 and HC. Also, 1989 regulations required a tighter configuration on the adjustable components of injector pumps.

3. According to CONAMA Resolution 10, on September 14, 1989, the following emission limits for Diesel cycle engines were established for 1993 and 1995.

For 1993:
11.2 grams per kilowatt-hour (g,/kWh) of CO
2.8g/kWh of HC
18.0 g/kWh of NOx

For 1995, the CO and HC indexes remained the same and the NOx limit was lowered to 14.4 g/kWh.

If the plan proposed by PROCONVE is successful, by the end of the century the total volume of pollutants emitted by vehicles into the air of the metropolitan area of São Paulo will be reduced by 60%. These indexes were set with the objective of obtaining the performance today shown by the vehicles in circulation in countries like the United States and Japan. PROCONVE eventually will require the use of the best technology available in order for the plan to be fulfilled.

Agriculture and Economic Development in Brazil

Soybeans are a significant contributor to the economic activity in Brazil. Total soybean production is now placed at 26.5 million metric tons (MMT) for the 1997 marketing year. Estimated planted area to soybeans in Brazil for 1997 was maintained at 11.8 million hectares. Brazil's number one soybean-growing state for 1997 was Parana where production was placed at 6.7 MMT.

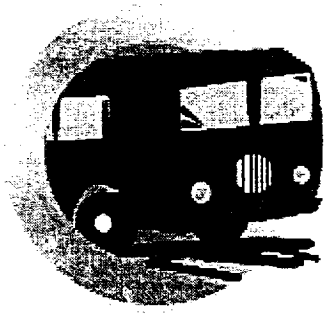
Soybean exports for 1997 are now estimated at 7 million tons; up almost 17 percent from ASA's last estimate. High international prices for soybeans, the removal of the value-added tax ("Imposto sobre Circulacao de Mercadorias e Servicos"- ICMS) on soybean exports, and the ending of the tax differential that crushers had previously enjoyed on exports of soybean meal and oil, explain this increase in soybean exports. As of April 15, 1997, over 5.5 million tons of the 1997 soybean crop had been registered for export with the Brazilian Government's Secretariat for Overseas Trade (SECEX).

Because of expected record soybean exports for 1997 the volume of Brazilian soybeans available for crushing has been revised downward to 19 million tons. Brazil will be required to buy record amounts of soybean oil and meal from Argentina this year. Soybean meal and soybean oil production are now estimated at 15 million and 3.58 million tons, down almost 5 percent for both products. Soybean meal and soybean oil export estimates have also been lowered, reflecting the lower crush. Soybean meal and soybean oil exports are placed at 9.6 million and 1.05 million tons, respectively. To make up for the domestic soybean shortfall, it is expected that Brazil's soybean import requirements will rise. To this end, the US Embassy has increased its estimate of soybean imports from 600,000 to 1.1 million tons.

Soybean production is significant for several specific states. Soybean production in the state of Mato Grosso was estimated at 5.3 million tons and 2.5 million tons in Goias. Soybean production in São Paulo was estimated at 1.3 million tons based on 574,000 hectares of planted area. Yields were estimated at about 2.3 tons per hectare. Soybean production is estimated between 530,000 and 550,000 metric tons in the state of Santa Catarina.

In addition to the significance of soybean production, other economic development activity in Brazil relates to a potential biodiesel industry. There has been a recent agreement by Detroit Diesel Corporation to manufacture diesel engines in Curitiba for the North American market. The state of Parana is the only region in South America that offers East-West rail service linking the Atlantic and Pacific Oceans. In order to make this transportation corridor attractive to industry the state government has committed to improving the other infrastructure areas such as ports, airports and roads.

New Holland harvester on a farm in Mato Grosso, Brazil



The National Biodiesel Board's responsibilities for the Brazil test program included training of the ASA in-country managers, coordination of fuel logistics, ensuring fuel quality, development of initial test protocols and troubleshooting. In addition, the NBB provided assistance with the public relations portion of the program as well as providing technical assistance in meetings with potential program cooperators and governmental regulatory agencies. Specific details of NBB's activities in Brazil are reported in the following sections.

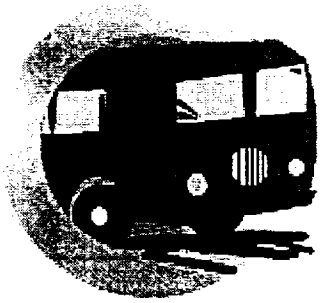
Brazil Fuel Logistics

The requests for proposal for the biodiesel required for the Mercosur Project were submitted to the four (4) NBB registered suppliers on 02 June 1997. Additional information regarding the shipping requirements for the biodiesel to be shipped to Brazil was provided to all bidders in this biodiesel competition on 06 June 1997.

Texaco supplies diesel to St. Antonio and provided the fueling infrastructure for the biodisel test program in Curitiba

On 16 June 1997, proposals for the biodiesel for the Brazil portion of the transit demonstration were provided by two firms, NOPEC and AEP. The quotes were not comparable due to AEP not including any demurrage charges associated with the ISO tanks. NOPEC's cost per gallon for the fuel portion of the bids was lower than AEP's cost per gallon. AEP was requested to provide the demurrage costs associated with the use of the storage containers for the 14 week program. On 19 June 1997, AEP provided the demurrage costs that had previously been omitted from its proposal. With this additional information, NOPEC's pricing still represented the lowest price. Therefore NOPEC was selected to provide the biodiesel for the Brazilian transit demonstration. The schedule required that the biodiesel be in the Brazil ports of entry no later than 08 August 1997.

The NBB prepared the Project Order for the biodiesel to be issued by the ASA to NOPEC. It was also agreed that the biodiesel would be shipped in 55 gallon drums. The Brazilian customer provided their concurrence to this packaging

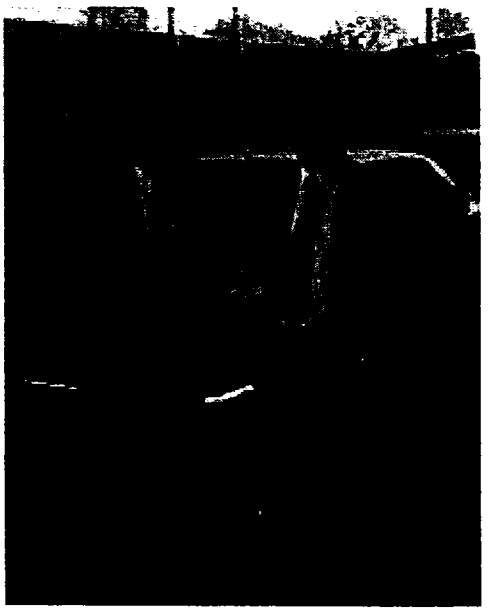


change on 02 July 1997. Due to issues encountered in the testing of the biodiesel, additional analysis was required to ensure that the biodiesel was in compliance with the NBB biodiesel specification. On 10 July 1997, the NBB provided NOPEC with the authorization to ship the biodiesel to Brazil. However, due to the import license not having been issued in Brazil, NOPEC's freight forwarder was advised to hold the shipment.

The NBB was advised, on 15 July 1997, by Julió Vianna, the Project Manager in Brazil, of the contact at the Brazilian import company, Fundacao ABC, that would be handling this shipment. In addition, the NBB was advised that all biodiesel was to be delivered to the Port of Parangua. The direction for the delivery of the biodiesel had previously been to the Ports of Parangua and Santos.

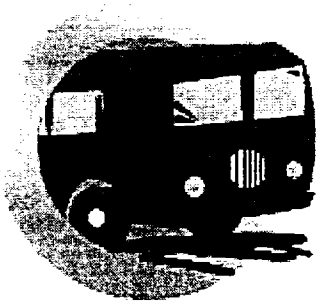
NOPEC provided a "Pro Forma" Invoice to its freight forwarder. This "Pro Forma" Invoice included the necessary information according to Julió Vianna. However, based on later discussions with Fundacao ABC, an updated "Pro Forma" invoice template was provided to NOPEC. On 21 July 1997, NOPEC's freight forwarder submitted the "Pro Forma" invoice in the format requested by Fundacao ABC.

On 28 July 1997, NOPEC's freight forwarder was advised that the "Pro Forma" Invoice must be in Portuguese. NOPEC resubmitted the "Pro Forma" invoice in Portuguese on 30 July 1997. The "Pro Forma" Invoice reflected U.S. gallons and U.S. dollars. Per Julió Vianna, this was not acceptable to Fundacao ABC. On 31 July 1997, NOPEC provided the "Pro Forma" invoice exactly as required - in the template requested, in Portuguese, in metric measurements, and in Brazilian currency. On 04 August 1997, Julió Vianna advised that he would "hand carry" the "Pro Forma" invoice to the responsible parties in Brazil. Julió Vianna agreed to immediately notify Central Florida Freight Forwarders upon any indication of issuance of the import license. It was also requested that permission be granted to initiate the shipment prior to the actual issuance of the import license. However, Julió Vianna did not recommend this action be taken.



Julió Vianna Jr. and Antonio Vellozo were project coordinators in Brazil

It should be noted that a ship sailed from Florida each Saturday. This required that the biodiesel be picked up from NOPEC no later than Wednesday preceding the ship date. The estimated shipping time is 14 days to the Port of Itajai plus 5 days (estimated) for transit to the Port of Parangua.



NOPEC continued to work closely with its freight forwarder, Central Florida Freight Forwarders, regarding the shipment of biodiesel to Brazil. The NBB maintained constant contact with the ASA and Julió Vianna regarding the status of the Brazil import license and providing assistance as required. Finally, on 28 August 1997, the import license was in place in Brazil. The biodiesel was picked up from NOPEC on 03 September 1997 and shipped from Florida on 06 September 1997.

The biodiesel for the Brazilian transit demonstration reached the Port of Paranagua on 06 October 1997. Due to the time that was required to secure the import license the schedule associated with the transit demonstration in Brazil had to be revised. The transit demonstration began during the third week of December.

Bus Identification Number _____

Company: _____

Address: _____

_____

_____

Make: _____ Model: _____

Odometer Reading: _____ Vehicle Weight: _____

No. Drive Axles: _____ No. Tires: _____

Type of Turbo: _____ Fuel Tank Volume _____

Engine Mfg: _____ Engine Size: _____

Model Year: _____ GVWR: _____

Total No. Axles: _____ Intercooled? _____

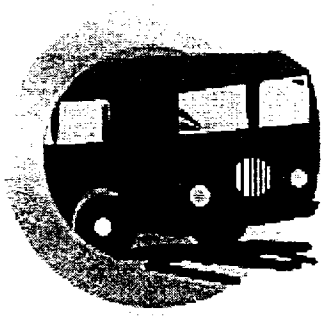
Front Tire Size: _____ Rear Tire Size: _____

Fuel Injection Pump Mfg: _____

No. of Seated Passengers: _____

Test Protocols for Brazilian Sites

The overall objective of the demonstration program was to collect reliable information that would allow transit companies and other interested parties to compare the performance of buses fueled with a biodiesel blend to petroleum diesel fuel. The NBB prepared a complete briefing book (see appendix II) for the in-country managers and conducted a training session in the US the first week of June, 1997. During this session, the Brazilian and Argentine managers were introduced to biodiesel's attributes as well as considerations for use. In addition, test procedures specific to each city were discussed. The Brazilian test sites which were initially selected to participate with the biodiesel program included one transit company in the city of Curitiba and four transits in the city of São Paulo.



Initially, in-country managers were asked to identify a set of buses with similar configurations and detail the specific information for each unit. Half of those vehicles were to be used as diesel controls. Information collected from the buses powered with B20 (20% by volume biodiesel mixed with 80% by volume diesel) was compared to the data collected from the similar control buses.

Managers were also instructed on the correct mixing and fueling procedures. Managers were instructed to take oil samples for a limited number of the project buses on a normal schedule (actual number were determined by individual company). Oil samples were sent to program partners for analysis. Professional evaluation of oil samples can help determine if excessive wear of internal oil-wetted parts is occurring. In addition, analyses such as fuel dilution, viscosity, and total solids provides an indication of impacts of fuel use. For example, fuel dilution of crankcase oil by unburned fuel reduces lubricant effectiveness. The thinning of the lubricant can lead to decreased lube film strength adding to the risk of abnormal wear. Viscosity is the single most important property of a lubricating oil. Viscosity measures the lubricant's internal resistance to flow. Total solids is a measurement of the amount of fuel soot, sludge, varnish, spent additives, and other insoluble contaminants. Values from the analysis of the oils samples were compared to average values associated with diesel fuel use.

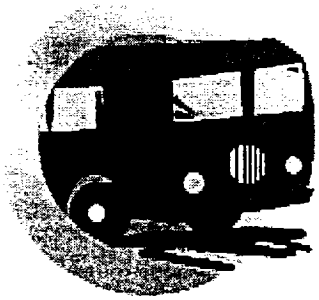
Tests for Oil Samples

Viscosity
Solids (soot)
Fuel Dilution
Water
Antifreeze
Wear Metals:
Copper
Iron
Chromium
Aluminum
Silicon
Lead
Tin

Fuel samples were taken by company personnel of both the neat biodiesel and the blended biodiesel. Initially, one sample of the neat biodiesel was taken when it was delivered to the site. In addition, one sample was taken each month from the neat biodiesel tank. Charts were provided for their convenience in recording the data. Fuel samples were to be stored in a cool environment. Samples were stored in the event that an issue arose and required the retesting of the fuel sample.

Program guidelines were developed to avoid misfueling issues with the project buses. The diesel buses for this project were fueled as normal. As a fail-safe, either the fuel inlets on the buses had been changed so that only biodiesel blends could be utilized or locking gas caps had been installed. In the event that these actions were not taken, decals were to be placed on the inside of the fueling port access door on each biodiesel bus.

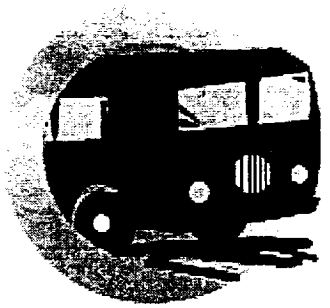
During the project test period repairs on each of the buses were monitored. Two mechanics on each shift had the responsibility of working on buses that were part of this project. Those individuals were designated by the project coordinators. It



is important to have specific mechanics assigned to the project in order to maintain continuity with repair procedures. Past projects have demonstrated that different mechanics approach repairs in different ways. For example, one mechanic may immediately change out an injector if serious loss of power is reported and the next mechanic may first change out the primary and secondary fuel filter.

Supervisors were responsible for ensuring that the specified mechanics service and repair the buses for this project. The following types of data were collected and summarized by the ASA South American project managers at the completion of the test program:

- Number of gallons of B20 added and mileage
- Diesel additions and mileage
- Maintenance and repairs
- Oil analysis
- Initial configuration information



Curitiba Test Program Overview

The biodiesel program in Curitiba was conducted at Santo Antonio, a municipal transit which operates in the Curitiba metropolitan area. The major objectives of this test program were to demonstrate the positive environmental attributes of biodiesel, determine the operational benefits of biodiesel blends compared to other alternative fuels such as compressed natural gas and to document reductions in the smoke from transit bus exhaust emissions.

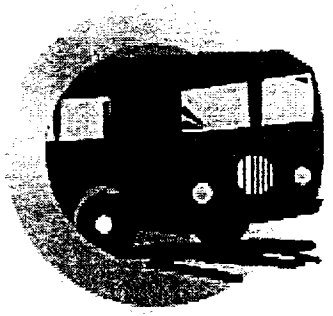
Approximately 2000 buses operate in the metropolitan area of Curitiba (city and surrounding areas). The municipal transportation office, Urbs, contracts with 15 private companies. Both the municipal government and state government have been very active in promoting the protection of the environment. Specifically, J. Lerner (governor of Parana) has expressed interest in examining biodiesel as a technology to reduce emissions in this area. Passenger fares are determined by Urbs. Contracts with the fifteen private companies are negotiated by the profit margins that these companies receive.

The city of Curitiba is designed to accommodate the transit system. There are five radials in the city. These radials run North, South, East, West, and Southeast. On these radials there is a middle lane in traffic that is only for transit travel. Twenty transfer stations are located on these radials and this is where the direct lines are operated. From the direct lines, many spur routes are operated.

Table 5. Engine inventory for St. Antonio.

Engine Manufacturer	Number of Buses
Mafersa (Cummins B)	3
VW (MWM)	3
Mercedes Benz (O-371)	36
Mercedes Benz (OF-1620)	25
Volvo (B58E)	18
Mercedes Benz (other)	38
Scania	5
Total	122

Santo Antonio operates 122 buses powered by a variety of engines. Table 5 details the type and number of engines that are used by Santo Antonio. Santo Antonio buses average approximately 2 km/liter. Average number of kilometers traveled each day ranges from 100 to 400 kilometers depending upon the different buses used. Some of the buses operate on long distance direct routes while others operate on low capacity, very short routes. Approximately 2 million people are transported by, on average, 92 buses each month. All Santo Antonio records are compiled on a computerized data base. Repairs, maintenance, fuel additions, oil additions, and routes are all col-



lected for each bus on a daily basis. Reports can be generated by time frame, bus number, and other parameters.

Major Partners

Success of the program in Curitiba was dependent upon the assistance and cooperation of several companies. The National Biodiesel Board coordinated the efforts of these companies and provided technical assistance throughout the program.

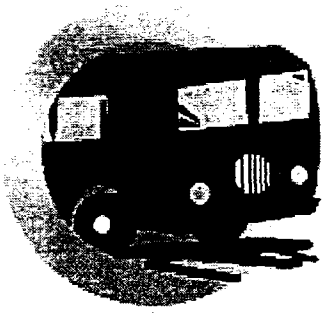
Texaco

Santo Antonio has a ten year contract with Texaco to supply their petroleum needs. Texaco has supplied the fueling infrastructure for Santo Antonio and will be working with Santo Antonio to supply the necessary infrastructure for the biodiesel project. Currently Santo Antonio uses a 30,000 liter primary fuel tank and a 15,000 liter secondary tank. A filter is used between the primary and secondary tanks to control sediments, etc. A standard dispenser (with normal nozzles) is being used.

Table 6. Specification for diesel fuel used at St. Antonio.

Characteristic	Method	Specification	Unit
Contaminants	D1796	0.05 max	%
Color	VIS000	Pass	
Cor ASTM	D1500	3.0 max	
Corrosian and Cobre	D130	2 max	
Density	D4052	0.82 and 0.88	Kg/L
Boiling Point	D86		° C
50% vol rec	D86	245-310	° C
85% vol rec	D86	370 max	° C
Sulfur	D1552	0.50 max	%
CCI	D4737	45 min	
Viscosity	D445	1.6-6.0	cSt
Cetane (engine)	D613	40	
Carbon	D524	0.25	
Cinzas	D482	0.02 max	%

Approximately 76,000 liters of fuel are used each week by approximately, 92 in-service buses. One trailer of diesel fuel is delivered by Texaco every day. The diesel delivered by Texaco to Santo Antonio does not contain an additive package. However, Texaco does offer diesel fuel with an additive package in this market.



Santo Antonio will supply a certificate of analysis of one of the petroleum shipments from Texaco. There are four grades of fuel used by the Brazilians (described as fuel A.B.C. and D). Santo Antonio uses fuel that meets the specifications of B. The Brazilian specification for "B" fuel is detailed in Table 6 on page 23.

Castrol

Castrol performs oil analysis for Santo Antonio. They have a regular oil analysis program and were willing to test the oil samples at the completion of the biodiesel project. The significance of oil analysis was discussed previously in the protocols section of this report.

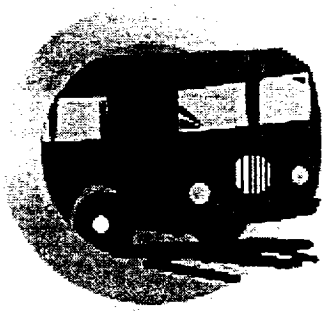
Volvo

Volvo is a major partner in the biodiesel project. Volvo will be conducting emissions tests on a new Volvo bus engine as part of the program. It is anticipated that Volvo will utilize a 1997 10 liter THD102KFM for this test, which is a typical bus engine that meets Euro 1 emissions standards. Volvo will use a European 13 mode steady state test protocol. The standard criteria pollutants that will be measured are: NOx, HC, CO, CO2, and PM. They are equipped with a mini-dilution tunnel and have the ability to collect PM on filters but not to measure the split between carbon and soluble organic fractions. Tecpar, the state research agency, indicated they will perform this function.

Members of the USB, ASA, and NBB meet with representatives of Volvo

Tecpar

The Technical Institute of Parana is 57 years old and serves as the state research center. They operate on a budget of over $40 million Real annually. Eighty percent of their budget is generated from revenue streams and only 20% comes from the state treasury.



Areas of concentration include:

- Materials Technology
- Health & Environment
- Metrology
- Biotechnology
- Computing & Automation
- Certification
- Technology Information
- Technological Incubator

The biodiesel program will be included in the Materials Technology division. Tecpar is directly aligned with the state government. The president of Tecpar is the Science & Technology Minister directly under Governor Lerner. Tecpar has an impressive lab and will be duplicating the fuel analysis. They will work in conjunction with Petrobras on some tests such as the cetane engine test.

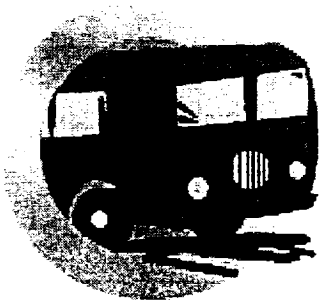
MOU Signing

A memorandum of understanding was signed between all participating parties in December, 1997. The MOU stated the basis for the demonstration's performance, proclaimed each entities support of the project and laid out each partners basic role and responsibility for the various elements of the project. A copy of the MOU is attached as Appendix III.

Volvo assembly plant in Curitiba, PR, Brazil

Biodiesel Initial Conclusions

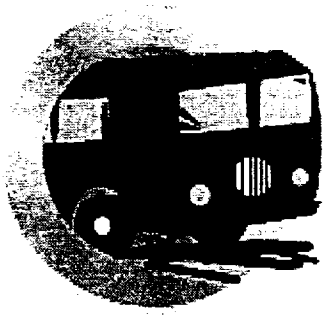
Valid reasons exist to consider Brazil as an attractive target for investment and expansion. First, President Cardoso has succeeded in convincing Brazil's Congress and the electorate to abandon the old economic model of state control and operation of business and public sector services. Second, the economic plan has eliminated hyperinflation and restored a sound and stable currency pegged to the dollar. Third, Brazil has sophisticated construction and construction equipment industries that are presently underutilized. Fourth, Brazil is the region's largest market and one of the world's largest markets. Fifth,



region's largest market and one of the world's largest markets. Fifth, financing for US participation is possible from various sources.

Furthermore, opportunities also exist in Brazil for biodiesel. Brazil currently has a municipal rule (now extending across the nation according to one transit), that 5% of the bus purchases by transits must be CNG by the year 2000. This regulation may offer the opportunity to showcase biodiesel. Dr. Nedo Eston de Nedo, a Prooleo pioneer, says urban transit is the best way to reintroduce biodiesel to Brazil. The urban bus sector represents the intersection of national energy security interests, air quality, regulations, economic development and lots of media attention. Economically, biodiesel blends compete well against other alternative such as compressed natural gas in this transportation sector.

Government fleets represent another major transportation sector in Brazil. However due to the statute limiting diesel engines to vehicles with cargo capacity of 1,000 kilos or greater, government fleets in general are not a significant opportunity for biodiesel.



São Paulo Test Program Overview

The biodiesel program in São Paulo was to involve four separate bus companies. The major objectives of the test program was to determine the operational benefits of biodiesel blends compared to other alternative fuels such as compressed natural gas and to document reductions in smoke from transit bus exhaust emissions by the use of opacity readings.

São Paulo Transportation has approximately 10,500 buses operating within the city of São Paulo and the surrounding areas. Approximately 7% of those buses are operated by Penha Sao Miguel (PSM). São Paulo Transportation contracts with forty private companies to operate the routes in the city. The forty private companies have organized themselves into an organization to negotiate with the city of São Paulo. This group is called Transurb and Mauricio Lourenco de Cunha (the owner of PSM) is currently the president. Transportation within the city of São Paulo is accomplished primarily by transit buses. Rates charged for the members of Transurb are set by São Paulo Transportation. The city does have a train that operates through the center of the city, however there are no spurs on this line. Essentially all of the buses that operate in São Paulo are diesel powered. According to one article in the newspaper there are currently 133 CNG powered buses. However, this number is supposed to increase to 753 by the end of 1997 due to a law that exists in São Paulo.

The four companies that were to utilize a biodiesel blend were:

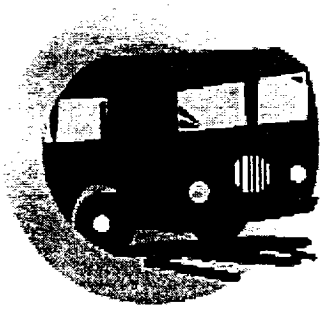
1) Penha Sao Miguel
2) Talgo
3) Saint Brigida
4) Bola Branca

PENHA SAN MIGUEL

Penha San Miguel (PSM) operates 732 buses. All of the buses are powered by six liter, direct injected, Mercedes Benz engines which range from MY88 to MY96. These engines are not electronic and make use of in-line injection pumps. Buses travel, on average 1600 km/week and obtain 2.5 km/liter of fuel. Fuel composes 10% to 12% of their annual operating budget and salaries/fringes 60% to 65%. The buses are 12.7 meters in length and can seat 48 passengers. Fueling infrastructure at PSM consists of one (1) 150,000 liter primarily tank and one (1) 15,000 liter secondary tank. A filter has been installed between the primary and secondary tank to ensure that sediment, etc. is removed.

TALGO

Talgo operates 276 buses. All of the buses are powered by 6 liter, direct injected, Mercedes Benz engines which range from MY88 to MY96. These engines are not electronic and make use of in-line injection pumps.



SAINT BRIGIDA

Saint Brigida operates 383 buses. These buses are powered by either MWM or Mercedes Benz engines. All engines are 6 liter, direct-injected, mechanical engines. The Mercedes engines range from MY90 to MY97 and the MWM engines are either MY94, MY95, or MY97.

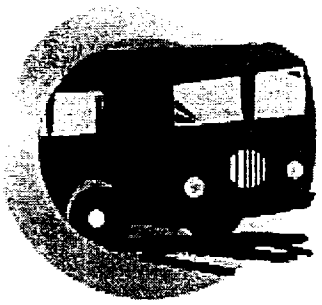
Issues in São Paulo:
The test program in São Paulo was not initiated due to regulatory issues affecting the legal status of the fuel in São Paulo. In addition, other factors also surfaced which will be discussed in the following section.

CETESB
As detailed in the previous sections, CETESB is the São Paulo state environmental authority. CETESB has the ability to regulate which fuels or fuel additives are used by fleets in the city of São Paulo. This organization was not convinced that a biodiesel in-field test should be allowed because biodiesel was not a legally registered fuel. NBB had raised the issue of the fuel's legal status in South American prior to initiation of the biodiesel project. This and other regulatory issues remain open and should be resolved prior to any further activity in Brazil.

A meeting was held in August, 1997 with CETESB. CETESB engineers requested technical information and attempted to locate holes in the technical repository of information concerning biodiesel. Essentially all questions were answered, however CETESB did not want to allow the initiation of the project prior to laboratory testing in the state of São Paulo. They indicated several reasons for this recommendation:

- Buses operate under different load conditions
- Brazilian buses mainly utilize 6 liter engines instead engines which are over 9 liters as in the US
- Diesel in Brazil is dramatically different from diesel in the US
- The "proper" place to start testing was in their state operated lab, IPT

These justifications were addressed by the NBB during the meeting. Specifically, CETESB engineers were asked about why load conditions would be that much different from US conditions and why they would dramatically alter emissions and/or performance. CETESB acknowledged that differences would probably be slight at best. In addition, it was noted that US and European laboratories have tested engines that are very similar or the same as engines utilized in Brazil. Although it was agreed that testing should occur in the laboratory prior to large and expensive in-field tests, NBB stated that it was the hope of the US soybean farmers that their counterparts would be able to utilize existing laboratory data in order to avoid duplication of efforts.



It was agreed, however that Brazilian diesel fuel was much different than US onroad diesel fuel and that results could be different. CETESB insisted that a 100 hour engine test be performed prior to project initiation. It was also indicated that costs associated with engine procurement and testing would be the responsibility of someone besides the state.

Alcohol Industry

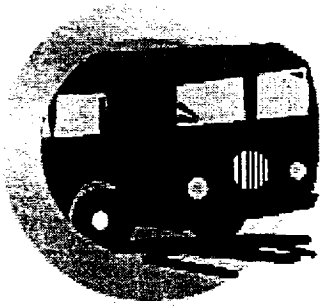
In order to better understand the relationship between sugar cane alcohol producers and the biodiesel industry, a meeting was scheduled with SOPRAL in December, 1997. SOPRAL (sociedade de producers de acucar e de alcohol) is an organization representing 19% (40 of 212) of the alcohol producers in Brazil. SOPRAL has 55 members of which 40 are producers. Their producers range in size from 300,000 tons to 3 million tons of annual production.

There were two major outcomes of this initial interaction. First, SOPRAL has indicated that they no longer view biodiesel has competition to their efforts. Second SOPRAL would like to discuss the potential of conducting joint research on the use of biodiesel and ethanol together in combination with diesel fuel.

Although both of these points should be considered as positive outcomes, caution is recommended as to the levels of support to expect from alcohol producers in Brazil. Consider the market outlook for alcohol producers. Brazil has had an alcohol program since 1975. Over the past decade about 95% of the cars that were produced and sold in Brazil were able to operate on 100% ethanol. At the present, only 1% of cars produced and sold are able to operate on E100. In addition, diesel cars are not sold in Brazil. Legally, only heavy duty vehicles are diesel powered. Therefore, the market in the light duty vehicle market appears to be limited unless more cars are produced to operate on E100. It is not unreasonable to expect that ethanol producers will continue to look at the diesel market as a way to maintain and potentially increase the demand for alcohol in Brazil.

Specifically, alcohol producers are looking at the transit segment as the market that can create inroads into the traditional diesel market. There are two major themes; treat alcohol as a fuel and operate the buses on E100 or treat alcohol as an additive and try to mix alcohol with diesel fuel. The alcohol producers are split on this issue. SOPRAL is supportive of utilizing alcohol as a fuel, not an additive. SOPRAL has become the flagship for this position. Also, OEM's do not necessarily support the concept of mixing alcohol and diesel fuel. There are several unanswered research questions associated with this concept.

Essentially, the biodiesel industry should not necessarily expect the ethanol producers to provide unconditional support. Unless the alcohol producers are able to increase a) the % of alcohol in the gas mix or b) number of E100 cars produced, they will continue to look to the diesel market as a new marketing opportu-



nity. However there are opportunities to work together in developing the biofuels industry in Brazil.

Move Toward Light Rail and Metro

According to Raul V. Bravo & Associates, in São Paulo the operators of both Metro and Commuter services have very ambitious plans in advanced stages of development. These plans include adding new metro lines in several areas of the city.

Biodiesel Initial Conclusions

The biodiesel program in São Paulo will need additional effort to resolve the regulatory, political and market competition issues. Upon resolution of those issues, similar conclusions can be drawn for São Paulo as those for the city of Curitiba. There are at least two issues/concepts which could help bring the alcohol and biodiesel industries together in developing the biofuels industry. First, renewal of the fuel subsidy program in Brazil could provide an opportunity for sugar cane and soybean farmers to work together to achieve a beneficial program for biofuels. Within the next three years, Brazil will revise the levels of subsidies for diesel fuel and alcohol. The alcohol industry is in the process of determining what position they want to promote. Adding biodiesel support from Brazilian soybean producers could create a formidable lobby in this effort.

Second, technologies are currently available which utilize both ethanol and biodiesel. Fosseen Manufacturing & Development (FMD) has patented an ethanol fumigation system which could utilize a biodiesel blend and fumigate ethanol into the combustion system during peak demand periods. This information could be forwarded to SOPRAL as an indication of support and potential collaboration. One needs to understand that the FMD technology, however, does not require the use of a biodiesel blend. The technology was originally designed to operate with diesel and ethanol only. In addition, other joint research programs on ethanol/biodiesel/diesel blends could also be pursued.

Argentina's 1990s defeat of hyperinflation and re-emergence as a functional stable country has been one of the economic success stories of the twentieth century. Although President Carlos Menem recently fired the architect of this success, economic minister Domingo Cavallo, his collaboration will bring positive economic benefits to Argentina and most Argentines for a long time to come. The Peronist party is probably very close to fragmentation and Menem is no longer assured of re-election, but the anti-inflation program has already been severely tested and appears strong enough to survive.

The test came from a surprising source. Of all countries in Latin America, Argentina was the most seriously affected by the Mexican currency collapse in December of 1994. Three years of swift growth and privatization came to an abrupt halt in 1995, as banks folded, $8 billion in deposits fled the country and President Menem deflated the economy to preserve Cavallo's program. This program, pure and simple, was to fix the value of the peso at parity with the dollar and to restrict the domestic money supply to the level of foreign exchange reserves. This meant virtually no deficit spending. Menem was able to salvage price stability and weather the crisis but the cost was surprisingly stiff, a 4.4% drop in gross domestic product (GDP) and 17% unemployment.

The program worked and Argentina's recovery in 1996 surprised even the critics. The ministry of economics revised 1997's growth forecast upwards from 5% to 6%. Similar growth is likely this year. Moreover, the recovery (in contrast to the consumer boom of 1991 - 1994) is led by investment and exports. Investors have become more confident as 'convertibility' has outlasted not only the 1995 recession but also the firing of Cavallo. Those businesses that have survived trade liberalization and the ending of subsidies are now tough and competitive.

Sweeping privatization and a wave of investment, both foreign and local, have modernized old industries and nourished new ones. Despite a drought, Argentina farmers produced a record feed-grain and oilseeds harvest last year. Argentine agriculture is changing to the California model, with high-end, specialty crops replacing raw commodities for export as the domestic and Mercosur market expands. Privatization and a new mining and mineral code has stimulated foreign investment in this once dormant sector. Mining firms expect exports, led by copper and gold, to grow from $30 million last year to $1.8 billion by the year 2000. Oil and gas output has doubled, YPF (the former state petroleum monopoly) has begun buying up strategic foreign companies and Mercosur has created a boom in Argentine manufactured cars exported to Brazil.

But the fact remains that perhaps as much as a third of the work force is excluded from the new prosperity. This frustration has caused waves of protest in the interior as well as made Argentina's middle class very nervous about the future of public education, health care, and social services. The unemployment is probably

due to both the tightness of money from the December 1994 currency crisis and the structural changes caused by the resultant recession. Employers had been slimming their workforce to face increasing competition within Mercosur at the same time that the government had been rampantly privatizing which meant more slimming and cutting of state payrolls. The joint result was high unemployment.

Because of unemployment, Menem's Peronist party will probably lose its majority in the lower house of Congress. The peronists are now hopelessly divided but so is the opposition. In any event, an opposition victory would probably not undo the price stability program or the fixed exchange rate. The opposition would probably not try to change Argentina's economic policy, but instead, focus on the unchanged aspect of Argentina's remaining institutions. The Menem government has come to a standstill with respect to the final phase of privatization and has yet to deal effectively with the still powerful Peronist unions. The delivery of health, education and social services needs to be made more efficient. The entry of new workers into the workforce needs to be made less expensive for employers and layoffs need to be accepted by the unions as a necessary tool to maintain competitiveness within Mercosur.

And finally, perhaps the most serious problem of all is still the systematic corruption that prevents a lot of public sector money from reaching its intended purpose. The politicized judiciary has done nothing to crack down on routine tax evasion or misuse of public funds. While these problems are in no way unique to Argentina they are, in this case, blocking the final stages of an otherwise miraculous economic transformation.

Argentine Energy Security

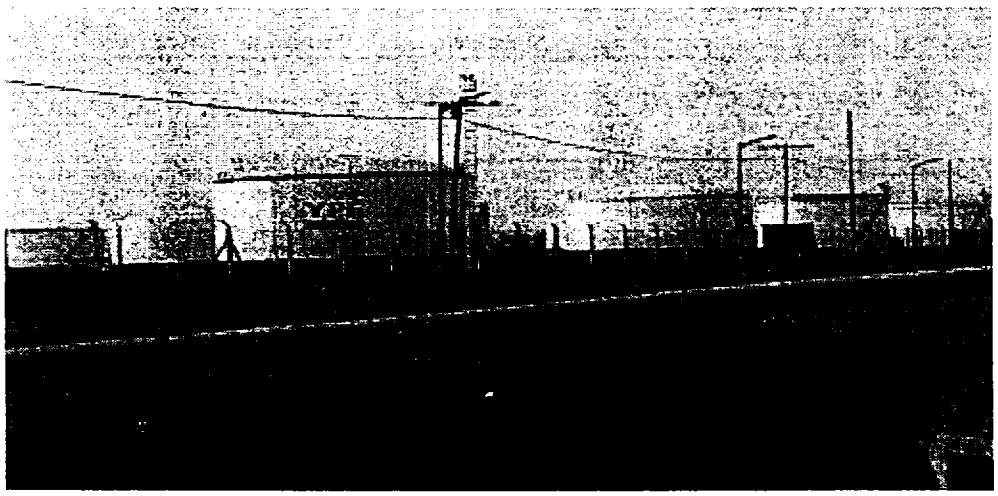
Argentine Energy Production and Dependence on Petroleum Sources

As detailed in an INTA (Instituto Nacional de Tecnologia Agropecuaria) report prepared in July, 1996, the significant increase in the consumption of petroleum liquid fuels is the consequence of the strong economic growth that began with the Convertibility Plan in March, 1991. Today, the situation differs significantly from that which existed prior to 1991. A discussion of YPF tells the whole story. Yacimientos Petroliferos Fiscales (YPF) is the former state monopoly oil company. Privatized in 1993, YPF has almost become a symbol of market forces working effectively for the restructuring of a noncompetitive state-owned company. Prior to this change, YPF operated in a regulated market. In the first two years after privatization, the workforce at YPF was slashed from more than 50,000 to 6,750, and extraneous assets such as movie theaters, railroads and hospitals were sold off for additional working capital. Deficit-ridden throughout its entire existence, in 1995 YPF netted $800 million dollars which was double

the previous year. Investors were so enthusiastic that YPF's S3 billion initial public offering, the largest in the history of the New York Stock Exchange, was oversubscribed by 40% and YPF's ADRs rose 47% over the next two years. While YPF is only the 11th largest oil company in the world in terms of stock market capitalization, it holds approximately 50% of all the proven oil and gas reserves in Argentina and Argentina's costal waters.

Since mid-1995 YPF has begun to tackle the requirements of a major oil company doing business on a global scale. This has meant acquisitions to increase refining and marketing capacity. While acquiring foreign companies YPF's capital to debt ratio has slipped from 16% to 38% which places it about average for a second-tier integrated oil company. Since YPF operated only in Argentina for decades it will have to acquire to expand. YPF wants to participate in the coming privatization of state-owned oil companies in Bolivia and Peru. Analysts contend that YPF has a definite competitive advantage in both those countries. "They've demonstrated that they know how to operate in that kind of environment and there are very few companies that have that type of expertise and are indigenous to Latin America," says Vinod Seghal of Oppenheimer.

Some analysts contend that the biggest challenge for YPF is in downstream production. And while currently producing at 450,000 barrels a day, refining and



YPF Facility in Argentina

processing capacity is much less than that. It will be hard to match the efficiency of refineries in the northern hemisphere. Shell has 1,035 gas stations in Argentina and Exxon has 935. But YPF is working on the problem. Before privatization, YPF owned very few of the gas stations in Argentina and could not control the quality or distribution of its products. YPF today owns 2,600 gas stations throughout the country and plans to build 600 "state of the art" stations by the end of 1997.

Demand for petroleum based fuels in Argentina has been steadily increasing. Demand for special gasoline is growing at an annual accrued rate of 16%, mainly due to the increased number of vehicles. The demand for diesel is also growing, approximately 10% in the last three years. The increase in demand for diesel is attributed to the increased number of diesel powered vehicles for transportation and freight. Seventy percent of the fuel consumed in the freight transportation sector is diesel fuel. Total demand within the farming sector for diesel fuel is 35%.

There has been almost no penetration of diesel fuel in the private automotive sector due to a pricing policy followed by car makers according to the 1996 INTA report. Diesel vehicles have always had a sufficiently high price to discourage its purchase in lieu of gasoline powered cars. Taxis were the one sector that purchased diesel powered vehicles, however with the introduction of CNG into the marketplace, diesel powered vehicles are also losing market share in this sector. In 1996, it was estimated that 40,000 taxis were powered by compressed natural gas.

Alternative Fuels in Argentina

The compressed natural gas industry has been steadily growing over the past two decades in Argentina. Consumption of compressed natural gas in 1996 was 600 million m^3/year, with an exponential growth that started at one million m^3 in 1985. The yearly growth rate of CNG use is close to 30%, however this annual growth is declining. Consumption for the year 2005 is projected between 1298 and 1863 million m^3/year, but still only 3% of total fuel demand for Argentina.

Diesel fuel, on the other hand, had a 8% growth rate between 1993 and 1995 due to the large increase in diesel powered vehicles. Diesel fuel demand in 1996 was 8.9 million m^3/year. Forecasts for 2005 demand are between 9.7 and 10.2 million m^3/year.

YPF also produces and distributes natural gas. Over the next ten years, natural gas production should reach 5.3 billion cubic feet per day, two thirds of which will be consumed domestically and one third exported.

Table 7. Annual growth rates for selected fuels.

Variables	1970-1993	1980-1993	1990-1993
Diesel conumption	3.34	2.38	8.07
CNG consumption	-	89.07	39.48
Diesel price	8.04	-1.89	-9.60
CNG price	-1.96	-0.64	7.17

Source: Characterization of the Argentine Liquid Fuel Sector, 1996

In 1996, YPF's natural gas exports exceeded $1.8 billion and are expected to grow by another $200 million this year. Future gas exports will be assured by a YPF-led consortium's plans to build a gas pipeline linking fields in southern Argentina with Chile. YPF is also expected to begin exporting natural gas to Brazil by the year 2000 if gas fields currently under exploration in northwestern Argentina prove to have sufficient reserves. Potential sales to Brazil are estimated at $600 million per year.

Argentina has no comparable legislation to the US Energy Policy Act. Argentina is fast becoming a major producer/exporter of traditional energy sources including electricity. YPF has very close ties to the government-run, but soon to be privatized, National Institute of Industrial Technology (INTI) which has overseen all of Argentina's experiments with alternative fuels except nuclear fuels. Dr. Carlos Lomo, Director of the Transportation Fuels Division, notes a few developments in recent years which highlight the movement toward alternative fuels such as CNG. Argentina already prides itself on its acquisition of CNG vehicles and operates more CNG vehicles than all the rest of Latin America combined. YPF plans to equip a third of its' new gas stations with compressors and CNG fast-fill technologies. CNG is viewed as the alternative fuel of the Argentina's future for a number of reasons. As soon as North American and European OEMs develop competitively priced CNG vehicles, the government plans on favoring this market through tax-based incentives. The more CNG consumed domestically, the more downstream petroleum products can be exported. Refined petroleum products for export are viewed as a major taxable foreign exchange earner, the necessary prerequisite for expansion of the domestic money supply. Many CNG joint ventures are currently under negotiation in Argentina, including the manufacture of heavy-duty CNG engines with Detroit Diesel Corporation (DDC), Cummins and Navistar.

Argentine Environmental Conditions

Most federal environmental legislation in Argentina focuses on water and soil erosion issues and not on 'green' issues like air pollution. Review of the federal codes and the Buenos Aires municipal codes produced only older vehicle restrictions and the world famous Buenos Aires smoke and noise 'ticket' section. It is possible that politically, air pollution is viewed as an OEM solvable issue that economic prosperity will take care of it as newer vehicles are purchased and phased into service. There is historical precedent for this line of thought. Twice during its history, Argentina has 'modernized' overnight when political stability and economic prosperity have attracted both local and foreign investment at the same time. Many observers to the current scene feel that this is what is happening today.

Agriculture and Economic Development in Argentina

According to a 1996 INTA report, the Argentine edible oil sector is one of the country's most important industries. It is responsible for 23% of foreign exchange earnings from exports, equivalent to $5.14 billion. The farming and beef sectors account for 60% of the total foreign exchange from exports. Argentina's comparative advantage as a producing and exporting country of agricultural commodities has been greatly developed by the edible oil industry, positioning Argentina as one of the leading exporters of the oilseeds complex as a whole, including both soybean and sunflower by-products.

Almost 85% of all crushing of soybeans takes place in the province of Santa Fe. The oilseed crushing industry has undergone a rapid expansion in the last ten years, resulting in greater capacity and modern facilities. Both local and international investors have been attracted, especially to the province of Santa Fe's. Vegetable oil refining, dairy products and cattle slaughter alone come to 34% of the province's GDP. Agricultural machinery, equipment and parts come to an additional 13%. None of this takes into account the actual value of the crops grown. Santa Fe produces 65% of the nation's soyoil exports and 26% of the sunflower oil exports. The province of Cordoba also derives 30% of it's GDP from processing vegetable oil.

The edible oil industry has been developing according to the increases in hectares planted and harvested for soybeans and sunflowers. Similar to the United States, soybean development is a recent historical event. Since the 1970's Argentina's soybean crop has been steadily increasing. The 1990/91 Argentine soybean crop was 3.77 million metric tons (1,925 million hectares planted). In 1995, 5.7 million hectares were planted and the resulting crop was 12.5 million metric tons. The province of Santa Fe is the leading soybean production area, followed by Buenos Aires and Cordoba.

As with every other sector of the Argentine economy in the 1990s, competitiveness has resulted in the closing of many of the smaller (less than 1,000/mt/day capacity) plants. Overall, the crushing industry's growth will continue to shift Argentina away from raw material exports and toward making component products. The laws creating

Table 8. Argentine Provinces in order of area planted to soybeans.

Province	hectares	metric tons	% of total area
Santa Fe	2.6 million	5,606,900	46
Cordoba	1.9 million	2,658,700	22
Buenos Aires	1.4 million	2,698,200	22

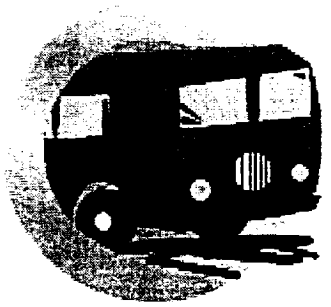
export taxes on raw commodities in the 1980s and early 1990s helped to initiate this trend. Raw commodities are still heavily taxed, although debate is considerable on how effective this policy really is. Most companies exporting soybeans from Argentina are the vertically integrated multinationals that transfer the bulk of their commodities internally. As far as the crushing industry is concerned, the export tax on oil and meal is virtually non-existent. There is an export tax but it is almost entirely rebated. On the oil there is an export tax of 3.5% with a rebate of 1.5% on crude and 3.15% on refined. These developments, plus improvements in the transportation infrastructure, open the future possibility of pulling-in raw materials from other countries for processing, shifting regional trade patterns somewhat. Small quantities of soybeans are already entering the country, which could increase if price relationships became favorable. But make no mistake, Argentina retains very little soybean oil for domestic consumption. Almost the entire crush (94 percent in 1995) is exported to Brazil in it's unrefined form. Argentina exports more than 1 million metric tons of soybean oil annually. The vegetable oil of preference for domestic consumption is sunflower seed oil. The Province of Buenos Aires produces 60 percent of Argentina's sunflower crop, a total of 3.26 million metric tons.

Table 9. Total crushing capacity in Argentina.

By Province, CY1996

Location	Number of Plants	Daily Capacity
Buenos Aires	16	15.05
Cordoba	6	6.49
Fed. Capital	8	5.34
Santa Fe	18	34.19
Others	10	2.92
Total	58	63.99

Source: JJ Hinrichsen S.A., 1997 Annual Report



The National Biodiesel Board's responsibilities for the Brazil test program included training of the ASA in-country managers, coordination of fuel logistics, ensuring fuel quality, development of initial test protocols and troubleshooting. In addition, the NBB provided assistance with the public relations portion of the program as well as providing technical assistance in meetings with potential program cooperators and governmental regulatory agencies. Specific details of NBB's activities are reported in the following sections.

Argentine Fuel Logistics

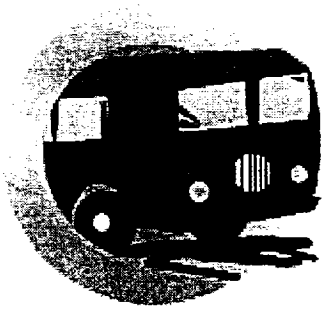
On 21 July 1997, the American Soybean Association requested that the NBB provide an estimated price for 20,000 gallons of biodiesel and the associated shipping charges for the Argentine portion of the transit demonstration. However, several of the details regarding the Argentine portion of the South American transit demonstration had yet to be provided prior to the actual procurement of the biodiesel being formalized.

In early September, the remaining details of the Argentine transit demonstration were provided. NOPEC was asked to maintain its same price for the biodiesel for Argentina as was paid for the biodiesel for Brazil. NOPEC agreed to honor this price. Accordingly, on 11 September 1997, the NBB, on behalf of the ASA, authorized NOPEC to proceed with the production of soy-based biodiesel. Shortly thereafter, the NBB issued a Project Order to NOPEC on behalf of the ASA for 10,010 gallons of biodiesel to arrive at the point of entry Buenos Aires, Argentina by 17 October 1997.

On 17 September 1997, NOPEC notified the NBB that they were unable to purchase soybean oil at the price that comprised its original biodiesel price of $3.19 per gallon in time to meet the required schedule. Therefore, it would be necessary for NOPEC to purchase the soybean oil at substantially increased price to achieve the required delivery schedule. Attempts were made by the NBB to find another source of soybean oil for NOPEC to no avail. The NBB notified the ASA of this situation and was advised to proceed as required to ensure the biodiesel was available in Buenos Aires by mid October 1997.

NOPEC was told to proceed with the purchase of the soybean oil and that the higher price for the biodiesel would be recognized by the ASA in order to protect the transit demonstration schedule in Argentina. However, when NOPEC was notified of this direction, they advised that it was not possible for them to obtain the soybean oil at any price in time to meet the shipment date of 06 October 1997.

Therefore, AEP, advised that they could provide the biodiesel in time to meet the necessary shipment date. However, the price for the biodiesel, inclusive of the required testing, was $4.06 per gallon. This price reflects a reduction in price of



12 cents per gallon based on the NBB's negotiations with AEP. In addition, the shipping costs were higher due to the additional interstate transportation required from AEP's facility in Sergeant Bluff, IA to Miami, FL. The ASA was contacted by the NBB and secured its approval prior to proceeding with the biodiesel purchase from AEP. AEP was authorized to proceed on the production of 10,000 gallons of biodiesel on 19 September 1997.

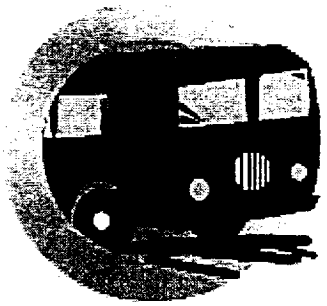
It should be noted that AEP didn't handle any of the shipping requirements. Therefore, all the shipping arrangements for the Argentine biodiesel were handled by the NBB. Due to the payment terms associated with the shipping and handling charges, the NBB made payments on behalf of the ASA and was later reimbursed by the ASA for these charges.

Based on the efforts of AEP the biodiesel was produced and containerized by 01 October 1997. Due to trucking problems, half of the biodiesel was picked up from AEP's packing company in Grain Valley, MO on 02 October 1997. This shipment departed Miami on 06 October 1997 and arrived in Buenos Aires, Argentina on 24 October 1997. The remaining fuel was picked up on 07 October 1997 and departed Miami on 13 October 1997. This shipment arrived in Buenos Aires, Argentina on 30 October 1997. It should be noted that based on the original schedule, the transit demonstration in Argentina was to begin the last week in October. The NBB took all the necessary actions to ensure that this schedule could be achieved. The biodiesel was available in Buenos Aires, Argentina the last week of October as instructed by the ASA. The transit demonstrations began the second week of December.

Test Protocols for Argentine Site

The overall objective of the demonstration program was to collect reliable information that would allow transit companies and other interested parties to compare the performance of buses fueled with a biodiesel blend to petroleum diesel fuel. The NBB prepared a complete briefing book (see appendix II) for the in-country managers and conducted a training session in the US the first week of June, 1997. During this session, the Brazilian and Argentine managers were introduced to biodiesel's attributes as well as considerations for use. In addition, test procedures specific to each city were discussed. The Argentine test sites which were initially selected to participate with the biodiesel program included two transit companies in the city of Buenos Aires.

Initially, in-country managers were asked to identify a set of buses with similar configurations and detail the specific information for each unit. Half of those vehicles were to be used as diesel controls. Information collected from the buses powered with B20 (20% by volume biodiesel mixed with 80% by volume diesel) was compared to the data collected from the similar control buses.



Managers were also instructed on the correct mixing and fueling procedures. Managers were instructed to take oil samples for a limited number of the project buses on a normal schedule (actual number were determined by individual company). Oil samples were sent to program partners for analysis.

Professional evaluation of oil samples can help determine if excessive wear of internal oil-wetted parts is occurring. In addition, analyses such as fuel dilution, viscosity, and total solids provides an indication of impacts of fuel use. For example, fuel dilution of crankcase oil by unburned fuel reduces lubricant effectiveness. The thinning of the lubricant can lead to decreased lube film strength adding to the risk of abnormal wear. Viscosity is the single most important property of a lubricating oil. Viscosity measures the lubricant's internal resistance to flow. Total solids is a measurement of the amount of fuel soot, sludge, varnish, spent additives, and other insoluble contaminants. Values from the analysis of the oils samples were compared to average values associated with diesel fuel use.

Bus Identification Number _____

Company: _____

Address: _____

_____

_____

Make: _____ Model: _____

Odometer Reading: _____ Vehicle Weight: _____

No. Drive Axles: _____ No. Tires: _____

Type of Turbo: _____ Fuel Tank Volume _____

Engine Mfg: _____ Engine Size: _____

Model Year: _____ GVWR: _____

Total No. Axles: _____ Intercooled? _____

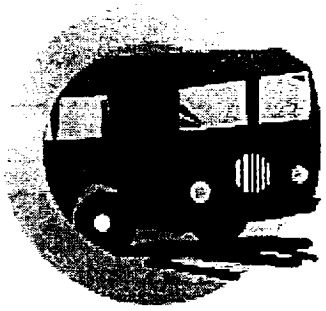
Front Tire Size: _____ Rear Tire Size: _____

Fuel Injection Pump Mfg: _____

No. of Seated Passengers: _____

Fuel samples were taken by company personnel of both the neat biodiesel and the blended biodiesel. Initially, one sample of the neat biodiesel was taken when it was delivered to the site. In addition, one sample was taken each month from the neat biodiesel tank. Charts were provided for their convenience in recording the data. Fuel samples were to be stored in a cool environment. Samples were stored in the event that an issue arose and required the retesting of the fuel sample.

Program guidelines were developed to avoid misfueling issues with the project buses. The diesel buses for this project were fueled as normal. As a fail-safe,



either the fuel inlets on the buses had been changed so that only biodiesel blends could be utilized or locking gas caps had been installed. In the event that these actions were not taken, decals were to be placed on the inside of the fueling port access door on each biodiesel bus.

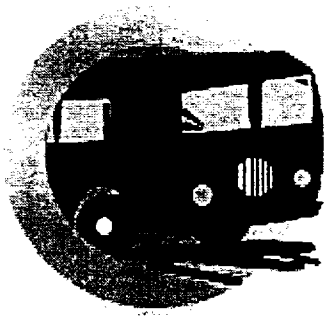
During the project test period repairs on each of the buses were monitored. Two mechanics on each shift had the responsibility of working on buses that were part of this project. Those individuals were designated by the project coordinators. It is important to have specific mechanics assigned to the project in order to maintain continuity with repair procedures. Past projects have demonstrated that different mechanics approach repairs in different ways. For example, one mechanic may immediately change out an injector if serious loss of power is reported and the next mechanic may first change out the primary and secondary fuel filter.

Tests for Oil Samples

Viscosity
Solids (soot)
Fuel Dilution
Water
Antifreeze
Wear Metals:
Copper
Iron
Chromium
Aluminum
Silicon
Lead
Tin

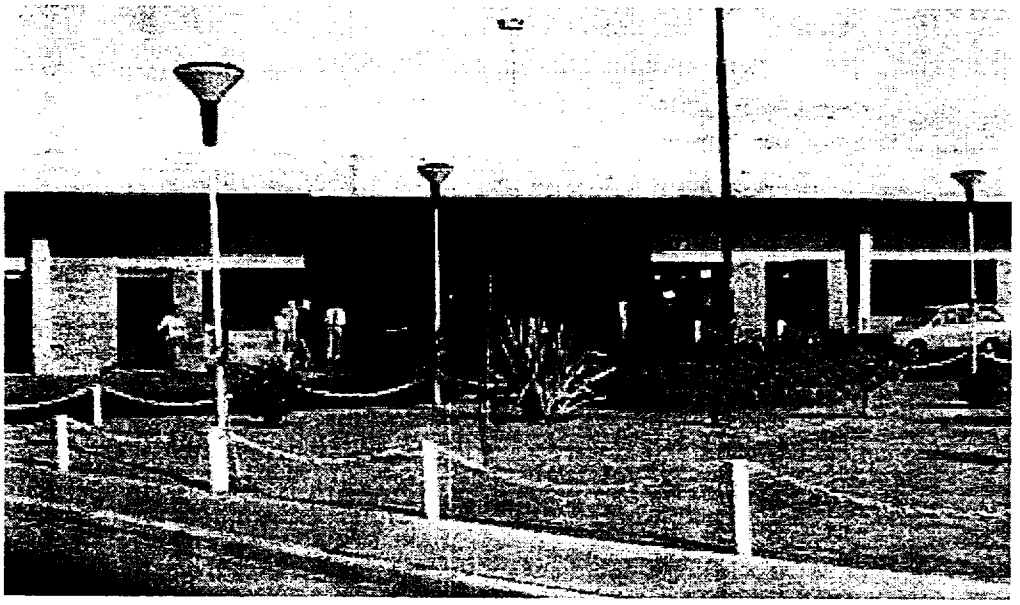
Supervisors were responsible for ensuring that the specified mechanics service and repair the buses for this project. The following types of data were collected and summarized by the ASA South American project managers at the completion of the test program:

- Number of gallons of B20 added and mileage
- Diesel additions and mileage
- Maintenance and repairs
- Oil analysis
- Initial configuration information



Buenos Aires Test Program Overview

The biodiesel program in Argentina was to be conducted in at least two cities (Buenos Aires and Rosario) and potentially a third site (Mendoza). The major objectives of these test programs were to demonstrate the positive economic and environmental attributes of biodiesel and to document reductions in the smoke from transit bus exhaust emissions. Before initiation of the test program, ASA management determined to conduct the demonstration only in the city of Buenos Aires.

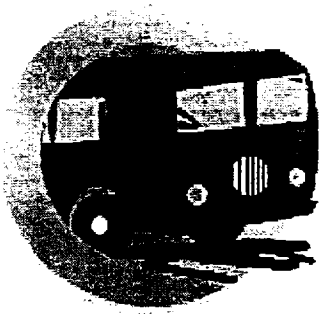


San Vicente is one of the largest transits in Buenos Aires

There are over 10,000 buses in Buenos Aires. Concessions are offered on a ten year basis, with the potential for renewal if there are no negatives recorded against that specific transit company. Two major bus companies are participating with the biodiesel program in Buenos Aires:

- E. San Vicente
- Nuevos Rumbos

E. San Vicente has approximately 260 buses and is the third largest fleet in Buenos Aires. It is one of the most important companies in the City of Buenos Aires. Their main office and facilities are in burzaco, near Capital Federal, in the south urban zone of the Great Buenos Aires. All of the buses are owned by San Vicente. Many bus companies in Argentina are cooperatives. Buses operate under one company name, but they are owned by differed individuals. Forty people own San Vicente, all of who work at the company. Eighty percent of the



people that work at San Vicente are shareholders.

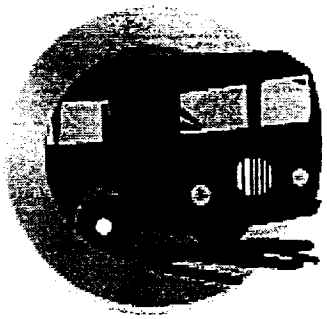
Buses in this fleet are powered by either Mercedes Benz or Deutz engines (see table 10). All engines are mechanically injected. All of the Deutz engines (77 engines) are between MY93 and MY95. Four of the Deutz engines are naturally aspirated and the remaining Deutz engines are turbocharged. The Mercedes Benz engines range back to MY83. The manager of San Vicente prefers the Mercedes Benz engines, specifically models 1320 and 1420. For this program, 40 buses will be assigned. Twenty buses will be operated on B20 and the remaining 20 buses will serve as diesel controls (determined by the San Vicente manger).

Table 10. Engine inventory for San Vicente.

Engine Manufacturer	Number of Buses
Mercedes Benz 1114	94
Mercedes Benz 1214	25
Mercedes Benz 1314	12
Mercedes Benz 1315	2
Mercedes Benz 1316	4
Mercedes Benz 1319	4
Mercedes Benz 1320	23
Mercedes Benz 1420	1
Detuz NA	4
Deutz T	73
Total	242

San Vicente has experimented with oxidation catalysts. This technology failed in their tests due to clogged catalysts and no long term durability. Similar to the Brazilian information,

Typical urban bus at San Vicente busline



fuel expenses account for about 10% of the operating budget of the transit. Esso is the fuel distributor for San Vicente. No additives are in the diesel fuel purchased by San Vicente. One half of the buses are fueled during the day and one half at night. Diesel fuel is stored in six underground tanks.

San Vicente is currently using 27,000 liters a day and their buses are average 2.5 km/liter. Approximately 25,000 to 30,000 liters of fuel is delivered every day. San Vicente has an annual contract with Esso, this year for 32.5¢/liter. They have, however, been using Esso for a number of years even though the contract renews yearly.

Nuevos Rumbos is a medium sized company that operates in Capital Federal. Their main office and facilities are located in Capital Federal. They are known as a very efficient and innovative company. Their bus fleet is equipped with late model engines. Similar to San Vicente, 40 buses will be assigned to the test. Twenty buses will be operated on B20 and the remaining 20 buses will serve as diesel controls.

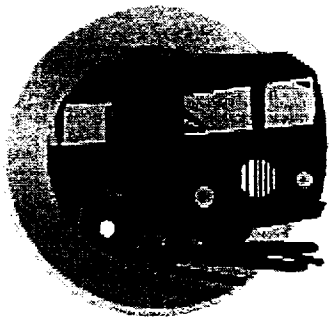
Major Partners

Success of the program in Buenos Aires was dependent upon the assistance and cooperation of several companies. The National Biodiesel Board coordinated the efforts of these companies and provided technical assistance throughout the program.

MOU Signing

A memorandum of understanding was signed between all participating parties in December, 1997. The MOU stated the basis for the demonstration's performance, proclaimed each entities support of the project and laid out each partners basic role and responsibility for the various elements of the project. A copy of the MOU is attached as Appendix III.

Employee of Nuevos Rumbos busline taking an opacity reading from a diesel powered bus



Biodiesel Initial Conclusions

The primary market drivers for biodiesel commercialization in Argentina appear to be different from those experienced in Curitiba, Brazil. The compulsion to create biodiesel markets is generally founded on one or more of the following elements: economic development; environmental improvement; and/or energy security. Of these factors, only economic development seems to be of interest to potential Argentine industry stakeholders.

Doug Magnus speaks at the signing of the MOU

In the Argentine case, if the environmental agencies begin enforcement of pollution limits then biodiesel blends will compete with compressed natural gas. If the agencies do not enforce emissions legislation then biodiesel blends will compete with the diesel fuel market. Given the strong level of interest from the agricultural industry, consideration should be given to including biodiesel into the petroleum infrastructure in low levels. This concept could be sold on the aspects of economic development by a strong agricultural contingent.