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PERU

Technical report: A strategic overview and evaluation of MODASA*

Prepared for the Government of Peru
by the United Nations Industrial Development Organization

Based on the work of Augusto Cezar S. de Aguiar,
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DEFINITIONS
(in a logical order for better comprehension)

MODASA
Motores Diesel Andinos S. A. - a company to be privatised in Peru, assembling Diesel Engines with British Perkins technology and working under a dedicated and exclusive components supply from England in CKD format. In the beginning, also partly owned by Volvo, the company was fit to assemble some specific Volvo engines. With the withdrawal by Volvo of their stake at MODASA (their shares were sold to a group of executives designated as San Juan Group) the Volvo assembly was practically extinguished (see more about this under the topic VOLVO). MODASA also machines a limited range of Perkins engine items, based on raw parts supplied by Peruvian foundries (if in grey iron) or by Perkins England or Brazil (Maxion) - if other raw materials are involved. These comprise the so-called national integration portion, a need, years ago, to remain competitive and legally bound by special compulsory regulations from the Peruvian Government. Such items are not to be regarded as spare parts as most of them are never replaced during the useful life of an engine. The factory also assembles generator sets with technology from Leroy Somer, a French firm with world-wide technical links with Perkins as a prime power source for their products.

LEROY SOMER
A classic market partner of Perkins engines for applications involving the generation of electric power, Leroy, of French origin and capital, has facilitated MODASA access to its matching technology, including the supply of CKD sets of parts and components for the assembly of alternators of varying capacity. Forced by the circumstances, Leroy also authorised a certain gradual nationalisation of components in Peru, including very elaborate state-of-the-art engine management and control Systems, remote control panels, electric power line monitoring Systems and related technologies. This newcomer can be seen as the current "*saviour*" of MODASA because of the very large market potential it has offered the company. For example, MODASA has a substantial share of the gen set market in Colombia, where municipal postures require that any building with above 3 floors is to have a lift and a corresponding back-up power generation unit. Although the same law exists in Peru, its enforcement is not as hard, resulting in very scarce sales for the specific application in their domestic market. Part of the warehousing area at MODASA, mainly that designated to hold Volvo parts and components, was converted into a specialised Leroy Somer gen set and control panel manufacturing plant.

CKD
Completely Knocked Down - an expression that defines the supply of all parts comprising a set or subset of a complex mechanical item in indivisible units, parts and assemblies, for ulterior mounting, generally at a distant captive assembly plant. By "*captive*" it is meant, endowed with specific rigs, jigs, fixtures, tools and a specially trained labour force. CKD sets are generally organised in the form of logical breakdown lists to facilitate ordering and shipping control and requested in multiple quantities of a given volume. In the case of the current Perkins CKD sets, the supply is made in multiples of 10 engines.

CBU
Completely Built Up - an expression that defines the supply of a complete assembled, checked and approved unit, only requiring its deployment to the market. In some cases, MODASA receives both Volvo and Perkins engines in CBU status, requiring adaptation to the final destination, be it a gen set, a compressor, a pump or a dress-up kit to be employed as a vehicle repowering unit.

COPRI
The Central Co-ordination entity in Peru for all privatising programmes, each governed by a local CEPRI (see definition in the next page).

CEPRI
The generic designation of the Special Privatising Committees activated on a per-company basis by the COPRI. Each CEPRI is comprised by a group of assigned executives, technicians of indisputable

knowledge and acceptance by the Peruvian Authorities and by the Board of the Companies subject to the process. The CEPRI holds a temporary "*power of proxy*" to assist the Government with all evaluations, discussions, external consultants, strategy planning up to the organisation of the respective "*subasta*" or public offering auction. There are strict legal rules setting up the duties and responsibilities of each CEPRI.

CEPRI-MODASA

The CEPRI in charge of selling 48% of the MODASA capital, held by the Peruvian Government. The plan is to complete the process till the end of 1996 and, by legal requirement, this has to be performed through a public offering in an auction. Annex 2 (list of all contacted personnel along the mission) indicates the members of the subject CEPRI, all of which took part in the activities leading to the generation of this report. Most of them indeed travelled to Trujillo to take part in the plant survey and held meeting even on Saturday, Sunday and the May 1st, Labour Day. This gives an indication of how committed and interested the subject gentlemen are.

APOYO

One of the major Auditing and Consulting firms in Peru, recently elected - through a public tender - to handle the valuation of MODASA in the pre-auction phase. APOYO is under a CEPRI-MODASA agreement contract to develop said activities since April 30, 1996 and estimated a 90-day period to complete the work. The time schedule can be revised depending on the findings and on special directions that they can receive from CEPRI.

ESAN-LIMA

The "Escuela Superior de Administración de Negócios" (Superior School of Business Administration), where most of the members of CEPRI-MODASA operate as professors or have received their Master degrees. Additional consultants to CEPRI-MODASA, like . Raul León, with a long-standing career in top-management in the United States' Steel Industry, have also been exponential figures in the life of ESAN in the recent past. ESAN offers only post-graduation courses and has been pointed by its leaders as the main responsible for the so far successful developments occurred in privatising programmes. To foreign visitors, though, ESAN, despite the wonderful resources, including an elegant and inspiring campus site, seems to be extremely concentrated in local perspectives, which provide a single sided view of the problems at hand. In that respect, activities like the one developed by UNIDO and UNDP are crucial and fundamental to set the proper environment for decision making.

SENATI-TRUJILLO

The Peruvian National Apprenticeship Programme Centre in Trujillo, with suitable facilities for the training of young students for professions in the best interest of MODASA, like metal working, engine assembly, testing and servicing, including some brief courses in quality control, metrology, basic design, electrical system concepts, automatic machinery handling, etc. They also carry other courses of regional interest, including an agreement with the Canadian Government aiming at fomenting better economic and technical performance within the local shoe industry. MODASA has supplied sample engines and still renders some lecturing capacity to SENATI. In addition, some members of Management and Supervision ranks at MODASA also serve as instructors at SENATI.

PERKINS

British transnational company producing a wide range of Diesel Engines. Perkins accepted the Peruvian Government challenge to carry 26% of the MODASA capital and to supply parts, jigs, fixtures, tools and instructions for the company to assemble a range of their engines in the Trujillo Plant in Peru. It should be noted that there is a large population of Perkins engines in Peru, as well as in the other country-members of the Andean Pact, attended by a non-exclusive (meaning multiple trade mark and products) dealership network. According to international statistics, published by Perkins in England and cited by MODASA's General Manager Héctor Garcia Béjar during the mission, Peru could correspond to a market the same size as Italy and France, being 4th in their rank by order of sale magnitude!

VOLVO

Swedish transnational company producing a range of Diesel Engines and vehicles. Volvo accepted the Peruvian Government challenge to carry 26% of the MODASA capital and to supply parts, jigs, fixtures, tools and instructions for the company to assemble a range of their engines in the Trujillo Plant in Peru. In August 1994, though, Volvo decided to sell their stake at MODASA, as they had expanded and consolidated their own operation to produce vehicles (trucks and buses) in the outskirts of Lima and that included the ability to assemble the respective engines. Not finding a suitable capital holder for the acquisition of their stake, Volvo decided to accept an offer to sell the shares for a gradual capital integration by the part of a group of MODASA managers, designated as the San Juan Group. The integration is half-way through (around 13% of the value), which resulted that one of the Volvo Societal Directors has left the Board allowing the election of a member of the San Juan Group as his successor. Therefore, Volvo still keeps one director's chair at MODASA, a situation that will last until the subject capital integralisation is completed. The Volvo business at MODASA is nowadays restricted to the eventual sale of large Volvo Diesel Engines, which MODASA receives in CBU status and couples to utility packs like generator sets, irrigation pumps, air compressors, etc. In this context, MODASA can be visualised as being a separate engine "*dealer*" for Volvo. Despite having the jigs and rigs and a certain machining capability for Volvo parts, those are not in use at MODASA, as there are very "*seldom*" orders for that kind of item. It should also be noted that the engine types for which the subject tooling was fitted are now past models and most of them cannot be characterised as regular spare parts (example: a very elaborate aluminium multi-piece cast oil sump set which does not need replacement all along the engine's useful life).

SAN JUAN GROUP

A formal group of MODASA present and past Managers who grouped together to acquire 26% of the company's stock (the part originally held by Volvo) by funding and placing the capital on a gradual scheme that is just about half-way through. The executives already have control over 13%, exercise voting rights in the MODASA Board and succeeded to elect a representative in the Directory. San Juan also became an important commercialisation channel to MODASA, operating a dealership that controls about 2% of all sales of the company at the moment.

NC

Numerically Controlled - a conceptual mode of building automatic machine tools, referred to as machining centres, that perform sequential metal cutting tasks based on a storaged computer program that commands all actions regarding the piece and the respective cutting tools. Typical programs entail part positioning, tool positioning, machining instructions (tools speed, bed advancement, etc.), parts repositioning, cutting tool substitution, on a pre-determined operations sequence. MODASA has invested, about two years ago, the approximate amount of US$ 1,2 millions to acquire two NC machining centres. This adds flexibility to their manufacturing of specially complex engine parts like the Flywheel and Clutch Housings, Distribution Covers and some Inlet and Exhaust Manifolds. Besides being able to save handling, intermediate operation buffer stocks, unitary machine operator labour, the subject machinery - due to their very strict measurement tolerances - also add to the quality levels, avoiding rejections. Still so, the decision can be regarded as questionable in view of other existing alternatives and the very low capacity utilisation at the moment of the acquisition, being even lower now. One of the reported problems with this kind of sophisticated equipment at MODASA is its extreme sensitivity to voltage and frequency fluctuations. Due to the rather problematic HIDRANDINA electric power supply - with frequent fluctuations and "*apagones*", meaning power black-outs, the NC machinery is frequently presenting circuitry damage and long down times awaiting for replacement boards from the respective suppliers. During our visit week, both matching centres were inoperative for damages of this nature.

HIDRANDINA

The utility company responsible for the electric power supply to MODASA. Despite a good generation capacity, HIDRANDINA suffers the consequences of an old, intricate and worn-out distribution network in Trujillo. Old wires, conflicting circuitry concepts, problematic integration with the Peruvian

firm energy network, all result in frequent fluctuations and power interruptions ("*apagones*'), which disturb production, can result in damaged parts, causing machining rejections, and have caused circuitry disabling to the most sophisticated pieces of equipment at MODASA, like the NC machining Centres from MAZAK and PROMECOR, specially sensitive to that kind of problem.

MORILLAS

A very impressive bus and truck superstructure constructor (body builder), also located in Trujillo, with sufficient and competitive technology to develop a strategic alliance with chassis producers to supply the Andean Pact markets for those products. The plant was visited by the CEPRI-MODASA, APOYO and UNIDO team gathering in Trujillo, on May 3, resulting is the manifestation of their vivid interest for the fate of MODASA. This is a family owned business that has an impressive investment in jigs and fixtures to build elegant and modern bus superstructures atop many different chassis models. Their most important continental competitor has always been the Brazilian company MARCOPOLO, of which MORILLAS has adopted the style, the design concepts and now seeks for an alliance. During the week of May 13-18, 1996, a group of MARCOPOLO executives was to visit MORILLAS to discuss common objectives for the South American market, including the inter supply of parts, components, design and assigned building capacity. After MODASA, MORILLAS is certainly the next most important metal-mechanic complex in Trujillo and the recent capacity expansions made by that contractor indicate his trust in a very wide market domain for their company. But MORILLAS may be facing a cashflow problem as denoted by the extremely low capacity in use by the time of our plant visit and by some "anomalous" business decisions like devoting to the production of (1) hand lay-up small short range type shoreline fishing boats of doubtful design, (2) Moto-Taxis (some sort of a motorised 'rickshaw') with fibreglass bodies and a motorcycle puller and (3) by odd practices - like acquiring violently crashed truck and bus units for reconstruction and recycling as new vehicles to the market (!) as seen during our visit.

SATESI

A Peruvian bus and truck superstructure producer which is involved with MODASA's new concept of light duty urban buses for sale to the "*Association of Bus Drivers in Lima*" and other Peruvian cities. SATESI adapted a body to the two first Chinese prototype chassis with MODASA's tentative application of a Perkins Diesel Engine and Eaton-Fuller gearbox. One unit was about to enter real traffic tests by the week of the UNIDO field mission. According to the information available, SATESI offered better support to MODASA than MORILLAS for the development of the subject unit. SATESI, though, is located in Lima, which would pace complex logistics problems to work with MODASA on a rolling basis. Still so, depending on interest and future arrangements, SATESI - alone or in parallel with MORILLAS - might represent a durable business partner to MODASA.

MARCOPOLO

A Brazilian bus and truck superstructure producer with strong market dominance in Brazil and other prominent markets in South America: Argentina, Chile, Uruguay, Paraguay, Peru, Ecuador, Colombia, Venezuela and Mexico. The company is now working to set-up a strategic alliance with another partner (MORILLAS ?) to set feet into the Andean Pact, where the repressed demand for buses is indeed very high and approaches the eve of a boom. MARCOPOLO is also dominant in AFRICA, where their sturdy bus construction has encountered strong market acceptance.

AGRALE

A strictly Brazilian capital company producing a range of autoparts and complete vehicles with their own technology and growing success. AGRALE is being thought of as a potential strategic ally of MODASA to develop suitable products to meet the general Andean Pact market demand for light duty trucks and buses. Such vehicles would have a MODASA made Perkins Diesel Engine and - in the eventual case Peru adheres to the MERCOSUR - the units could possibly encounter good sales perspectives in all the member nations of the mentioned free trade agreement zone.

ABSTRACT

TF/PER/93/E10

Objective: Render technical advisory in the process of privatising of the Fábrica de Motores Diesel Andinos S. A. - MODASA.

Timing: 18 days, starting with a 9-day field visit (Lima and Trujillo) for data collection and company acquaintance (April 28 through May 8, 1996), plus the necessary days for report preparation at home-base (S. Paulo-Brazil).

Responsibilities: (according to the UNIDO Terms of Reference, see Annex I) To work in close co-ordination with the people assigned by the Special Privatising Committee of MODASA, performing the duties mainly at the premises of that company, including the following tasks:

1. Inspect and evaluate the MODASA facilities, determining their current status and the productive and marketing potentials.

2. Analyse the possible sale strategies and international placement.

3. Identify a range of possible users and international auction bidders.

4. Indicate criteria for the valuation of the enterprise.

This report covers the activities held in Peru by **Augusto Cezar Saldiva de Aguiar**, a Brazilian adviser, working under a special contract from UNIDO, for the purpose of evaluating MODASA - Motores Andinos S. A., a Peruvian Diesel Engine Assembly Plant which is subject to a privatisation programme due to be completed by the end of 1996. It serves as a technical and strategic guideline on actions that can be attempted by the Special Privatising Committee, in charge of that operation with regards to alternative outcomes, potential strategic alliances and other technical considerations aiming at a maximised auction sale value for the Governmental stake in that company's capital. It also serves as a crucial step in the recognition of the complex situation created with the decision to privatise the company due to the peculiar status of the society's capital ownership and irrevocable technological limitations of their market and manufacturing capability.

The visit still served to assist a local consulting and auditing firm (APOYO), elected by a public tender, in their mission to prepare the final evaluation of the MODASA Assets for the legal formalities preceding the auction. This was done by advising on topics and items to be investigated and considered in the process and through an Executive Seminar, held in Lima, with members of the Management of MODASA, CEPRI (the Governmental Privatising Committee), UNIDO (acting as co-ordinator of the panels held), and APOYO (the external Auditing Consultant). The subject Seminar served the purpose of homogenising the knowledge of all parties regarding the real status of MODASA, its present threats and opportunities, market challenges, structural deficiencies and technological limitations.

All four topics above, regarding the objective of the mission have been accomplished.

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INTRODUCTION

This report contains the result of the work tackled during a field visit to Peru, by Brazilian adviser Augusto Cezar Saldiva de Aguiar, held on a special temporary contract, as part of the United Nations Industrial Development Organisation involvement in the Peruvian Governmental Privatising Program, under the support of the United Nations Development Program. The 18-day (9-day field) mission comprised the analysis of one specific company included in the said privatising programme, namely MODASA, Motores Diesel Andinos S. A. The co-ordination of the MODASA privatising programme is attributed by COPRI to a specific committee designated as CEPRI-MODASA, under the guidance of Luiz Piazzon, a well known Finance Specialist and Professor of ESAN-LIMA, who is also involved in other crucial CEPRI activities like the huge CEPRI-PETRO-PERU. Professor Piazzon is the responsible executive officer as the UNIDO Counterpart.

The activities in said mission started on April 28, 1996 and were foreseen to last 18 days, including an originally 6-, finally a 9-day field visit to Lima and to Trujillo, in Peru, for a direct contact with the people, locations, sites, premises, offices, facilities and authorities involved in the mentioned privatising operation.

The original objectives as described in the Terms of Reference (see Annex 1) were all fulfilled. In addition, due to a nebulous environment and a noticeable lack of common vision regarding the real status of MODASA from the part of the Peruvian executives involved in its operation, as well as those from CEPRI-MODASA and from APOYO (the consultancy firm in charge of its official valuation) the mission calendar was changed to accommodate an unforeseen 5-hour "Executive Seminar" conducted by the UNIDO adviser. It was held at MODASA Lima Headquarters, as the closing of the field visit, using the "*Quest*" Method, to help formulate a vision of some crucial topics, as it will be demonstrated in this report. The Seminar also served the purpose of extracting a very accurate situation summary from the people who carry the memories of the whole process. The subject Seminar was seen as the most important contribution, so far, for the development of the aimed privatising, as it served the purpose of highlighting very important, though neglected aspects of the MODASA status in real terms.

A total of above 2,000 pages of relevant historical, technical, economic, commercial and legal information about MODASA, the Auto Parts industrial base, the local Transport Industry conditions, CEPRI and the Peruvian Privatising programme were reviewed during the field visit, most of which have been collected and remain in the possession of the UNIDO adviser at home-base for eventual reference. That vast amount of interview notes and physically submitted (official) data has been properly analysed and all that was considered relevant is reflected in the subject report so as to contain an organised and structured view of the situation.

According to Luiz Piazzon, Peruvian counterpart of this UNIDO mission, the objectives with the work were well succeeded and fulfilled the expectations. He has already verbalised the intention to continue in contact with the Brazilian adviser in future phases of the MODASA privatising, which will require instructions from UNIDO regarding the feasibility.

The next page contains a brief summary of the main conclusions deriving from this mission.

Main[1] Conclusions and Recommendations:

- Accept and act under the notion that MODASA is a captive and now exclusive Perkins Engine assembly plant and perform the necessary negotiations to keep the British partner deeply interested in the maintenance of its stock and - even better - in increasing their equity.

- Retard the time schedule of the privatising programme, within the permissible legal time range, in order to offer MODASA a chance to celebrate strategic alliances that reinforce the company's market position and add value to the present stock.

- Consolidate the strategic alliances by inviting the involved companies to commit in acquiring determinate volumes of the MODASA shares, including Leroy Somer, a suitable vehicle chassis producer (already under discussion with either a Chinese non identified supplier or AGRALE), one or two Peruvian based vehicle superstructure builders, and some other producers of equipment in the areas that are going to offer the fastest growth possibilities in the Peruvian Economy : Fishery, Mining, Agriculture, Civil Construction Energy and Telecommunications sectors.

- Develop, through expansions and attraction of new capitals, a broader commercialisation structure to avoid the present odd concentration, when - consistently along time - a single dealership (Ferreyros) sells around half of the money value of the MODASA production and 7 dealers respond for around 65% of the turnover. Take the opportunity to increase the presence in markets like Ecuador (with all time insignificant sales) and Chile, where a good potential exists for the products of MODASA, to explore the advantages of the so-called Andean Pact.

- Consider the possibility of an alliance with MORILLAS and/or SATESI, for exclusive body building of eventual bus and truck chassis to be assembled in Peru, which might derive into their interest to acquire a stake of MODASA's capital in the "*Subasta*".

- Specialise a group of Sales Engineering people to exercise influence over the technical purchasing cycle of prospect clients. This solves the improper market penetration in segments where a clear demand exists for the type of products MODASA is able to produce and/or commercialise.

- Be extremely prudent in the choice of derivative applications for Diesel Engines to ensure that Perkins Engines are the main core business of the company.

- Evaluate MODASA according to a concept that is a combination of a ROLLING BUSINESS venture and a REALISTIC FUTURE MARKET domain prospect. Exclude from that value any known liabilities, which will require extensive search and proper economic implication valuation for unknown clauses, diffuse rights and other such conditions in the existing By Laws, Capital Sharing Modifying Acts, Dealership and Suppliership Agreements, Employees and Management Contract Terms, etc. Also check for eventual Governmental restrictions, rules and liability or compensatory clauses before the auction is announced.

- Seek counselling and advice to follow the strict legal terms regarding Industrial property, Patents, Trade Marks, Consumer Protection Code, Anti-Trust Regulations, Vehicle Certification, etc., to minimise exposure to liabilities and civil responsibility claims relative to products, parts, services, etc., including diffuse rights and "class claims" possibilities.

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[1] Other recommendations and conclusions appear throughout the text or in specific chapters.

I. WHAT IS MODASA

A. Some background

MODASA is one of four similar companies that were inducted by the Peruvian Government during the military rule. Three others were subject to the same process but do not exist any longer. They were:

- COPASA - Compressores Andinos S. A., created to produce air compressors;
- FAMASA - Fábrica de Máquinas Andinas S. A., created to produce machine tools;
- TASA - Tractores Andinos S. A., created to produce agricultural tractors.

Together with MODASA, all three have the same genealogy, that is, the governmental intention to create in Trujillo, 500 km North of Lima, along the seashore, a metal-mechanic pole to help develop the otherwise micro-property based agricultural zone. Trujillo did not present at the time any organised industrial activity of that scope, and the peculiarity of the region had been a scattered dedication to family operated shoe craftshops of very low technology and done in a region without any leather production. Indeed, most cattle raising activities happen further North, in the Cajamarca province, where such a shoemaking pole would be much better served in terms of raw material availability and choice. According to SENATI experts, interviewed for this report, the leather supplied to the region is not of the required quality and there are no local providers of machinery, moulds, fitting supplies, etc., resulting into an essentially manual manufacturing, non-competitive even in Peruvian national terms. The main shoe manufacturer in Peru is of Czech Origin (Batta) and develops intensive manufacturing in another region, notably in the outskirts of Lima. Therefore, Trujillo shoe works were and are of a local nature, despite employing what could be 90,000 people and occupying whole families in districts like Esperanza, where every home has its active manufacturing and sale business, most operating as underground economic activity.

This was the outset. Rather humble neighbourhood, home and family based economy and productive activity. Without crucial resources - like skilled labour and familiarity with metal works - all four companies with forced birth by the Government had to rely with great intensity on supplies from outside the region and from transnational companies, starting from very simple CBU sets progressively converted into CKD operations. Logistics problems were overwhelming, specially because of the precarious road connection between Trujillo and Lima at the time, a situation - to a certain extent - still prevailing nowadays. Many of the technicians, even at blue-collar level, had to be brought from Lima, some from abroad. Training, therefore, became a fundamental part of the business concept in Trujillo, and still today occupies a great deal of the efforts at MODASA. Trujillo indeed reflects an unsuspected devotion to training and education, with a quite impressive network of public and private schools, including 4 universities[2]. SENATI is also a warm example of this indigenous interest for regional personnel formation at all levels. A vast number of professional development centres and schools for computer users, programmers, etc., can be spotted all over the town. The equipment and software in such local units are state-of-the-art!

The reasons for the failure and disappearance of all three sister factories of MODASA - the profound disinterest of the technology supplier, difficulties to establish a proficient operation, the lack of skilled workers, the inbound/outbound transportation needs, as well as the overestimation of the market demand - are all latent also at MODASA. Therefore, any actions regarding the future privatising of the company have to consider what has already happened to the three ill-fated congenial enterprises...

[2] Two of these have been briefly visited by the UNIDO adviser, to obtain an inside perspective of their level and quality. The impression is reassuring.

B. The Capital Formation of MODASA

The induction of MODASA came after an international tender, with candidates from Eastern Europe (Russia, Bulgaria), from USA (not identified by MODASA) and from Western Europe (including those winning the bid). Although we do not have much background on the methods utilised in the selection, it becomes patent that Volvo (Sweden) and Perkins (United Kingdom) have presented the best suited plan at the occasion, becoming "*joint-venture*" partners for the constitution of MODASA and acquiring, each of them, 26% of the capital shares. The Government has kept its 48% stake since day 1 and did let the Management of the company free to define the technical and commercial fate of the resulting enterprise. It is curious to note, at this point, that although Volvo and Perkins usually face ruthless competition from each other in all international markets, they have "*settled*" for the induction of MODASA, even when the respective engine ranges were intersecting and overlapping in the respective edges of power output availability and final applications. It seems that, at the time, they envisaged other strategic variables that surpassed in importance the competition balance. After all, one does not need much imagination to conclude that what was being tendered was a substantial share of the present and future Peruvian Diesel Engine Market, with extensive implications over a vast area with restricted access and characterised by growing demand: the Andean Pact!

Perkins and Volvo became then partners to explore the already disseminated image and large operating population of their respective engines, through a partly owned governmental plant to assemble the respective products and eventually nationalise the pieces that the Peruvian authorities would require based on a moving concept (initially by value %, then by weight %, soon by more complex calculation rules, then and finally, by the application of free market practices). The opening of the market to imports, already in the Fujimori first rule, broke the balance and upturned the market, resulting in substantial volume losses to MODASA. Under that picture, Volvo decided to leave the Society, which is far from saying that they were deciding to leave Peru...

According to Héctor Garcia Béjar - a fundamental participant from the very early times and today the General Manager of MODASA, as well as the most prominent investor of the so-called San Juan Group - the coexistence of both Volvo and Perkins at MODASA has been peaceful and the intensive technical co-operation, and the sharing of knowledge and experience on manufacturing, designing and servicing Diesels, constitute one of the "*main assets*" on sale at the moment.

The abrupt leave of Volvo provoked a turmoil which has consequences to date. This led MODASA into a creative mood that resulted in the production of Leroy Somer alternator and generator sets and related control panels and computerised monitoring systems. Leroy Somer, though, does not bear any capital ownership at MODASA, which is something to be further developed, specially in view of the very traditional liaison Perkins-Leroy that pervade other markets and the large participation they have in the Peruvian scene through the present arrangement with MODASA.

An insignificant amount of shares is in the hands of "*the labourers*" of MODASA. This is due to a local law allowing that such shares be issued to the bearer, without identification of ownership. The members of CEPRI-MODASA, as well as some executives from MODASA, in Lima and Trujillo, have mentioned the so-called "*acciones laboriales*", whose value dropped from S$ 0.75[3] in January 96, prior to the announcement of the privatisation, to S$ 0.49 by the time of our field mission start-up. The executives of APOYO commented on their impression that someone (still not identified) might be provoking the drop to send signals to the market about the "*real*" value of the share, in an attempt to reduce the overall company worth of MODASA. But APOYO is also convinced that those signals will mean very little because the portion of capital under the legitimate hands of the workers is indeed very nominal. As a curiosity, the shares increased value while the CEPRI-MODASA, APOYO and UNIDO visitors were in Trujillo, confirming the sensitivity of such shares market due to its tiny dimension. By

[3] S$ stands for the local Peruvian currency Nuevo Sol (plural Nuevos Soles). Exchange rate by the time of the field mission was S$ 2,39 = US$ 1,00

Wednesday, day of our departure from Peru, the "*acciones laboriales*" had shifted back to S$ 0.56[4].

C. The Present situation of MODASA

MODASA is definitely a Perkins Diesel Engine assembly plant almost entirely dependent on a CKD supply from the British source, with a moderate capacity to machine a small range of assigned components. MODASA is entirely bound by commercial treaties, licensing agreements and other practical aspects (like tooling limitations, jigs, fixtures with exclusive fitting and purpose) to their key supplier: Perkins from England[5].

MODASA is also an engine adapter, with a good capacity to fit Perkins (and eventually Volvo) CBU engines to specific machinery, such as compressors, generator sets, hydraulic pumps, past model vehicles, earth moving machinery, marine propulsion, etc. Between 1985 and 1987, MODASA has also adapted CBU Deutz engines to the same type of equipment. For small adaptations, like low power / low torque demand motor-pumps, MODASA has developed a local range of rigid couplings and clutch type devices, to replace imported ones. The technology employed "*imitates*" the design of previously imported units. It was not possible to clarify if any technology or patent agreements exist for those small units or if their existence is just an expression of the local creativity and mechanical skill[6].

MODASA is an assembler of Leroy Somer generator sets, in the suitable range that fits the Perkins Engine models it is equipped to assemble. Also here, MODASA is endowed with a certain local manufacturing capacity, having defined a practical line of components that are locally machined and fitted. Among such, the most notable items are the control panels, power line monitoring systems, which are state-of-the-art technology. Beside the support from Leroy, MODASA has specific competence in this field by having developed a local technician through a number of courses and training opportunities abroad. This is a typical case where local talent of a single person has been transformed into a highly valuable company asset, by enabling the take over of a given market sector. (Example: telephone and telecomm back-up and remote station support energy packs, with remote computerised control and performance checking).

MODASA is also one of its own dealers, by operating a shop and two firm designations for the purposes, right in the commercial area of Lima, where the Management and Directive activities of the company are also headed from. Surprisingly enough, the cumulative volumes (in 93, 94, 95 and 96 through March) sold through this outlet were respectively 0.15% of all engines, gen sets and motor-pumps (reported as Motores Diesel Andinos S.A.), and another 4.84% in the same period (reported as MODASA Comercial S. A.). On the other hand, Grupo San Juan, in the same period shows sales of 1.85% of the total volume. One topic that calls the attention is that, since the appearance of Grupo San Juan in the statistics, the actual sales of MODASA Comercial and Motores Diesel Andinos S. A. suffer a drastic reduction.

The table reflected in the next page is a summary of the volumes report submitted by MODASA to CEPRI and made available to the UNIDO adviser during the field mission:

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[4] The nominative value per share is S$ 1,00.

[5] The fact that MODASA still has past model Volvo engine jigs, rigs and components machining tooling becomes irrelevant since these are rather engine specific and cannot be applied to other production purposes without major investments.

[6] If this is the case, MODASA should be alert for possible liabilities and international claims on patents or other industrial property issues. The specific - renewed - legislation about this matter was published on April 24, 1996, and is a current debate all over the continent because of its rigour.

Total Sale of Engines, Gen Set Groups and Motor-pumps

Dealer	1993	1994	1995	Ytd 96	Cum. 3.25 Years Total	%
Enrique Ferreyros S. A.	346	1163	266	90	1865	46.57
MODASA Comercial S. A.	63	76	52	3	194	4.84
J.C. Representaciones S. A.	70	94	30		194	4.84
Mac Donald y Co. S. A.	129	38	14	4	185	4.62
Motorindústria S. A.	111	50			161	4.02
Cumulative Participation in the Market of above 5 dealers						64.89%
Grupo San Juan			36	38	74	1.85
Motores Diesel Andinos S. A.			4	2	6	0.15
SUB-TOTAL (7 of 59 dealers)	719	1421	432	137	2679	66.89
Volvo Del Peru (phase out)	72	7	1		80	2.00
GRAND TOTAL	2533	3690	1359	394	4005	100.00

source: MODASA Plant in Trujillo

One company distributing MODASA products, namely Enrique Ferreyros S. A., responds historically for about half of the total sales volume at national level. This allows the subject firm to exercise a real control over the market practices of MODASA. When questioned about this smashing participation of an external force in their business, MODASA Chief Executive Héctor Garcia Béjar indicated that "*this has been a historical feature of the company which is specially due to the Ferreyros ability to finance the sales to the clientele*". According to information collected with Orestes Cáceres Zapata, Technical Secretary of CEPRI-MODASA, Ferreyros is a real mega-dealer in the American concept, also operating with Caterpillar, Cummins and other engine brands as well as with passenger cars and other equipment. Last, but not least, Ferreyros also has a small generator set plant of his own, and has been adapting his own produce in place of the Leroy Somer units that MODASA produces. A point describing the fragility and risk involved in the overwhelming presence of Ferreyros at MODASA is the estimation, made by Benito Zarate Otarola, MODASA's Manufacturing Division Manager (stationed in Trujillo and also holding a stake at San Juan Group), that the participation of the MODASA business within the Ferreyros company can be less than 10% of the total[7] turnover! Still so, it is spread voice that Ferreyros "*has interest*" in acquiring MODASA shares at the privatising auction...

MODASA grants Perkins a substantial market in Perú and in the Andean Pact, despite the fact that some of the sales are done directly through dealers and based on direct imports of CBU volumes from England. It has been stated by MODASA Chief Executive Héctor Garcia Béjar that the Regional Mar-

[7] The Edition of Lima's "*El Comércio*" on May 1, (page E2, Business Notes), decribes the commercial results for Ferreyros as having sold US$ 150 million in 1995. The company hopes to close 1996 with a 15% growth. Considered one of the best 100 "*small*" enterprises of the world by Forbes magazine, Ferreyros will celebrate its 75th Jubilee Year in 1997, in a grand style: they will open a financial institution to operate in their field of business and knock-down the banking community. More impressive yet, according to Oscar Espinosa (Director Gerente General) in the paper's interview, "*their results in sales in 1995 are the double of those of 1993*". The article was specifically made after a press conference when a new institutional image and three new "*products*" were being launched (**Servifer 24**, **Rentafer** and **Credifer**). In summary that means: a Service Network with 24-hour on-duty time, a new equipment Rental service, to work with all the product range - inclusive the MODASA beton mixing machines (as cited by Héctor Gárcia Béjar during our visit) - and a Credit line, responsible for financing above 50% of the whole Ferreyros Group sales, with a portfolio of US$ 80 millions in credits already rolling!

ket, more specifically the "*normal*" Peruvian Perkins engine market is of the same magnitude of important world markets like Italy and France (3500 Perkins engines per year!). By "*normal*", MODASA means an equivalent production and sales performance of 1994.[8]

MODASA also grants Perkins, through its present dealer network, a very attractive spare parts market, which is solely captive of Perkins themselves, because the local machining and eventual reproduction of selected engine components does not indeed constitute a range of spare parts.

Along the years, MODASA has tried their hand with other third party engines, the following table shows the total per manufacturer along its whole time history. The table is also suitable to ascertain how variable the volumes have been since 1977 and to date:

TOTAL ASSEMBLY OF DIESEL ENGINES BY MODASA

Year	Perkins	Volvo	Deutz	Bounus	Total
1977	128	46			174
1978	1302	193			1495
1979	1465	648			2113
1980	2451	1164			3615
1981	2263	1499			3762
1982	1222	612			1834
1983	601	146			747
1984	424	278			702
1985	715	388	11		1114
1986	1814	634	9		2457
1987	2727	1033	20		3780
1988	2428	766			3194
1989	918	428			1346
1990	1334	676		30	2040
1991	2697	93			2790
1992	2329	209			2538
1993	767	86			853
1994	1860	21			1881
1995	654	24			678
1996 (Ytd March)	138	10			148
TOTAL	28237	8954	40	30	37261
in approx. %	75.8%	24.2%			

source: MODASA Plant in Trujillo

From the above table we can note the massive participation of Perkins engines in the production activities of MODASA, responding for 75.8% of the total production volume. Volvo comprises the rest, as Deutz came about for a three-year period (1985-1987) with 40 units and Bounus (an Argentine supplier) came in 1990 for a market experiment, with just 30 units. It is interesting to note that MODASA still produced 24 Volvo engines in 1995 and 10 in 1996...

The table also highlights the extreme turbulence faced in the market, with a peak production of 3780

[8] MODASA capacity, variable in function of mix, is rated at 5.000 engines a year. No critical barriers exist, though, to lift that capacity to 7500 units, as the only restriction would be the Engine Test Cells, which can result in the second mentioned capacity figure keeping the "*generous*" 2.5-hour test cycle in use today, or even more, if the test cycle is optimized.

engines, in 1987. From then on, the market dropped substantially, with 1995 bearing the all time low: 678 units. By the looks, and unless substantial Marketing efforts are made, 1996 will mark a low figure, as the first quarter already confirms .

Another variable to consider is that MODASA carries at the moment an evident excess inventory of engines being 386 from CKD origin, of which 231 are reported as "*ready on storage*" and 155 are reported "*in process*", plus 74 units reported as CBU, meaning finished products in stock. This means that 460 engines are held in inventory, which - according to the above table - means that, in proportion, 67.8% of the production volume of 1995 "*remains*" inside the company. These numbers, according to MODASA do not include the goods in transit. Beside that, we have no figures handy to know how much raw material and goods in process could be in inventory for the so-called national integration portion, where a substantial volume and value may be accounted. For Perkins only, the so-called horizontal integration comprises the number of 361 items, usually simple line-up parts, like pipes, hoses, clamps, pulleys, manifolds, housings and oil sumps, normally supplied as castings or raw parts, still subject to some machining or finishing operation at MODASA. For these, the sources are a network of suppliers involving 35 companies. Also for Perkins only, the so-called vertical integration comprises 68 parts, including aluminium and grey iron castings and forgings, supplied from a range of 7 suppliers, plus Perkins England and Perkins Brazil (Maxion) for the real complex rough parts. The machined parts of this last kind are elaborate items like flywheels, flywheel housings, oil sumps, pulleys, inlet manifolds, thermostatic chambers, exhaust ducts and some simple spacers and adapters. Very few of these 429 items characterise what is commercially viable as spare parts, as many are never replaced for wear and tear. Most of those are structural parts that remain in place for the whole useful life of the engines, seldom requiring any type of maintenance or repair. This subject is reviewed in detail in Chapter III. E.

D. New Products in sight?

Forced by the difficult market conjuncture, MODASA Management started a series of trials to escape this oppressing reality. As far as we could check, the trials - consisting of new products and plant manufacturing activities - were discussed and approved by the Board, being legitimate and legally valid Management decisions.

One example that shows how dramatic the situation can be: about three years ago the Peruvian Government authorised the importation of USED VEHICLES on a duty free basis. This done, a large number of entrepreneurs, generally individuals with a very small capital at hand, decided to import old and totally depreciated school buses from the United States, to operate them as city buses in Lima and other large communities in Peru. The final cost for those imports could mean some US$ 4,500 FOB Lima! The result was a total downturn in the already precarious status of the urban bus fleet, with many fleet renewal decisions being postponed "*sine die*". The law has already been revoked but its effects are still present in the congested traffic of Lima and other Peruvian cities. Since many of the Perkins engine sales were for the repowering of old units, the decision to import used vehicles provoked a substantial drop in MODASA sales of vehicular engines, up to that time the most prominent sector for the placement of Perkins engines in Peru.

One of the present programmes at MODASA entails the assembly of construction site beton mixers, with technology and components supplied by a company from Argentina. The plan is to use idle assembly and machining and hardware handling capacity at MODASA to put the subject units together, despite the low added value (no Perkins, but a Bounos small power output engine) and the lack of a suitable distribution chain for the final product. The first CBU units were still in plant - the project started earlier in 1996 - and a market trial will comprise two types of units. Interesting to note that Ferreyros, with an already high participation in the MODASA sales volume has already announced his determination to sell (and principally to RENT) the subject, by placing an order for 12 units. The simplest model, a 9 ft^3 mixer bears an electric motor (?!) and an extremely simple manual tilting mechanism. The larger unit, for 12 ft^3 volume is powered by a 13 HP (@ 2.000 rpm) Bounus engine unit. Also, in the literature supplied, there are indications of a dumper unit, a micro-tractor endowed with

either a tipper bed (to transport crushed rock and mixed beton) or already bearing a tilting stand with the rotary drum for the mixing already in place, best suited for paving operations. The literature being distributed in Peru already indicates MODASA as the producer of all equipment, makes no reference to the Italian originator of the technology or even to the Argentine supplier, and attributes to the Bounus engine the brand-name MODASA. These are decisions and practices that may incur into liabilities and other patent/industrial property/trade-mark litigations.

Another idea, that is exciting the imagination MODASA executives, is the possibility to acquire Chinese components for a light duty truck and adapt a Perkins Engine, a Brazilian gear box (Clark or Eaton), a range of local components to be sold as a distribution truck and also as an urban bus chassis, already bearing a Peruvian bodywork made by SATESI. The prior applications development area at MODASA has been transformed into a prototype workshop, where a total of 8 units (4 still in construction) are being "*adapted*" to cope with that objective. Two trucks are already circulating on a field test and two buses were already built. One bus prototype could be seen at the MODASA-Lima site, where it sits waiting for an agreement with the Lima Association of City Bus Drivers for a round of demonstrations in real passenger traffic planned to start still in May. The intensity of the work at the mentioned workshop indicates that there is strong pressure over the workers, and specially over the assigned Project Manager, Horácio Aguilar Z., who accumulates the Product Engineering Manager's post, to complete the adaptation.

After finding some trouble with the Chinese components, namely the brake system, among others, due to the typical driving and loading habits of the Peruvian operators, a new supplier is being thought of: AGRALE, Brazil, which carries a whole range of ready products suitable for the need. That company has been contacted and a field visit was to take place between May 9 and 17, for discussion to "replace" the Chinese source. Also a field visit by MODASA's General Manager Héctor Garcia Béjar to AGRALE in Brazil had been planned to start by May 28.

Considering the status of the subject transports sector segment in terms of fleet age, general health, overall safety conditions, traffic security deficiencies, endemic lack of spare parts, specially for ancient models, etc., the MODASA idea makes sense. We shall go into deeper details in the appropriate chapter of this report. For now, let's stay with the consideration that MODASA is looking for new products according to two lines of quest, as follows:

1. products that generate work for the present idle capacity (both human and material)
2. products that offer new market possibilities for Perkins Diesel engines

One does not have to think much to agree that number 2. must be the most effective. This signals in the direction of having MODASA to celebrate strategic alliances with companies that can produce the means to reach that objective.

II. MODASA PLANT IN TRUJILLO

This Chapter contains an evaluation of the MODASA Plant in Trujillo, based on data collected during the field mission and other information sent, afterwards, to home base by telematic means. It is structured to present the main characteristics and variables in a way to provide a general overview of the resources and technological status of that enterprise.

A. Basic facilities

The MODASA Plant in Trujillo comprises a single property site located at the Southwest city exit, at Ruta Panamericana, the International Traffic Road towards Lima (the North exit, across town, goes toward the border with Ecuador[9]). Said road presents intense traffic, day and night, and, at the point confining with the MODASA property, is a dual lane track, divided by a 0.6 metre wide, 0.30 metre tall concrete framed walking refuge. The roadside safety lane is not paved. Right in front of MODASA's entrance gate, the subject divider is interrupted, enabling vehicles to perform a risky crossing and bend in both directions. No protected right or left turn facilities or international standard road return exist at that point.

For the gate access area, MODASA segregated and fitted a special unpaved apron, beyond the road domain strip, surrounded by an angled brickwork wall, where two gates (inbound & outbound) exist, with a guard house in the centre. The said guard house is constantly occupied by a 3-men heavily armed third party security crew and a Doberman watchdog. The two 2.5 metres high gates are made of strong iron bars in a welded structure. The company is properly identified at the entrance. From that point, the MODASA name can be read in the brick wall (see photo 1) and also the Corporate logo is seen atop the adjacent water tower (see photo 2), completing the site identification. Strict access (entrance and exit) security procedures are enforced.

The whole property area is fenced, being the East side, confining with the Ruta Panamericana endowed with a grilled fence. The total property grounds comprise approximately 100.000 m^2, distributed as follows:

Floor Plant Main	:	21.384 m^2
Other Industrial Areas	:	624 m^2
Office Space	:	2.516 m^2
Cafeteria	:	1.312 m^2
Utility houses	:	652 m^2
Roads, Yards & Aprons	:	20.374 m^2
Free Areas, not-utilised yet	:	54.106 m^2
Summary:		
Covered constructions	:	24.341 m^2
Paved & provisional buildings	:	20.374 m^2
Total Property Space	:	**99.821 m^2**

source: MODASA Industrial Division, Trujillo

An area of 85 m^2 has been assigned to the Policia Nacional del Perú, at the South corner of the property.

[9] This is a different Road, though, than the so called North Route, connecting Trujillo to Chiclayo, that follows a seashore pathway.

The general area is landscaped with regional native plants and forms a nice looking and harmonic architectonic complex.

The hexagonal shaped 2-winged and 2-floored Administrative Office comprises the general office space available in the premises (see photo 3). Small clerical offices also exist in the plant interior, where supervisors and technicians have typical foremen cribs surrounded by typical plant dark blue metallic divisions.

The reception of the Administrative Building contains a counter type desk and the usual visitor sitting and waiting room. One member of CEPRI-MODASA highlighted, during the visit, that almost without exception, all decoration pictures - not only in the Plant Reception, but in all Offices at MODASA - exhibit VOLVO promotional materials. This is the same in the Lima General headquarters. Considering that VOLVO has left the company and does not represent a high volume product any longer, this was remarked as an "*intensive tribute to the ex-partner*"...

The Offices are divided with floor-to-ceiling plywood oak casket partitions, some bearing opaque glass panels. They are ample inside and still reflect the style and furniture preferences at the time of company induction. The internal circulation corridors, in view of the solid and opaque partition type selected, are dark and force the fluorescent bulb luminaries, specially in the ground floor to be on all day long. There are elegant illumination shafts with zenith domes and well arranged gardens in the core of each of the hexagonal wings.

The exit from the Office Building to the Plant area, or to the very ample Cafeteria Building, is made through glassed doors and no surveillance or access control exist in that route.

The different Departments are identified with door name plates. This is now essential as the receptionist services at the main lobby have been discontinued, as part of the company's forced slimming campaign. We have visited practically all the different Offices and the effects of the Headcount slashing are notable. A large number of desks, drawing boards and secretarial (or clerical) layout positions are empty. This indicates that MODASA may have lost substantial capacity in the Administrative Offices by force of the mentioned personnel reductions. In such a short visit, though, it is not possible to judge how much of this loss has indeed affected the collective competence of MODASA for the future. In the Product Engineering Office, for example, the effects of the reductions are dramatic, with a long row of idle drawing boards still in place. When questioned about this potential problem, the respective Manager indicated that indeed the subject personnel reductions are causing problems, including a slight delay in processing the necessary engineering changes. Since most of the work refers to Perkins engines today, and that company transacts the engineering data by means of aperture cards and micro-fiches, the effects of the personnel level changes are still to be noted.

The same sensation of empty Office space was felt throughout the Administrative Building, which caused the worry that the mentioned Personnel reductions may have already affected MODASA's technical skill and collective competence to handle to design, manufacturing and technical support services to their products.

At the Engineering Office, the UNIDO, CEPRI and APOYO visiting party saw two employees working with AUTOCAD 12. When asked about that standard, they indicated that they were processing changes in parts from Leroy Somer, which transacts their design information through that system.

The visiting party made an extensive and detailed 2-day visit to the Workshops and Plant activities. For better understanding of the process flow, it was decided that the visit tours would be made by following the production operational sequence. Therefore, we will handle each activity, according to that sequence.

1. Material reception and CKD set inspection area

In a paved area, towards the West wing of the Plant, a wide apron is reserved for the reception (and eventual storage) of the goods received. There was a large volume of crates shipped either from Perkins England (the CKD boxes, see photo 5) or from local suppliers of castings, raw materials and special Purchased items (the so-called horizontal integration items).

From there, the crates are led to the material reception for shipping conference and stock booking transactions. The CKD parts are packed in sets of 10 engines and divided to a determinate degree of breakdown, in the specific case observed, down to indivisible parts (nuts, bolts, bearings, injector, gears, pulleys, etc.). Both ready machined parts and rough parts (still depending on MODASA's machining) are led to a washing machine, for degreasing, including the removal of the thick film of anti-corrosive oil (Tectyl), which is done by using a solution of warm water and tri-chlor-ethylene. This is a problematic substance[10] and its use is being banned elsewhere in the Automotive industry. To do so, Perkins England would have to apply another corrosion inhibitor which would be easier to remove, like Ferromed 920, a cold detergent washable oil.

2. Engine pre-assembly operations

Parts are then either sent for batch machining or enter directly into the roller conveyor system, to undergo detailed quality inspection and initial pre-assembly operations. The subject roller conveyor is engine specific, as special tilting and rotation tables are custom designed to safely hold the heavy castings during such processes. Items like Connecting Rods and Engine Crankshaft Bearings come already machined and tested. The same bolts used during the original manufacturing process are removed and then reinstalled. This means that said bolts are retorqued (tightened again, with the application of an angle torque). When questioned about this unusual practice, MODASA Product Engineering Manager Horácio Aguilar Z. indicated *that "this is prescribed in the process from Perkins-England"*.

3. Engine assembly

The old L-shaped Volvo assembly line has not been in use, and was filled with unit fixtures containing either Volvo or Perkins ready built or CBU engines as a provisional storage space. In some cases, complete assemblies, including gen sets, motor-pumps, etc., were also on storage. The impression, confirmed later by the statements submitted by MODASA, was of a very high finished products inventory.

Essential parts like the Cylinder Heads, Engine Blocks, Crankshafts, Camshafts, the Connecting-Rods, Valve Taps, Rocker Arms, Main Bearings, etc., come all ready machined and in the final shape to be assembled. Internal and external engine dress-up items, like the Water Pump, Timing Gears, Power Takeoff, vehicle Auxiliary Compressor, Fuel Filter Console, etc., come pre-assembled and ready to fit. The same is valid for the injecting system, including the Pre-Filters, the high pressure Injection Pipes, Delivery and Relief Valves, etc.

MODASA vertical integration items for the Perkins range (the only active at the moment), deriving from a general machining area, or from the NC plant, where more complex machining operations are performed, meet with their respective engines along the short engine assembly line. Said line is characterised by the presence of Perkins designed wheeled carriers, which can be latched to each other and pulled by an under-floor mounted chain conveyor with a Varitron electronic advancement speed control. The 23 available carriers are engine specific, as the fitting of the block follows the design of the side flanges, holes and threads for the fixation. We noted that the conveyor system was not in use and were told that it hasn't been so for several months now, due to the rather low volume. The material

[10] Studies made in USA and Europe have indicated potential noxious health effects deriving from the human exposure to the respective fumes and environmental problems relative to its disposal as a contaminant of underground water sources.

feeding to the assembly line is made in shelves, tubs and tote-boxes, where the CKD nature of the supply becomes evidenced: parts are delivered in sets and to the exact count of production. The Volvo assembly line also has a chain based traction unit and comprises 6 engine specific wheeled carriers. This quantity indicates the original Mix objective as being indeed 75% Perkins and 25% Volvo (23:6)...

The Perkins Engine assembly is performed in batches of 10 engines, to follow the rhythm imposed by the CKD flow and facilitate the line feeding process. A total of what can be 20 assembly stations are defined, with process sheets assigning the respective operator tasks. Most assembly operations are manually made, including the verification of torque, as the compressed air feed lines are not endowed with torque control ability. All necessary manual wrench-type torquimetres are, at least theoretically, submitted to daily verification and gauge checking in a special calibration unit located at the head of the line. Operators are instructed to perform the mentioned checking at the start of each shift. Quality control operations were - about two years ago - included in the process sheets as part of the direct labour (assemblers' duties). A formal product Audit System, presumably with Perkins England procedures and reporting routines, has been implemented since then.

Due to the low volume being faced at the moment, MODASA is utilising part time work assignment. During the visit we noted that certain workers were arriving for their duties. Also we were informed that certain assemblers are working just a few days a week, according to a flex-time schedule.

Material handling, starting from the packing methods utilised for the CKD, is slightly deficient at MODASA. Parts are placed atop pallets, without dunnage or separators, and transferred to the respective installation points, where bulk handling is a fact. Despite the usual rough nature of Diesel Engine components, we observed fine finished parts, with rectified exposed surfaces and threads, being moved around and placed alongside the assembly stations without much consideration of their class 1 condition.

4. Engine Testing

After the passing through the assembly line process, engines become ready for test, which is done at a special dynamometer row area. There are 10 water-loaded dynamometric cells, assembled in two adjacent rows, of which bench 6 is assigned to quality control operations, and benches 7 and 9 are intended for Volvo engines. The total test cycle is of about 2.5 hours, including a warm-up period and the respective performance curves plotting by manual methods. From assembly, engines are relocated to test trolleys, of which there are 18 units dedicated to Perkins engines and 4 units to Volvo. The engine test area is a totally opened floor space, surrounded only by the contour walls. The operators remain inside the area (no control room or consoles available) and temperature, fumes and a puncturing noise level can be expected when more than 3 engines are tested simultaneously.

For testing, engines are coupled to a special fuel supply line, to the cooling water system and generally are not yet endowed with some of the dress-up peripherals. During tests, engines are submitted to the usual verifications, including a smoke evaluation, the setting of the valve plays, the visual inspection for oil, water or fuel leakage and a subjective evaluation of eventual vibrations or noise. Just conventional fire combat equipment is available in this critical area.

If problems arise regarding engine power output or fuel consumption, the respective injection equipment is submitted to a bench test. A special Injection Equipment workshop is located to the West of the engine test area. Two Hartridge benches exist, which enable workshop calibration of unit injectors and on-line pumps. A special injector checking unit is also available. The equipment is considered satisfactory for the needs and very seldom are the cases when extra help may be required from a Lucas/CAV specialised workshop. But new engine models, like the very advanced Phaser series, will soon require the investment in a new Injection Equipment Test Bench, to cope with increased pressure and debit characteristics of the respective injection sets. The Injection Equipment "*Lab*" is also endowed with capability to alter injection equipment calibration, including the respective governor replacements and

regulation, when vehicle engines are to be used for stationary purposes and vice-versa. As an example, during our visit, some vehicle engines - from the already mentioned excess inventory - were being re-tuned, to become gen-set units. A given set of parts, specially ordered in England, is used for such ret-rofittings including the injecting equipment centrifugal regulator.

5. Engine final dress-up and painting

After the test cycle is completed, the engines are led to the Engine Finishing Area, where the final dress-up is made, depending on application. Adjacent, and to the North of that area, is a special spray booth, with an overspray catching water cascade, where air dry lacquer paint is applied to the engines and respective dress-up items. Engines are suspended from an overhead monorail crane during the operation and, soon after, placed on finished product storage and handling skids. Those are available in a very small number (12 units) for the present inventory and to cope with the excess units in stock, a simple wooden structure (the actual shipping rack) is being used. A Ready Engine Storage Room is available North of the final Engine Dress-Up station. At the time of the visit, the temporary inventory surplus had filled the Storage Room entirely, requiring extra space along the inactive Volvo Engine Assembly Line and filling with ready products the Engine Parts Warehousing area, located to the South of it.

B. Special features

North of the paint booth, across the L-shaped Volvo assembly line - and separated from the rest of the plant by a brick wall - is a small crib workshop, where Volvo engines are submitted to overhauling or reconstruction. This is a typical example of an operation that evidently would be best placed in a third party specialised firm. Still so, the crib is there, inside MODASA, and has a current idle capacity. During the visit we have been shown two engines, still in the yard, that had just been received (from Volvo !) to be submitted to that kind of operation inside MODASA...

1. The Leroy Somer generator set operations

A special work area[11] has been segregated to house the Leroy Somer assembly, coupling and testing operations, including the very specific and complex control panel electronic work station. The subject area is separated from the rest of the plant It houses its own warehousing space, assembly benches, demarcated work stations and contains a small office where clerical and also technical operations are performed.

The young engineer responsible for this operation has had intensive training abroad and has shown to have full and complete domain of all aspects relative to the field, including a good ability to adapt and modify the control panels design and built-in software according to the needs. PLC type controllers and a variety of different constructive variant options exist for the mentioned control panels, including very elaborate features enabling power line monitoring and remote data exchange via digital modem lines. These last ones have been very successful toward the telecomm complex (Tele Peru), of which above 100 units have been sold in recent times. A new order was being processed by the occasion of the visit. The parts and components for the subject control panels are either supplied by Leroy Somers, as part of their CDK sets, or acquired directly by MODASA from the international suppliers. It could be verified that all instruments, microprocessors, switches, multiple cables, connectors, circuit boards, displays, monitors, etc., are of superior quality and legitimate procedence.

There is a growing vertical integration relative to the Leroy Somer product range within MODASA.

[11] According to the information available, the referred space used to be a Material Wharehouse before. The decision to use it for the mentioned Leroy Somer functions, somewhat reduced to CKD storage space, meaning that boxes containing imported sets have to remain longer in the yard apron, where the truck receiving and unloading operations are performed. This is OK for short permanence - as the boxes are weather-proof ocean freight type crates and the packaging specifications can impede material damage or corrosion.

Beside some machined gen set Housings, Adapter Rings, Supports and Brackets, even the Control Panel Cabinets, Fuel Tanks, Intake and Exhaust Ducts, Mufflers, etc., are made within MODASA. For some cases, MODASA is providing a locally made Clutch-type Coupling. Two special workshops have been fitted in the two West side utility buildings, where special sheet metal cutting, punching, bending, welding and finishing operations can be performed. In those shops, two brand new heavy machines (large width sheet metal mechanical Shears) had just been received and were pending final installation. These are intended for the existing Instrument and Control Panel Cabinet blanks, for the growing production of Mufflers, Fuel and Coolant tanks and for the new coming Beton Mixer parts production. Some 20 people were active in the mentioned "*external*" workshops, where handicraft techniques are essential for the production in question. Besides work benches, conventional arc welding, brass welding, etc., some CO_2 Hobbard type[12] welding units are available. Also available are several oxy-cutting devices, including a pantograph profile copying unit, bar stock cutters, turret drilling and threading machines, a radial drilling machine, overhead cranes, punches, hydraulic presses and a range of portable pneumatic tools for metal surface finishing.

According to MODASA's Trujillo Plant Manager Benito Zarate Otarola, the decisions leading to new investments in this Hardware operation "*are justified by lower costs for making*"[13] "*than purchasing them from external sources*".

At the Gen Set assembly area, elaborate Generator performance control panels are available for quality auditing, as well as a modern confined and sound insulated test cell has been recently constructed. This area meets the international standards for temperature, atmosphere and acoustic comfort for the respective technicians and operators. The area is also well protected with anti-flame materials and fire combat equipment.

C. Technical considerations

The MODASA plant site is fed by HIDRANDINA with power at the tension of 10 kilovolts. A site intake substation and two tension reduction substations set the power down to practical operational needs, respectively 440 Volts and 220 Volts, which is the general utility tension for the Trujillo area. The Frequency is 60 Hz.

As it has already been mentioned, the power supply is not straight, with many practical problems due to the present state of the public transmission and distribution system. This precarious situation affects MODASA performance, including frequent disturbances to expensive and critical machinery like the NC Machining Centres and the Leroy Somer Generator Set testing benches. It also adds to potential problems for data processing activities.

MODASA is well suited with a Telephone Switchboard and Facsimile equipment and is connected to IDD (International Direct Dialling). But despite being a common feature elsewhere in Trujillo, MODASA is not operating E-Mail or any kind of digital data exchange through telematic means.

MODASA Trujillo Plant is away from Lima, from most of its national suppliers and requires a continuous flow of transportation to and from Lima. In practical terms, this means a 7-hour trip by truck in each direction.

The plant is endowed with a Tool Room of its own, with sufficient capacity to build all the required fixtures, jigs, machining aids, checking gauges and other production auxiliary means. The subject area houses a sophisticated co-ordinate Jig Boring Machine, a specialised Radial Drilling Machine and a range of special dedicated machines, as indicated in the next table:

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[12] Continuous wire-type electrode welding machine in amorphous gas atmosphere.

[13] Make or Buy studies were mentioned, but not supplied to the UNIDO adviser or to CEPRI-MODASA. The UNIDO adviser has recommended that APOYO should make a quick analysis of these studies and investment decisions.

Tool Room Machinery and dedicated equipment

Quantity	Description	Current Estimated replacement cost (US$)
1	Coordinate Jig Boring Machine, Heckert	150,000
2	Universal Milling Machines, Heckert	85,000
1	Universal Milling Machine, Varnamo	58,000
2	Drill & Bit Gindrers	35,000
3	Rectifiers, of different brands	83,000
2	Radial Drilling Machines, Csepel	50,000
-	Other specific equipment	30,100
	Total at replacement value	491,100

source: MODASA Industrial Division, Trujillo

The MODASA Tool Room is self sufficient for the production of all that is required for their plant, including efficient metrology resources, like the very modern high accuracy digital probes installed in the Jig Boring Machine and in some of the key machines of that workshop.

Also, MODASA has a small Quality Audit Measurement Room, where conventional equipment is available for the duties. As far as we could inquire, standard gauging and regular calibration to the metrological international standards are performed and records are duly kept. A total of US$ 45,000 (at replacement value) have been invested in that room, including temperature control. The Room is capable of analysing raw parts, machining fixtures and finished parts as well. The documentation methods in use derive from the Perkins process instructions.

A Compressor room, bearing two units, respectively a 75 HP and a 150 HP Atlas Copco compressors, takes care of the 70 pounds pressure lines supplied for all pneumatic tools in the shop. Air cooling units for both compressors are available. No torque control equipment, though, is used. The compressed air pipelines are mounted overhead and oil and condensation water flasks are mounted at the hose take-up points. The hoses are new and all quick coupling connections are in good shape. The investments in Compressed Air supply and control equipment reach US$ 90,000 at replacement value. This, of course does not include the respective manual power tools

A small Carpentry Shop is available, being mainly in charge of providing emballage and small maintenance tasks.

For material handling, the MODASA plant is endowed with a large number of overhead cranes, radial rail mounted hoists, bridge cranes, hydraulic pallet trucks (24 units), three fork-lift trucks, being two electric and one Diesel, all from Caterpillar. Four Spegel industrial battery chargers are available. The total investment in Material Handling and industrial transport equipment reaches US$ 250,000 at replacement level. The value includes an old Perkins engined Dodge truck used for general transports, but exclude the two truck prototypes (Chinese chassis with adapted Perkins engines and Eaton transmission) presently under field testing and also handling goods between Lima and Trujillo.

MODASA has also a complete water supply handling system, including a water treating station, a water supply control system to and from the engine test cells, a cooling tower for the return water from the engine test and the respective dynamometer load water cool down units. Underground water supply (artesian well) complements the utility company supply. A concrete structured water tower, with capacity to maintain pressure by gravity to all plant locations is available to the Southeast apron of the main industrial building. The investments in the water supply and control system reach US$ 280,000 at replacement value.

D. The CKD routines and methodology

At the moment, the CKD routines refer essentially to Perkins (for the Engines) and to Leroy Somer (for the Generator Set models). As far as we could check, the breakdown levels used in the Perkins engine sets is very ample, all the way down to fasteners, gaskets, O-Rings and minor individual components, etc. Obviously, though, complete functional items like injecting pumps, unit injectors, water pumps, etc., are supplied as single pre-assembled items.

Each whole engine type comprises a certain set, specified to mutual acceptance. The CKD sets are ordered and supplied in formal lots for exact 10 engines. The "*omission lists*" correspond to local integration items, to which Perkins may exercise veto rights and require supplier pre-qualification for ability comprobation.

According to historical procedures, possibly fixated by contract, a 12-month ordering lead time, with a frozen 5-month period (excluding transit time) is "*mandatory*" . This makes it very hard, nearly impossible to circumvent demand fluctuations either up or down. This actually means that more than half a year of material has to be on order at all times, which also implies a certain inflexibility when the demand varies abruptly!

A MODASA internally developed computer application is used to control the composition of the CKD set, the demand calculations for the sets, for the vertical and horizontal integration items and the respective inventory. CKD entails careful quantitative controls over supply, demand and plant rejections replenishing or compensation. Due to the short time available for all the work, it was not possible to evaluate if the subject application is suitable and safe enough for the due control.

The imported portion of the CKD sets is packed in standardised crates, with all parts packaged in specific emballage units, cardboard boxes, plastic bags, etc., all of which are identified with part number and CKD lot number. As already mentioned earlier, parts with exposed machined surfaces are rust protected with a thick film of an anti-corrosive oil (branded Tectyl), posing special problems at MODASA for the respective removal. The shipping crates or wooden boxes are internally recovered by laminated plastic to impede water penetration. A visual inspection of a box being opened at the CKD control area, indicated sufficient material shipping protection according to internationally accepted standards. Each box contains a respective pick and pack list.

According to Benito Zarate Otarola, Industrial Division Manager of the MODASA Trujillo Plant. shortages are seldom occurring and shipping discrepancies were reported as statistically tending to zero. The eventual recovery of damaged, rejected or missing parts in the CKD supply is provided by air freight from England. Special orders are placed for the supply of extra quantities destined to spare parts or to cover warranty claims.

As declared by MODASA, the sale of CKD sets from the part of Perkins is performed at international market prices. This means that, despite ownership relations, Perkins has at MODASA an important and captive CUSTOMER The inflexibility of the 5-month frozen period and the risks incurred are a threat to MODASA's stability and economic health. This is one of the possible explanations for the existing excess inventory of Built-Up units at MODASA nowadays, meaning a stock in units nearly equivalent to 2/3 of the 1995 annual production! This aggravates the company finances by jeopardising the liquidity and may force MODASA to use bank loans to dispose of sufficient working capital to run business and self-finance its operation!

E. Machining operations

Machining operations are performed in specifically assigned areas, mostly located in the North foremost edge of the Plant floor. A varied range of machines and fixtures is used to perform the subject operations, with process instructions originated in England and suitably adapted to the local conditions

by the MODASA Plant Engineering Staff.

The majority of the equipment employed is constituted of Universal Machine Tools, to which special jigs and fixtures, entirely customised, to the either Volvo or Perkins parts, are in existence. The Volvo ones, mostly referring to past model engines are not in use. A vast shelve contains a large number of Volvo machining fixtures and a nearby display panel shows the nature and general line-up of those parts. The Perkins parts, comprising the various types of either past model or current production engines are in full vitality. Another display panel depicts those parts, essentially of the same nature as the mentioned Volvo items. They are mainly castings made in grey iron and acquired from local foundries and sub-suppliers. If the parts are more complex, requiring elaborate moulds and casting precision, then the source is usually Perkins England or Maxion (Perkins plant in Brazil). This also applies to forgings and die castings of Silumin alloy.

The generic machining style is "*process by batch*", with closed (finite) lots of parts being cycled along the various machines and fixtures to receive the programmed processes or operations. Due to the nature of the equipment employed, it is plausible that the same machine may have to be utilised to perform a given series of operations, when different parts are cycled in plant. This means part of the capacity may be consumed for set-up of the respective fixtures. At the present production level and capacity utilisation rate, this is absolutely irrelevant.

The table in this page indicates some of the machines and other productive resources available in the general machining area:

Basic General Machining equipment

Quantity	Description	Current Estimated replacement cost (US$)
2	Automatic lathe, Churchill	396,000
1	Vertical lathe, Webster Bennet	345,000
1	Broaching machine, Marlco	42,000
3	Multiple Spindle drilling machine, Pollard	341,000
5	Radial drilling machine, several brands	163,000
5	Milling machines, several brands	318,000
1	Parallel lathe, Colchester	18,000
	Total at replacement value	1,623,000

source: MODASA Industrial Division, Trujillo

Besides that large value, one has to consider the investments made in the respective jigs, fixtures, machining aids and even safety shields installed in the machines for worker protection. Those are part and machine specific. The Volvo leave and the replacement of certain engine types, by force of technical advancements, turns such fixtures and utilities obsolete. MODASA submitted a vast list of such Obsolete fixtures some of them already relieved from Fixed Assets by Management decision. The units are storaged in 22 crates corresponding to 115 tooling items. Other 5 crates contain special hooks and material handling auxiliary means, comprising 62 units. Another set of checking fixtures and Tool Room utilities, comprising 127 items is also reported as obsolete. Still another, comprising 27 complex machining fixtures, machine adaptations, etc., is listed by MODASA as out of duty.

Some of the obsolete fixtures correspond to parts subjected to engineering and process changes; another part is due to the decision to transfer parts from conventional to NC machining. Obsolete fixtures configure a considerable volume of investment. They also denote the "*non-spare parts*" character of the so-called vertical integration portion of the MODASA production range, as they are no longer in use, contrary to what would happen if Spare Parts would have to be produced.

In the Northernmost aisle of the plant, just across the Main Machining Area and the NC Machining Centre, a huge high-reach shelf contains part of the machining fixtures, tools and jigs active for production. Other such jigs are storaged in the small Southwest storage areas, including a room containing checking fixtures, drills, bits, taps and other small sized production aids. Another quantity of such devices (possibly obsolete ones) are storaged in open air shelves, to the East of the Receiving Area.

F. NC machining centres

The use of two elaborate NC machining centres, at MODASA, is indeed surprising, specially when we are aware of the company's profile and decreasing volume trend. According to information that was made available to the UNIDO adviser and to the CEPRI-MODASA visiting team, the adoption of NC was "*taken for granted*". The study supplied, in no moment questions the real need or economic opportunity of the subject acquisition, starting from the assumption that there is a need of NC machinery to increase capacity and to improve the productivity in the manufacturing of components. The report sent to the General Manager, from the Trujillo plant on January 3rd, 1991, describes a large number of alternatives and variants for the subject equipment Under topic 2, "Introduction", said report indicates that analysis and studies for the adoption of NC equipment were started in 1986, and continued with a field visit to Brazil in 1988.

Under topic 3, "Necessities", the study announces the conclusion of those needs by stating "*3.1. NC Machining Centres with capacity to integrally machine components with a high percentage of national integration, such as the Distribution Housing and Cover, the Lower Thermostatic Chamber, the Water Pump Body, the Oil pumps, the Volvo and Perkins Flywheel Housings, and parts and pieces for the Clutch Couplings for Generator Sets and for the Air Compressors*". It also states, as a side comment, that the NC centres should be projected to form part of a future production cell, or "Mini-Plant" for Clutch Housings ("*mini fábrica de culatas*").

Under topic 3.2, another NC machine, a Vertical Lathe, "*capable to replace the Webster Bennet unit, where Flywheel Housings and Coupling Housings type SAE 2 and SAE 3, as well as components for the Leroy Somer Gen Sets, such as Central Body, Exciter Coil Housing, Ventilator Rotor, Coupling Housing and other large diameter pieces*".

From that point on, the subject study makes evaluations of different acquisition alternatives, defining the respective machinery main characteristics, prices and conditions, reaching the conclusion for the acquisition of both units from MAZAK. The study does not bring reference on the decision for the PROMECOR Lathe presently in plant, although the technical characteristics comparison summary sheet indeed shows the unit as a second choice. In the cited study, two and not one mini-plant PLUS the Lathe are being discussed.

The decisions to invest approximately US$ 1,2 millions in one Mazak and one Promecor machines, plus the respective accessories, installation, tooling and spare parts, started to be discussed when the total production volume was at a peak. Since then, a continuous and dramatic volume reduction was experienced. The machines were acquired two years later and have been in plant for at least 3 years now. According to the programmer and technician in charge, the main problem with the subject machinery derives from their sensitivity to voltage and frequency fluctuations, which often cause certain printed circuits to suffer damages. The problems with the subject items are random and not always the same type of circuitry is affected. This results in frequent downtime, "*as there is the need to wait for replacement boards from respectively USA (Mazak) or Argentina/Germany (Promecor/Siemens Sinumerik)*".

The reason for the subject fluctuations is the indeed very poor state of the public electric power distribution network outside the premises of MODASA and generic for the whole city of Trujillo. Old cables, excessive demand for the transmission lines gauge capacity, moist, pealing insulation, fragile transmission line towers and distribution pole, sugar cane plantation fires and traffic accidents, cause "*apagones*", i. e., power interruptions and blackouts that are rather frequent. Surges and peaks, not

successfully handled by the machinery electric source controls, result in the mentioned circuits overloading, often causing board burning episodes. Observing the power lines at night has evidenced the large number of sparks, flashes and short circuits happening all over town.

Although HIDRANDINA is in good shape in terms of Power Generation Capacity, being assigned for its eventual privatisation, it is in the Trujillo's local power distribution network that the problem lies. Questioned about the subject, the General Manager of MODASA, Héctor Garcia Béjar, indicated that the situation tends for improvement as there are plans to replace entirely the old public transmission lines "*in the future*"... While the future does not come, MODASA should try to anticipate for the occurrences by increasing the inventory of spare boards, so as not to lose so many days of production of the mentioned NC machinery due to that predictable problem.

MODASA made all the parts fixtures for use with the subject NC centres, using indigenous design and local manufacturing ability. Also the basic instruction programs, to control the function of the two centres, are generated by the MODASA Plant Engineering Staff, using conventional data entry methods (EIA/ISO conversational protocol).

One evidence of excess capacity, though, is the fact that MODASA still relies on the conventional process, jigs, fixtures and machines, to produce the NC assigned parts, whenever the respective machines are down. This was precisely happening during the days of our visit.

The next table reflects the NC equipment and the peripherals installed in the "*Mini Plant Machining Section*", located just across the aisle from the Leroy Somer generator set assembly line, along the North plant wall:

Basic NC Machining equipment and peripherals

Quantity	Description	Current Estimated replacement cost (US$)
1	Horizontal NC machining Centre, MAZAC	346,000[14]
1	Vertical NC Lathe, PROMECOR	241,000[15]
2	Radial drilling machines, Nardini	42,000
1	Dynamic and Static balancing machine, Jackson-Bradwell	46,000
2	Neumat Threading machines, S& L Maskin	7,000
	Total at replacement value	682,000

source: MODASA Industrial Division, Trujillo

When asked about the very ample idle capacity, caused to the old machinery, plus the additional one provided by the new equipment, Mr. Benito Zarate Otarola, Manufacturing Division Manager at the Trujillo plant, indicated that it "*will be employed to manufacture parts for Volvo*". When asked about a contract or a letter of intent, he declared that this is not yet negotiated...

Overall appraisal: the two machines appear to be indeed sophisticated for the present and immediate future needs of MODASA. But their presence is a reality and MODASA must find ways and means to take full advantage of the investment already made. This is specially important for the celebration of the strategic alliances that may give MODASA a new competitive edge, including the need to manufacture an ample variety of new local parts.

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[14] The original study refers to the FOB USA value of US$ 387,645, which does not include accessories, peripherals, the eventual shipping, insurance, freight, duties, relocation, installation, the locally made tooling and the spare parts stock - normally sold along with the original machine. The total Mazac centre may have reached the investment total of US$ 650,000. Due to obsolescence factors, though, the value shown is the present value of the same machine in the international market today.

[15] Same considerations as above... for a total of US$ 550,000.

MODASA must, by all means, improve the promptness of said machines, by providing a range of spare circuit boards - not expensive at all when seen in proportion with the investments already made. Statistical failure analysis could point to other non-identified factors and causes for the reported circuit burning, resulting from eventual problems like insufficient grounding, deficient installation, operational pitfalls or operator errors that can be prevented. It is obviously worth a try...

G. Capacity considerations

As with every CKD assembly plant, beside a certain specific static capacity, the operation is extremely sensitive to labour availability. In the case of MODASA, this is not any different. A few considerations, though are needed:

MIX, that is, the production distribution among the several types and power levels of the engines to be produced, controls the MODASA capacity. One clear example of that is the totally idle Volvo assembly line after the volume dropped substantially in a phase out pattern. Left practically with just the Perkins range of engines and applications, MODASA lost part of its static capacity. Using the ex-Volvo assembly line for any other engine assembly (inclusive Perkins) requires investment. If the engine class is different, for instance, the investments can become prohibitive. In the discussions held in Trujillo and Lima, other engine manufacturers (Cummins, Caterpillar, Komatsu, Maxion, MWM, etc.) were indicated. Such ideas impose a very broad change in the scope of the operations with many practical implications over investments and potential market conflicts with Perkins and the distributors. One question that must be asked is: why would a new producer be interested to "*manufacture*" engines in Peru, from CDK sets, when imports of CBU units are free? More even, why do it by acquiring a plant in Trujillo, engine brand-specific, when starting from scratch (and in Lima) would be more effective?

VOLUME, that is, the quantity of engines to be produced, is the next variable affecting capacity. MODASA has a volume limitation expressed by its engine testing capability. As it has already been mentioned, the subject plant can easily hold 5,000 units a year and, without major investments. With changes in the testing cycle, it could reach a 7,500 units a year total capacity. This last figure is practically the double of MODASA's all time production record. But, so much for that! What today controls the capacity of MODASA is the supply of CKD sets from Perkins and, to a certain extent, of Leroy Somer generator set kits. Since nobody anticipates that a CKD supply increase, from either source, would be a specific problem, except for the 5-month "*rigid*" schedule freeze maintained with Perkins, that capacity "*limitation*" is elastic. But volume, more than mix, poses a special problem for the assembly capacity: the need for skilled labour! And here, unfortunately, MODASA is in the danger zone. With the continuous drop in volume the company has experienced in the recent years, a gradual - but steady - CAPACITY LOSS is a fact. Many of the workers MODASA employed in the past are no longer available. Indeed, during our visit to the plant, we could note that the engine assembly crew is rather limited, with part of the workers being contracted for a broken duty schedule, to work part-time, flex-time and on short call.

The eventual return of MODASA to its historical peak production level means a substantial effort to HIRE AND TRAIN workers for many specific production tasks. Although this is not an impossible task to tackle, even within Trujillo's non-skilled labour market, it certainly means investments in time and a threat to the product quality while being done. This loss of collective competence, caused by antagonistic market and economic forces, also affects the technical staff in different levels. A clear indication of that are the difficulties faced by the MODASA personnel to provide the data the UNIDO and CEPRI-MODASA visiting team has requested.

VOLUME can also pose problems to the still incipient supplier network (not analysed by the UNIDO adviser), where capacity to cope with a higher demand of specific parts may be compromised by tooling and machinery limitations. Indeed, MODASA would have to reconsider some of its local integration decisions (which may even simplify things by re-including ready parts in the CDK lots) if capacity

limitations would appear from that side.

MODASA machining operations were not deeply analysed regarding their respective capacity, but since the historical peak level already took place, we may consider that this could not be a real short range threat. One new factor, though, may have created a potential limitation: the NC Machining Centres! Such equipment, due to its peculiar operation pattern, is not to be usually employed for high volume production. It is flexible, versatile, accurate, providing good repetitivity and reproducibility (essential for a stable quality), but cannot beat a conventional machining "*line*" in terms of volume processing!

As a summary, we can say that LABOUR and not CAPITAL ASSETS, SUPPLY or EQUIPMENT control the capacity of MODASA up to a reasonable volume of 5,000 to 7,500 engines per year, almost six times the present sales volume forecast for 1996.

H. Systems & other support functions

MODASA has a simple organisational structure and a straight forward manufacturing process. Its demands for systems are not very ample. Beside the normal administrative and accounting control systems, made internally by MODASA for a small network of IBM-PC clones, the requirements are for proficient production planning and control systems, Material Requirements Calculation and Control, CKD ordering and for the management of technical variables, including - of course - non-production materials. During the visit, we could note that such systems exist and were designed in the past. It was not possible, though, to determine their function and suitability to the operational needs of MODASA.

Stand alone computers could be seen in several offices. Those are mainly used for reporting purposes, which is mostly done by applying commercial software, word processing and spread sheet applications, etc. That was the method used to supply the information we requested for this report.

A strong technical capacity for handling computer software is available at the already mentioned operation involving the design and customising of the digital controls for the instrument panels and power line monitoring at the Leroy Somer dedicated workshop.

As to process and manufacturing engineering, a rather manual operation is exercised, which may suffice for the present needs. If the production is to grow again, or if new engine types will have to be introduced, it might be so that MODASA does not have the required technical capacity to process the new information and become operational without a major hiring campaign for that kind of expertise. The Headcount reductions may have been excessive and competence damaging.

The same can be said about the Quality Control functions, with the recent leave of its long-standing Manager, of European origin and unquestionable technical skill, now serving as a Technical Consultant to Apoyo during the CEPRI-MODASA evaluation phase. The move to direct labour self-inspection, with a supporting Quality Auditing Method, poses special difficulties for the training of newly hired operators, because, beside the productive tasks, they have to be indoctrinated about their inspection duties, possibly being introduced for the first time in their lives to norms and metrological concepts that are not the natural domain of the Trujillo labour force. To that, the SENATI Apprenticeship programmes constitute a very valuable aid. No wonder that several MODASA executives, engineers and technicians keep themselves deeply involved with their programmes, even acting as instructors at that remarkable entity!

I. Personnel & Staff

One of the most important assets of an industrial company is the respective Staff. To define its value, it is essential to evaluate how a company is positioned in terms of the respective Labour Force. In the case of MODASA, two different kinds of competence are essential, i.e., Technical, scattered among the

Managerial and Clerical category, and the Blue Collar, meaning the ability of the employees to tackle the real production tasks.

From the supplied data, we can have a retrospective vision of the evolution by Professional Category, all along MODASA's existence. For reference, we have added a column with the respective Engine Production Volume and another with a Ratio Engines/Employee. The table below enables a general look-up.

MODASA Headcount by Professional Category
Historical Series

Balance Dates	Managerial	Clerical	Blue Collar	Total	Engine Production Volume	Ratio/employee
31.12.77	8	98	57	163	174	N/A
31.12.78	9	97	70	176	1405	7.98
31.12.79	9	133	85	227	2113	9.31
31.12.80	7	152	84	243	3615	14.88
31.12.81	7	206	135	348	3763	10.81
31.12.82	7	215	121	343	1834	5.35
31.12.83	7	141	88	236	747	3.17
31.12.84	16	131	107	254	702	2.76
31.12.85	23	140	105	268	1114	4.16
31.12.86	24	144	142	310	2457	7.93
31.12.87	23	157	162	342	3780	11.05
31.12.88	25	136	124	285	3194	11.21
31.12.89	25	133	114	272	1346	4.95
31.12.90	21	122	101	244	2040	8.36
31.12.91	20	106	96	222	2790	12.57
31.12.92	20	96	104	220	2538	11.54
31.12.93	24	87	69	180	853	4.74
31.12.94	26	84	66	176	1881	10.69
31.12.95	23	53	32	108	678	6.28
30.04.96	23	51	32	106	148	N/A

source: MODASA Industrial Division, Trujillo

The table above tells a history. But beware: it cannot reflect a few important facts about the operation, which we are summarising in the three following statements.

- The Mix, the growing local integration and the addition of items like the Leroy Somer line do not appear in the sole engine production volume figures, but indeed reflect a major change in job content at MODASA.

- The increased complexity, the growing dealer network, the new applications and products, inclusive the Hardware production (mufflers, panels, electronic circuits, fuel and coolant tanks, etc.) are not reflected either. They also and indeed reflect a major change in job content at MODASA.

- The phase-out of Volvo, though, consists into a major reduction in complexity and isn't reflected either.

For a better analysis, more time - and some new criteria like "*fixed and variable Headcount*" would have to be established. The subject information does not exist at the moment. Also, in the same direction, would be an analysis to set up a product unit concept, that can convert the different components of Volume & Mix, in the different product ranges, into a single virtual unit, enabling a perfect comparability of productivity data. The concepts and instructions on how to perform that analysis

were left with MODASA by the UNIDO adviser for future development

From the existing data, we could derive that the productivity "*performance*" in recent times sets a level of roughly 11 engines per employee and year (91= 12.57, 92= 11.54 and 94=10.69). By curiosity (or just a mere coincidence), that is also the productivity level of the "*all time production record*" (87= 11.05). This indicates a risk situation for MODASA today. Despite having reduced substantially the Blue Collar Force, the company hasn't been able (or willing) to reduce the Clerical and the Managerial Headcounters in the same proportion. One point to consider is if the subject reduction is at all feasible. given the present status of MODASA, with long rows of drawing boards and desks already without their former occupants at the moment. Another point to consider is, how much technical capacity and collective competence has MODASA already lost by force of the adverse conjuncture? Would it be feasible, in the necessary speed, to reconstruct the missing teams when and if business prospects start to improve?

When confronted with that question, MODASA executives indicated concern with the subject, as the majority of the people leaving MODASA will not return, having changed city, region, some even country, and the majority changed fate and profession[16]. Therefore, any major increase and advancement at MODASA requires a strong effort to hire, train and develop talent. Given the general attitude of the Peruvian Society about that, specifically the ambient in Trujillo, we can consider that - though difficult - this is not an impossible task to accomplish.

[16] Tito Cuevas, an ex-MODASA employee, for example, is now a leading member of the Scientific Community in Australia - Secretary General of SAE - Society of Automotive Engineers - Australasia).

III. MODASA PRODUCT RANGE

Just for the sake of unification of the information, we are summarising below the relevant data about each of the existing MODASA products, by range. For practical reasons, we are also including the data about the Leroy Somer line and the beton mixers. Still, some comments about the so-called national vertical and horizontal integration are reflected. All the information is based on technical literature and/or detailed information made available upon request.

A. Perkins range

The Perkins range available for MODASA includes a large number of variants, distributed in Vehicle and Stationary 4 (models 236) and 6 (models 354) cylinder types, going from naturally aspirated versions up to the very advanced intercooled (Phaser) one. We are reflecting below their main features per general model type:

Perkins Direct Injection - 4 Cylinder 3,86 litres Vehicle Engine Specifications

Parameter	4.236.V	C4.236.V	T4.236.V
Power Output	61 kW @ 2800 rpm	61 kW @ 2800 rpm	69.5 kW @ 2600 rpm
Torque	258 Nm @ 1450 rpm	258 Nm @ 1450 rpm	296 Nm @ 1600 rpm
Bore	98.48 mm	98.48 mm	98.48 mm
Stroke	127 mm	127 mm	127 mm
Air induction	naturally aspirated	turbo-compensated	turbo-charged
Epsilon	16:1	16:1	16:1
Firing order	1-3-4-2	1-3-4-2	1-3-4-2
Curb weight	380 kg	391 kg	391 kg
Length, Width, Height	940, 770 & 810 mm	950, 800 & 854 mm	1020, 700 & 760 mm

Perkins Direct Injection - 6 Cylinder 5.8 litres Vehicle Engine Specifications

Parameter	C.6.354.4V	T6.354.4V NCC
Power Output	95.5 kW @ 2800 rpm	108 kW @ 2600 rpm
Torque	407 Nm @ 1400 rpm	454 Nm @ 1650 rpm
Bore	98.48 mm	98.48 mm
Stroke	127 mm	127 mm
Air induction	turbo-compensated	turbo-charged
Epsilon	16:1	16:1
Firing order	1-5-3-6-2-4	1-5-3-6-2-4
Curb weight	548 kg	580 kg
Length, Width, Height	1160 , 820 & 870 mm	1170, 780 & 850 mm

Perkins Quadram Direct Injection - 6 Cylinder 6.0 litres Vehicle Engine Specifications

Parameter	160 T6.60 Phaser	180 Ti6.60 Phaser
Power Output	119 kW @ 2600 rpm	134 kW @ 2600 rpm
Torque	516 Nm @ 1600 rpm	581 Nm @ 1600 rpm
Bore	100 mm	100 mm
Stroke	127 mm	127 mm
Air induction	turbo-charged	turbo-cooled
Epsilon	16:1	16:1
Firing order	1-5-3-6-2-4	1-5-3-6-2-4
Curb weight	510 kg	522 kg
Length, Width, Height	1170 , 790 & 860 mm	1170, 790 & 860 mm

source: MODASA technical literature

Typical Applications of Perkins Vehicle Engines

Engine Types	GVW	Dodge	Ford	Chevrolet	Others
4.235.V / C4.236.V	5 to 10	D300	F350/F4000	D20/D40/C20/C30	
T4.236.V	6 to 10	D300	F350/F4000	D40	Mitsubishi Canter
6.354.V / C6.354.V	9 to 12	D500	F600/F700	D60/C60	M.Benz, International
T6.354.4V NCC	10 to 14	D500	F600/F700/F750	D70/C70	International
160 T6.60 Phaser	13 to 16	D800	F750/F800	D70	
180 Ti6.60 Phaser	13 to 16	D800		D70/C70	

For the above engines, MODASA also offers couplings with Clark and Eaton gear boxes, including the respective Sachs clutch sets. There are 5 types of Gear Boxes, defined by the respective gear ratios. MODASA follows (whenever available) the original vehicle specifications to define the appropriate gear box to adapt.

source: MODASA technical literature

The next two tables reflect the respective applications for Industrial Engines:

Perkins Direct Injection - 3 & 4 Cylinder Industrial Engines Specifications

Parameter	D3.152 I	4.236	T4.236 I
Power Output	29 kW @ 1800 rpm	49 kW @ 1800 rpm	69.5 kW @ 1800 rpm
Torque	160 Nm @ 1600 rpm	267 Nm @ 1300 rpm	372 Nm @ 1600 rpm
Number of Cylinders	3	4	4
Bore	91.4 mm	98.48 mm	98.48 mm
Stroke	127 mm	127 mm	127 mm
Air induction	naturally aspirated	naturally aspirated	turbo-charged
Epsilon	18.5:1	16:1	15.5:1
Firing order	1-2-3	1-3-4-2	1-3-4-2
Curb weight	439 kg	508 kg	514 kg
Length, Width, Height	1225, 810 & 1160 m	1405, 730 & 1160 mm	1405, 730 & 1160 mm
Application Range	16 to 26 kW	26 to 45 kW	38 to 63 kW

Typical equipment applications are: Water Pumps, Compressor units, Welding Machine Power Supplies, Mining and Agriculture equipment, and industrial stationary applications in the power ranges above.

source: MODASA technical literature

Perkins Direct Injection 6 Cylinder Industrial Engine Specifications

Parameter	T6.354.4 I
Power Output	102 kW @ 1800 rpm
Torque	547 Nm @ 1500 rpm
Number of Cylinders	6
Bore	98.48 mm
Stroke	127 mm
Air induction	turbo-charged
Epsilon	15.5:1
Firing order	1-5-3-6-2-4
Curb weight	711 kg
Length, Width, Height	1630, 775 & 1235 m
Application Range	56 to 93 kW

Typical equipment applications are: Water Pumps, Compressor units, Welding Machine Power Supplies, Mining and Agriculture equipment, and Industrial Stationary applications in the power range above.

source: MODASA technical literature

B. Volvo range (phase-out)

MODASA still keeps its status as a "*dealer*" for Volvo Penta Industrial engines. This is something that may change when Volvo leaves the Society entirely, which is already in course with the integralisation of about half of the 26% stake by the San Juan Group. MODASA still holds a very high inventory of Volvo engines in plant that must be negotiated one way or the other. There are basically three engine types that MODASA announces to the general public, as follows:

Volvo Penta Direct Injection - 6 Cylinder Industrial Engines Specifications

Parameter	TD71AGP	TD100GGP	TD121GGP
Power Output	151 kW @ 1800 rpm	179 kW @ 1800 rpm	250 kW @ 1800 rpm
Torque	759 Nm @ 1400 rpm	1010 Nm @ 1400 rpm	1160 Nm @ 1500 rpm
Bore	104.77 mm	120.65 mm	130.17 mm
Stroke	130 mm	140 mm	150 mm
Displacement	6.73 litres	9.60 litres	11.98 litres
Air induction	turbo-charged	turbo-charged	turbo-charged
Epsilon	14.5:1	14.3:1	14.2:1
Firing order	1-5-3-6-2-4	1-5-3-6-2-4	1-5-3-6-2-4
Curb weight	1110 kg	1245 kg	1410 kg
Length, Width, Height	2270, 920 & 2220 m	2340, 940 & 2270 mm	2480, 1200 & 2300 mm
Application Range	83 to 139 kW	107 to 179 kW	135 to 226 kW

Typical equipment applications are: Water Pumps, Compressor units, Welding Machine Power Supplies, Mining and Agriculture equipment, and industrial stationary applications in the power range above.

source: MODASA technical literature

C. Leroy Somer

MODASA is assembling and supplying a complete range of Leroy Somer Gen Sets and Alternators for both Perkins and Volvo Penta engine ranges. These go from 8 to 1200 kW of continuous power and are capable of supporting a 10% overload during one hour for every twelve hours of duty. The basic specifications for the subject ranges are very ample, comprising International Technical Norms such as ISO 3046 for the Engines, IEC 34-1, UTE:NFC 51-111-105-110, VDE:0530, BSS 5000, NEMA (MG1) - American Norm, for the Alternators. The standard set usually comprises: the engine assembly, respective steel structure bed, including radiator and integral fuel tank, thermo-magnetic switch, engine control panel, automatic engine protection system including automatic engine stop for excess temperature/pressure (with visual alarm) and industrial type exhaust ducts and muffler. As optional equipment, the Leroy line offers: automatic TTA transfer panel, anti-vibration mounts, electric sensors for generator coil overheating, plus engine block coolant heating element, flexible engine exhaust tubes, static battery chargers for 12 and 24 Volts- DC, electronic speed governor, low noise (residential type) muffler and engine encasement, overspend protection by an engine stop device, low coolant level engine stop device, stand-up cabinet or wall mounted type control panels, etc.

The basic specifications are tabled (see next pages) per group of application, for both Perkins and Volvo Penta engines[17]. These data were extracted from the supplied technical literature and are summarised just in the basic features.

[17] Here, many high output Perkins and Volvo engines appaear on offer. Most of these are not supposed to be assembled by MODASA, but imported as CBU units. Only the types and models cited in the preceding pages, that also appear in the tables are "*real*" MODASA production units.

Technical Specification of Leroy Somer Eletrogenic Groups for Perkins Engines

Description	unit	MLS-20	MLS-25	MLS-38	MLS-56	MLS-65	MLS85	MLS-96
Gen Set								
Continuous Power	kW/kVA	20,4/26	25,4/32	38/47.5	56/70	67/83	84/105	96/120
Emergency Power	kW/kVA	22.4/28	28/35	42/52	61/77	73/92	92/115	105/130
Tension/Voltage	V	240-380	240-380	240-380	240-380	240-380	240-380	240-480
Intensity/Amperage	A	63-41	73-48	115-72	168-106	200-125	253/160	289/144
Coupling Type	SAE	3	3	3	3	3	3	3
Fuel Consumption	l/hour	7	8.3	12	16.8	20.4	25	28.9
Dimensions:								
Length	mm	1420	1420	1710	1640	1875	2145	2145
Width	mm	760	760	760	760	760	760	760
Height	mm	1100	1100	1160	1290	1240	1265	1400
Weight	kg	567	577	779	862	894	1017	1129
Perkins Engine (CKD or CBU)								
Type		D3.152	3.152.4	4.236	T4.236	1004TG	1006TG1	11006TG2
Continuous Power	kW	25.5	29	43	64	74	97	107
Emergency Power	kW	28	32	47	70	82	107	119
Cylinders	Number	3	3	4	4	4	6	6
Air Induction	(code)[18]	N	N	N	TC	TC	TC	TC
Alternator								
Type		41.1M2	41.1M3	42.1L8	44.1S1	44.1M3	44.1M4	44.1L6
Continuous Power	kW/kVA	20.4/26	25.6/32	40.8/51	64/80	72/90	84/105	96/120
Emergency Power	kW/kVA	22.4/28	28/35	44/55	67/84	77/96	93/117	104/130
Efficiency rate	%	85.8	87.4	89.2	87.5	90.1	89.3	91.3

source: MODASA technical literature

Technical Specification of Leroy Somer Eletrogenic Groups for Perkins Engines

Description	unit	MLS-122	MLS-150	MLS-500	MLS-615	MLS-825	MLS-1000	MLS-1200
Gen Set								
Continuous Power	kW/kVA	121/151	148/185	499/623	606/758	821/1026	999/1249	1190/1488
Emergency Power	kW/kVA	133/167	163/204	549/686	664/830	903/1129	1098/1373	1310/1638
Tension/Voltage	V	240/480	240-480	240-480	480	480	480	480
Intensity/Amperage	A	365-182	445-222	1500-750	911	1234	1500	1790
Coupling Type	SAE	3	2	0	0	00	00	00
Fuel Consumption	l/hour	37.6	42.5	126	150	226	63	319
Dimensions:								
Length	mm	2330	2400	3180	3450	4650	4790	5110
Width	mm	760	856	1040	1400	1880	1880	2260
Height	mm	1365	1640	1990	2020	2500	2510	2800
Weight	kg	1195	1325	3815	4225	6265	7705	8720
Perkins Engine (CKD or CBU)								
Type		1006TAG	1306-8TAG	3012TG	3012TAG2	4008TAG2	4012TWG2	4012TAG2
Continuous Power	kW	134	164	532	646	864	1056	1256
Emergency Power	kW	147	181	585	711	950	1162	1382
Cylinders	Number	6	6	V12	V12	8	V12	V12
Air Induction	(code)	TI	TI	TC	TI	TI	TI	TI
Alternator								
Type		44.1L8L	46.1S2	47.1L10	49.1S4	49.1L9	50M6	50L8
Continuous Power	kW/kVA	126/157	150/188	500/625	634/792	845/1056	1080/1350	1272/1590
Emergency Power	kW/kVA	140/175	164/206	549/687	664/830	928/1160	1120/1400	1336/1670
Efficiency rate	%	90	90.2	93.7	93.8	95	94.6	94.8

source: MODASA technical literature

[18] N = naturally aspirated, TC = turbo-charged, TI = intercooled

The following are the respective gen Sets Specifications for the Volvo Penta line:

Technical Specification of Leroy Somer Groups for Volvo Penta Engines

Description	unit	MLS-125	MLS-185	MLS-230	MLS-250	MLS-315	MLS-400	MLS-450
Gen Set								
Continuous Power	kW/kVA	125/156	186/232	230/288	252/315	318/396	400/500	450/563
Emergency Power	kW/kVA	137/171	202/254	253/316	277/347	344/434	440/550	495/619
Tension/Voltage	V	240/480	240/480	240/480	240/480	240/480	240/480	240/480
Intensity/Amperage	A	376/188	160/280	692/346	758/379	957/478	1203/602	1354/676
Coupling Type	SAE	2	1	1	1	1	1	1
Fuel Consumption	l/hour	37	54	63	70	91	112	121
Dimensions:								
Length	mm	2500	2590	2825	2825	3035	3250	3370
Width	mm	880	1001	1001	1001	1089	1089	1261
Height	mm	1411	1584	1614	1614	1668	1765	1765
Weight	kg	1672	2005	2287	2390	2434	2972	3122
Volvo Engine (CKD or CBU)								
Type		TD71AG	TD1010G	TD1210G	TWD1210G	TAD1230G	TAD1630G	TAD1631G
Continuous Power	kW	139	203	250	275	349	435	484
Emergency Power	kW	141	223	275	302	381	479	537
Cylinders	Number	6	6	6	6	6	6	6
Air Induction	(code)	TC	TC	TC	TI	TI	TI	TI
Alternator								
Type		44.1L8L	46.1M5	46.1L6	46.1L8	47.1M4	47.1M6	47.1L9
Continuous Power	kW/kVA	126/157	200/250	230/288	252/315	350/437	400/500	450/563
Emergency Power	kW/kVA	140/175	220/275	253/316	278/347	384/480	440/550	495/619
Efficiency rate	%	90	91.5	92.4	92.5	91.2	92.7	93.6

source: MODASA technical literature

D. Beton mixers

MODASA made a recent decision to commercialise beton mixers assembled with parts and pieces obtained from a supplier from Argentine, by its turn reproducing technology from a non-revealed source in Italy. The subject units are available in two basic sets, respectively with 9 and 12 cubit feet tumbling capacity. The business concept behind this idea is not yet clear. Apparently, the motivation is to take advantage of existing capacity at the Hardware Workshops located in the back of the MODASA Plant in Trujillo, where (as it has already been mentioned) a certain metal bending, cutting, piercing and welding capacity is available, to then gradually verticalise the production.

Two models are to be "*manufactured*", respectively M-240 (9 ft^3) and MC-350 (12 ft^3). By the moment of the visit, two of the recently MC-350 imported units - supposedly for a market test - were in plant, to be submitted to the application of the respective peripheral parts. According to comments heard during the field mission, the subject units would be sold through the same commercialisation channels as the engines and gen sets. We also heard that Ferreyros, MODASA's mega dealer, is already planning to enter a new business field, by renting instead of selling some equipment, including the MODASA beton mixers. MODASA may have not yet realised that the rental issue reduces the market of the subject units by inhibiting acquisition...

The idea of building such simple devices, just to take advantage of a given hardware shop capacity, deserves better consideration, specially in view of the very little aggregated value that such a "*production*" may presumably provide. Still so, according to MODASA's General Manager, Héctor García Béjar, they "*decided to do so to try to absorb some fixed cost by doing something that did not require very large investments*". Here are, in a simplified format, the basic specifications of the mentioned equipment:

Basic Specification's of MODASA's Beton Mixer Models
Model M-240

Model M-240 is a manually tilting Beton Mixer unit for 9 ft^3 of concrete blend per cycle. The design is simple, atop a profiled steel chassis, that can bear 2 or 4 wheels, being these either solid or endowed with tyres. The chassis has a telescopic-type towing bar. The axles are fitted with bearings but no vehicle type suspension is available. This model can powered by either an electric motor or a small gasoline engine. The rotation of the mixing drum is provided by a V-belt, with a clutch type engagement lever. The main rotation shaft is bearing carried by a train comprising conical and straight ball bearings, sealed by synthetic rubber grease retainers. The drum is made of thick steel sheet, in a welded structure. The rotation crown gear is replaceable and the interior of the drum is endowed with baffles that favour a well balanced mix. A very simple crown and pinion tilting device, with a large crankwheel, enables the unloading of the mix with reduced operator manual effort.

The mixing capacity is 240 litres, for a mixing drum volume of 385 litres. The production capacity is rated at 40 to 50 m3 per 8-hour shift. The unit's weight - without the motor - is 355 kg.

In the literature supplied there is no mention of the Argentine source or of the Italian technology ownership.

source: MODASA technical literature

Model MC-350

Model MC-500 is a mechanically tilted Beton Mixer unit for 12 ft^3 of blend per cycle. The design is simple, atop a profile steel chassis, which bears four 16" tyred wheels. The chassis has a telescopic type of towing bar. The axles are fitted with bearings but no vehicle type suspension is available. This model can be powered by either an electric motor or a small Bounus Diesel Engine, which in the distributed literature is identified simply as a MODASA Diesel engine (13 HP @ 2000 rpm). The engine is protected from the hard environment conditions by a special metal cabinet, endowed with access doors from the left side of the unit. The rotation of the mixing drum is provided by a wedge type belt driven mechanical reduction gear, with a clutch engagement lever. The main rotation shaft is bearing carried by a train comprising conical and straight ball bearings, sealed by synthetic rubber grease retainers. The drum is made of thick steel sheet, in a welded structure. The rotation crown gear is replaceable and the interior of the drum is endowed with baffles that favour a well balanced mix. A special loading apron is available to facilitate the cement, crushed rock and sand charging. An angled belt conveyor, carried by bearing mounted rollers is used for that purpose. The movement is provided by a steel cable/drum type drive. The direction of the movement can be reversed. Additionally, a special automatic dosimeter enables the calculation and setting of the water charge. An option 6000 litres/hour hydraulic pump can be fitted to assist in the function of the automatic water dosimeter. A crown and pinion tilting device enables the mechanical unloading of the mix.

The mixing capacity is 350 litres, for a mixing drum volume of 510 litres. The production capacity is rated at 6 to 8 m3 per hour. The unit's weight - without the engine - is 1200 kg. The dosimeter has a 50 litres capacity. When assembled with electric motor, the subject unit requires a 10 HP unit. For obvious reasons we did not even discuss the origin or brand of the subject...

Same as in the other simpler model, the literature supplied brings no mention of the Argentine source or of the Italian technology ownership.

source: MODASA technical literature

Dumper Mixer VB-1000 (VP, H, VEF/G)

Although it is still not defined if MODASA will effectively get involved with the subject, literature is being distributed containing the specifications of a mini-tractor type auto-propelled Dumper, containing either an integral transport fixed front-loader tipper tub (VP), a fitted longitudinal mixer rotary drum (H) or a rotary launch hydraulically lifting tipper tub (VEF/G). The table below reflects the basic specifications of the subject units:

Useful load: 1200 kg
Gradient capacity at full load: 30%
Engine: 4-stroke, Diesel cycle, Direct Injection, Air Cooled, single cylinder 13 HP @ 1800 rpm.
Start: manual crank start; optional 12 V electric starter motor
Clutch: single dry disk, hydraulic drive.
Transmission: 3-speed synchronised gear box; max speed in the third gear is 14.55 km/h.
Steering: mechanical with worm bolt; external turning radius 3500 mm.
Brakes: hydraulic in the two traction wheels; optional: in all 4 wheels; manual parking brake.
Wheels: 6.50 x 16 (traction) and 5.00 x 15 (steering).
Hydraulic prime power: 16 litres/minute gear pump; hydraulic dumping cylinder; lever type control valves.
Hopper capacity:

- VP (floor dumping) water level 650 litres; struck 870 litres; heaped up: 1000 litres
- VEF/G (fixed rate rotating elevated dumping) struck level: 700 litres.

Concrete mixer capacity: H-300 L hydraulic engine drive.
Weight in order of march, empty, including the 13 HP engine:

- VP 1075 kg
- VEF-G 1325 kg
- H 1225 kg

The same comments about the absence of references to the Argentine supplier and to the Italian originator of the technology are made. These comments derive from our concern with potential liabilities either for the use, or from incurred hazards, accidents, etc. Peru has a very complex Consumers Defence Code and a brand new Patents Protection Law in vigour and such liabilities may represent a ponderable risk (see specific chapter about the subject).

source: MODASA technical literature

E. Vertical and horizontal integration

The next type of product in full existence at MODASA is the range of local integration, being both Vertical (meaning parts made inside the plant) or Horizontal (meaning parts acquired from external suppliers). The vertical integration parts are either obtained from local raw materials (bar stock, steel sheet/ plate or castings, that can either be locally supplied or imported). The decisions for the subject local integration have followed determinations from the Peruvian authorities regarding an obligatory national content, then other technical criteria, including an attempt to diminish the cost of the CKD set.

The Vertical integration items were originally defined in common agreement with Volvo and Perkins and comprise a very ample list of items, for which specific investments in rough parts supplier tooling, checking fixtures, machining fixtures, quality auditing tools, assembly fixtures, etc., had to be made. With the leave of Volvo, the respective investments were practically lost. For Perkins, the are still many components being machined according to the decisions made in the past. Since MODASA is fitted to produce such items, and although they can not be exactly considered "spare parts" - most are never replaced along the engine's useful life - there has been little consideration about their current

economicity[19]. The national integration also comprises a hand full of items that are purchased finished from local Peruvian suppliers. Those are usually simple line-up parts, appearing in the extensive lists supplied by MODASA to CEPRI and the UNIDO adviser. According to David Ritchie Ballenas, CEPRI-MODASA member and a gifted Strategic Planning Expert at ESAN-Lima, this subject has been treated in a recent MODASA Board Meeting. From his personal notes from the meeting, he could recall that MODASA "*considers that the national integration is a very good decision, as the engines with the highest local integration are the ones that MODASA demonstrated to be the most competitive in market terms*". This opinion was also expressed by Luiz Piazzon, the CEPRI-MODASA Chief Executive, in a separate discussion. Of course MODASA's Management handles the subject under strict confidentiality, meaning that the UNIDO adviser could not access the mentioned comparative data.

In order to provide an insight of what the local integration can be, we are presenting below 5 lists of local integration (vertical and horizontal, altogether) which MODASA's General Manager has provided - upon request - to the UNIDO adviser. They are broken down by engine type and reflect all national items as a percentage of the respective CDK set FOB price.

PERKINS ENGINE C4.236V

National Integration List (both Vertical and Horizontal)

Item	% of CKD $
Intake Manifold	0.71
Exhaust Manifold	0.31
Oil Sump	1.37
Fan Shroud	0.21
Flywheel Housing Cover	0.74
Integral Bridge	0.48
Alternator Pulley	0.32
Front Engine Supports	1.79
Rear Engine Supports	1.25
Chassis Frontal Support	0.39
Adapter	0.22
Water Pump Cover	0.23
Suction Pipe	0.27
Water Pump Housing	0.40
Lifting Arm	0.61
Water Pump Rear Cover	0.29
Upper Cover	0.20
Thermostat Chamber Housing	0.59
Crankshaft Pulley	0.31
Water Pump Pulley	0.16
Water Pump Pulley Hub	0.18
Alternator Pulley	0.42
Distribution Gear Set Cover	0.94
Distribution Gear Housing	1.31
Flywheel	1.30
Flywheel Housing	2.99
Adapter Plate	0.55
Rear Cover	0.25
Induction Air Connection	0.44
Exhaust Duct	0.33
Filter Element	0.52
Filter Housing	1.60
Vacuum Tank	1.15
Hoses Set	1.54
Pipes	1.83
Alternator Set	2.43
Others, Miscellaneous	3.49
Total Local Integration	32.12%

[19] By economicity, here, we mean the regular performing of accurate technical and economic studies to judge if their maintenance in the local integration lists indeed represents an economic advantage, or not.

PERKINS ENGINE T4.236V

National Integration List (both Vertical and Horizontal)

Item	% of CKD $
Intake Manifold	0.63
Exhaust Manifold	0.35
Oil Sump	1.31
Ventilator Shroud	0.23
Flywheel Housing Lower Cover	0.76
Integral Bridge	0.48
Alternator Pulley	0.36
Lifting Arm	0.63
Front Engine Supports	2.55
Rear Engine Supports	1.77
Front Chassis Support	0.32
Water Pump Housing	0.39
Rear Water Pump Cover	0.41
Thermostat Chamber Housing	0.61
Water Outlet Connector	0.24
Crankshaft Pulley	0.71
Water Pump Pulley	0.27
Water Pump Pulley Hub	0.18
Transmission Housing Cover	0.58
Distribution Gear Cover	0.65
Distribution Gear Housing	1.18
Flywheel	1.59
Flywheel Housing	3.65
Adapter Plate	0.47
Crankshaft Bearing Housing	0.45
Exhaust Duct	0.30
Filter Element	0.56
Filter Housing	1.56
Vacuum Tank	0.95
Pipes	1.59
Hoses Set	1.39
Alternator	2.12
Other, Miscellaneous	3.95
Total Local Integration	33.19%

PERKINS ENGINE C6.354 4V

National Integration List (both Vertical and Horizontal)

Item	% of CKD $
Intake Manifold	0.46
Exhaust Manifold	0.71
Integral Bridge	0.48
Ventilator Shroud	0.25
Flywheel Housing Lower Cover	0.75
Alternator Pulley	0.36
Distribution Gear Cover	0.65
Oil Sump	0.86
Front Engine Supports	1.58
Rear Engine Supports	0.93
Thermostat Chamber Housing	0.40
Water Outlet Connection	0.57
Water Pump Pulley	0.62
Rocker Arm Compartment Cover	0.27
Lifting Arm	0.61
Flywheel	1.29
Flywheel Housing	3.17
Crankshaft Bearing Housing	0.27
Exhaust Pipe	0.46
Filter Element	0.53
Filter Console	1.73
Oil Level Measurement Stick	0.20

Heat Shield	0.41
Compressor Set	7.26
Pipes	1.22
Hoses	1.72
Alternator Set	2.18
Others, Miscellaneous	1.63
Total Local Integration	31.57%

PERKINS ENGINE D3.152 I

National Integration List (both Vertical and Horizontal)

Item	% of CKD $
Muffler	1.14
Front Engine Supports	2.03
Rear Engine Supports	0.94
Intake Manifold	0.27
Radiator Set	5.73
Radiator Support	1.60
Engine Stop Control System	1.58
Flywheel	3.45
Flywheel Housing	3.80
Lifting Arm	0.72
Engine Instrument Panel	0.92
Filter Element	0.31
Filter Console	1.18
Alternator Pulley	0.35
Pipes	1.11
Hoses	1.03
Alternator Set	2.71
Others, Miscellaneous	3.26
Total Local Integration	32.13%

PERKINS ENGINE 4.236 I

National Integration List (both Vertical and Horizontal)

Item	% of CKD $
Integral Bridge	0.19
Front Engine Supports	1.60
Rear Engine Supports	0.86
Radiator Assembly	6.34
Radiator Support	2.03
Engine Stop Control System	0.52
Rocker Arm Compartment Cover	0.12
Thermostat Chamber Housing	0.22
Crankshaft Pulley	0.47
Water Pump Pulley	0.21
Water Pump Pulley Hub	0.17
Ventilator Shroud	0.28
Distribution Gear Cover	0.30
Distribution Gear Housing	0.44
Flywheel	3.13
Flywheel Housing	2.81
Lower Flywheel Housing Cover	0.73
Crankshaft Bearing Housing	0.35
Instrument Panel	0.69
Exhaust Duct	0.98
Filter Element	0.55
Filter Console	1.07
Hoses	1.18
Pipes	1.05
Alternator Set	2.63
Others, Miscellaneous	3.02
Total Local Integration	31.94%

PERKINS ENGINE T6.354 I

National Integration List (both Vertical and Horizontal)

Item	% of CKD $
Integral Bridge	0.24
Intake Multiple Manifold	0.38
Exhaust Multiple Manifold	0.81
Heat Shield	0.19
Oil Sump	0.82
Rear Engine Supports	0.63
Front Engine Supports	0.78
Radiator Assembly	4.50
Lifting Arm	0.72
Radiator Support	1.13
Oil Cooler Support	0.58
Engine Stop Control System	0.84
Alternator Pulley	0.36
Ventilator Shroud	0.22
Rocker Arm Compartment Cover	0.42
Thermostat Chamber Housing	0.33
Adapter Plate	0.19
Water Pump Pulley	0.22
Heat Shield	0.77
Distribution Gear Housing	0.24
Alternator Pulley	0.37
Flywheel Housing Lower Cover	0.74
Flywheel	1.93
Flywheel Housing	1,74
Crankshaft Bearing Housing	0.22
Instrument Panel	1.11
Exhaust Duct	0.78
Filter Element	0.55
Filter Console	1.42
Hoses	1.51
Pipes	1.39
Alternator Set	1.87
Others, Miscellaneous	4.10
Total Local Integration	32.10%

Comments: The national integration values are being computed as a percent of the total CKD set value. Annex 5 contains a general overview of the historical development of the so-called national integration indices for all types of engines produced by MODASA, current and past model.

Since the CDK values have not been supplied, nor has MODASA clarified what is meant - in terms of accounting criteria -by the respective "cost" used in the comparisons, a fundamental parameter for a cost efficiency evaluation is missing. Still so, it was possible to raise some pertinent questions, which can indicate such cost efficiency by indirect means. First we should have a Summary to look at:

Summary of National Integration at MODASA

Engine Type	% of the respective CKD Set FOB Value
C4.236 V	32.12
T4.236 V	33.19
C6.354 4V	31.57
D3.152 I	32.13
4.236 I	31.94
T6.354 I	32.10
Average % National	32.18

At the first sight, the indices supplied by MODASA seem to be fairly high, when they appear to point to **about one third of the respective CKD sets value as being nationally made** (average of 32.18% of the respective set). But many things lie behind those figures that require another interpretation; very simple items appear with a rather high percentile participation in the index, or with widely different participation levels, as follows:

Item designation	Engine Type	Individual %
Intake Manifold	C4.236 V	0.71
	T4.236 V	0.63
	C6.354 4V	0.46
	T6.354 I	0.38
Oil Sump	C4.236 V	1.37
	T4.236 V	1.31
	C6.354 4V	0.86
	T6.354 I	0.82
Ventilator Shroud	C4.236 V	0.21
	T4.236 V	0.23
	C6.354 4V	0.25
	T6.354 I	0.22
Alternator Pulley	C4.236 V	0.32
	T4.236 V	0.36
	C6.354 4V	0.36
	D3.152 I	0.35
	T6.354 I	0.36
Intake Manifold	C4.236 V	0.71
	T4.236 V	0.63
	C6.354 4V	0.46
	T6.354 I	0.38
Flywheel	C4.236 V	1.30
	T4.236 V	1.59
	C6.354 4V	1.29
	D3.152 I	3.80
	4.236 I	3.13
	T6.354 I	1.93
Flywheel Housing	C4.236 V	2.99
	T4.236 V	3.65
	C6.354 4V	3.17
	D3.152 I	3.80
	4.236 I	2.81
	T6.354 I	1.47
Filter Element	C4.236 V	0.52
	T4.236 V	0.56
	C6.354 4V	0.53
	D3.152 I	0.31
	4.236 I	0.55
	T6.354 I	0.55
Alternator	C4.236 V	2.43
	T4.236 V	2.12
	C6.354 4V	2.18
	D3.152 I	2.71
	4.236 I	2.63
	T6.354 I	1.87
Radiator	D3.152 I	5.73
	4.236 I	6.34
	T6.354 I	4.50

The UNIDO adviser has tried several statistical correlation techniques to devise a fair comparison method to judge the subject information. The conclusions were:

1 The method employed by MODASA to reflect National Integration is disguising and misleading, because it compares a shrinking base (the FOB value of the CKD set) with the cost(?) of the local integration parts. Since a part selected for nationalisation, changes side in the ranking, the 100% comparison base is reduced, artificially increasing the value of the national content for the other items already nationalised.

2 The very same item can change importance and magnitude when the subject method is applied. If we take the Alternator Pulley, presumably the very same part for all engine types, this distortion becomes evident. Since the percentile participation of the part is rigorously the same, we must conclude that the FOB value for the CKD set is the same for all engines. The same happens if we look at the Filter Element. How then, can we explain the Radiator and Flywheel Housing apparent discrepancies to that unlikely rule of thumb?

3 The method does not allow a perception of the cost inefficiencies. Since the comparison is supposed to highlight the LOCAL content, a too expensive item - i.e., deriving from an economically inefficient decision - counts as a "*good*" result.

We have presented this "*puzzle*" to several experienced Cost Analysts of the TECKNOWLEDGE INTERNATIONAL Staff, to try to extract some useful conclusion from the supplied information. The following comments were made:

"*MODASA's method reveals that a Radiator can mean 6.34% of the respective FOB CKD set value. Since a radiator is normally around 0.25% of the value of a similar Diesel engine Bill of Material, we can derive two ideas from that high number, and both are doubtful and unlikely:*

- *that the CKD FOB value might be smaller than reasonable for a satisfactory margin to the respective supplier;*

- *that the CKD content might be smaller than indicated by the lists of national integration for the respective engines. This second impression could be "confirmed" by the submitted List of Suppliers and their line-ups, extracted for cross-reference from another MODASA document. Many kinds of parts cited in the subject line-up profile do not appear in the supplied local integration official lists delivered by MODASA to the UNIDO adviser.*"

The Supply Base, extracted from the general nationalisation components list, as submitted by MODASA, is as follows:

The National Integration Supply Base

Company Name	Line-up profile
AMIMETAL	Light castings
A. METALÚRGICA	Fan Shrouds, Large Stampings, Distribution Housings, Intake Ducts, Cast Covers, Oil Sumps
AUTOMOTIVE	Gaskets & Packings
CAMDEP	Hardware
CASISA	Connectors
CITESA	Belt Safety Protection, Water Duct Connections
EDWARDS	Stampings, Clamps & Brackets
F.H.	Indicators and Instruments
F. INDUSTRIALE	Upper Water Exit Connection,

	Fuel Filter Console, Engine Supports, Rocker Arm Compartment Cover
F. MALEABLE	Rough Pulleys, Manifolds, Flywheels, Flywheel Housings
FANESA	Caps, Thermostat Chamber, Exhaust Manifolds, Air Lid
FERROSA	Oil Pipe Adapter
FERRET	Mufflers and Exhaust Pipes, Vacuum Tank
FRENOSA	Air Compressor
HIDRAULICA CO	O-Rings
HIDROSTAL	Foundry - Larger Items
IMP. ORTIZ	Warning Decals
IMDICO	Fasteners
IMER	Gussets
INFESA	Levers
IPROMSA	Stampings, Air Filter Housing, Stamped Oil Sump
JETEC	Rubber Hoses & Cushings
KELLENBERGER	Hose Supports
L. N. ORG. COME	Operator's Manual
L. P. C.	Fuel Filter Feed Pipes, Air Cooler and Oil Cooler Ducts, Crankshaft Pulley, Oil Level Check Pipe
LEE FILTER	Air Filter Element, Vacuum Pipes
M. MONTOYA	Connections, Washers, Terminals, Hydro-Vaccum Tank and Ducts
M. LLANOS	Indicator Bulb, Alternator Pulley
MAJESA	Water Hoses, Rubber Blocks
MAQUEIRA	Washers & Small Stampings
MENSA	Connectors
MERTAL - POMAR	Fuel Filter Support, Stampings, Oil Level Stick, Clips, Radiator Lid, Spacing Plate, Accelerator Bracket
METAL COLOR	Identification Plates
M. METÁLICAS	Small Castings, Valve Lifters
NISSAN	Radiator Pressure Lid
O. AYBAR	Horn, Hoses, Spacers, Radiator Support, Clamp Brackets
PROPECA	Fasteners, Ball Joints, Spacers, Oil Drainage Bolt
RAPESA	Pipes and Ducts
REP. UNIVERSAL	Bulk Rubber Hoses
SERVIZA	Decals
TARAZONA	Self Threading Screws
T. MORAN	Metal Piping
TRANSMETAL	Springs
VOLVO	Conical Washer
WILLY BUSCH	Air Filter Element
YI CHANG	Clamps & Washers

Many of the above companies may not be current MODASA Suppliers any longer, even because they might have been producing Volvo Parts, or items for past model engines, or having been replaced by vertical integration, as already done by MODASA with several purchased articles (mufflers, exhaust ducts, instrument panels, supports, etc.). Still so, the list is good to judge the kind of potential supply base an eventual strategic alliance contender or auctioneer might encounter in Peru. If the companies still exist, and actually supply their line-up type components, then, the national integration lists supplied by MODASA's General Manager do not contain all information for the necessary comparability study. Also, MODASA did not indicate what is the criterion for the computation of the VALUE of the local parts (industrial cost, just variable cost, full burden absorption, etc.).

IV. MARKETS - TODAY AND TOMORROW

A. Vehicle engines

MODASA, as indicated during the Executive Seminar (see the specific Chapter VIII, for details), has concentrated the sales effort into vehicle engines along most of its history. The large vehicle park utilising Perkins and Volvo engines like "*justified*" that strategy. It was not until three years ago that the Peruvian market for CBU vehicles started to disturb that approach, by suddenly reducing the replacement engine market in favour of a prospect fleet renewal trend. By observing the Peruvian fleet in action (Lima's city traffic, Trujillo's city traffic, Ruta Panamericana road traffic) one can notice that - clearly - two distinct fleet status and renewal approaches remain in force:

> first - and with an overwhelming presence - are vintage vehicles, with improvised superstructures and an ailing aspect, mostly used for urban transportation, with very poor rolling and maintenance standards, sub-human ride comfort, comprising a serious threat to traffic safety. In that fleet, one can see representatives of all kinds of brands, models, trends and concepts, from Hungarian Ikarus city buses to "*super-duper*" Mann articulated buses, through improvised buses atop old (not seldom post-crashed) Volvo and Scania truck frames, down to US vintage school buses of advanced age and 50-year old design concept, recently imported[20] to become urban buses in Lima and other cities in Peru. Distribution trucks, light and medium duty, can be seen improvised atop old car bodies, or ancient design pick-ups from the time of World War II can be seen transporting either cargo or passenger in improvised wooden superstructures.
>
> second - with a special presence in Lima - are brand new passenger cars, mostly of Japanese and Korean origin, with an average use of two to four years, in flagrant contrast with old and semi-destroyed passenger cars, having their lives indefinitely prolonged by means of an ample traffic authorities tolerance combined with an unbeatable craftsman repair creativity.

It is the first approach that mostly affected MODASA, since there are no passenger cars with Perkins Diesel engines. Despite the obvious demand potential, outlined by the mentioned transit and national fleet conditions, many of the existing entrepreneurs were confused[21] by the new policy and deferred investments, expecting for new developments. The operators of both passenger and cargo services had a clear choice to make: move on, to total fleet renewal, instead of trying overhauling and "*repowering*" of their dying park. Still so, many hesitated. Those who were capitalised - or could obtain international loans - went straight to the best that there is, like Ormeño's top-of-the-line Mercedes Benz coaches with Neoplan luxury body-building, that he uses in Continental routes like Lima-Rio (via Chile, Argentina, Uruguay and entering Brazil from the Southern border). Others preferred to just WAIT and see... Those in doubt were instrumental to MODASA's current problem, as their fleet overhauling decisions were postponed, causing the strong volume drop that we can see in the sales statistics. So, in a matter of three years, MODASA saw its stronghold in vehicle engines vanish...

One might ask a pertinent question: is the market still there? The reply to that is both YES and NO. It is **YES** because the repressed demand for transportation in Latin America is a real fact. Therefore,

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[20] The duty free imports amounted to US$ 4500.00 for such a unit FOB Lima!

[21] Up to about 5 years ago, TEPSA (a Ciccia family owned business) represented a strong force in the Road Passenger Transportation market in Peru. Wealthy and proud, the company even thought of building their own buses, for which they tried to organise their own factory (AUPESA). They had nation-wide and international routes and a strong presence in the overall Transports segment economy. Not any more... Confused by the emerging policies, unwilling or incapable to invest, disturbed by the daring moves of Ormeño, Morales and other contenders, TEPSA started to shrink, up to a point where it is practically extinct. Their aluminum bodied American based bus (Greyhound style), before a symbol of timely and constant service, is a seldom vision in the Peruvian roads today. They failed in their judment of the right time to renew their methods, procedures AND FLEET. The same happened with Ruggiero, who is now out of business...

sooner or later that demand will have to be met and MODASA has a fortunate chance to have the products to do that. It is **NO**, if MODASA expects that it will meet that demand by just placing "*replacement engines*" in the dealership, because that is visibly and definitely going to change. It is evident now that the Peruvian market characteristic will be altered. It is highly improbable that the urban and road transporters, exposed to larger demands for comfort, frequency, passenger and cargo density, punctuality, safety, fierce intramodal fare competition and even intermodal cannibalisation (cargo and passengers moving from road to air transportation), will give course to their old habit of overhauling the ancient fleet. They will - almost certainly - move into new units, fully built-up, prepared and adapted to run in Peru. The prime motivation for that is economic efficiency, definitely a novelty in the segment in Peru. This is, at the same time, a threat and a promise to MODASA. It is a threat because MODASA will not take the market if it fails to celebrate strategic alliances to keep Perkins Diesel aboard the new-coming units. It is a promise, because, made the proper decisions, bearing the capacity and ability to offer the market what it needs, MODASA will take the best portion of the demand.

A natural change to take place is the professionalisation of the urban transportation providers. Nowadays, this is a highly individual task, promoted by tiny operators, many of them single unit owners/drivers, attached to the "*Cooperativa de Los Choferes*", which controls the concession of the lines. This is a system unlikely to endure for much longer, as the needs for investments, the setting of better operating standards, plus the enactment of norms and traffic legal requirements on safety, passenger comfort, maximum unit ageing, maintenance, etc., as well as free market fares, will force the system into a rationalisation that can only be achieved by the agglutination of today's individuals into proficient companies of tomorrow. Such development also opens the floor to new investors...

MODASA, aware of the situation, is already working on the subject. We will comment more about this in Chapter V., E., topics 1. and 2. For the moment, let's remain with the notion that MODASA's strong concentration in the vehicle engine market is impossible to keep without major modifications in the commercialisation strategy, because boundary constraints, relative to fleet renewal, expansion and management policies, will require new strategic and tactical approaches. Let's also keep in mind that the same situation, of repressed demand for light duty vehicles, is present in Ecuador, Colombia, Bolivia and Venezuela (i.e., the Andean Pact members) where MODASA's presence is and has always been insignificant and where the mentioned structural changes are also expected to take place in the near future. But let's also keep in mind the fact that the local market is EXTREMELY SENSITIVE TO PRICES, not to technical features. It is also DEFINITELY SENSITIVE TO FINANCING, which explains the massive participation of the financially oriented Ferreyros Group in MODASA's bulk sales.

B. Stationary engines (gen sets, motor-pumps, compressors, etc.)

MODASA's next best market was (and keeps being) the supply of stationary engines, mainly as Gen Sets, at the moment, taking advantage of the alliance with Leroy Somer. But the potential represented by that market is far bigger than MODASA's present sales figures indicate. Indeed, with the exception of some nominal deals in Colombia, based on municipal postures that require lift and back-up gen set for any 3-floor and higher buildings, the current exports of engines are indeed very small. There are clear indications that MODASA is relying basically on the dealers ability and contacts to effect such sales. The results are not appreciable, though, as potentially important segments of the Economy, precisely those that are presenting the best growth capabilities (Mining, Fishery, Agriculture, Telecommunications and Energy), are scarcely present in MODASA's sales profile today.

Here, MODASA must understand a critical variable: sales to those segments are technically oriented decisions, with a very long processing cycle. Without the properly trained sales force, that can talk - with the due time anticipation - to the SPECIFYING POWER within the customer base, MODASA will not gain any territory. In summary, MODASA needs to scan the markets for the fast growth segments and start making the appropriate contacts, possibly by jumping over the present dealer network at first, or, even better, by trying to establish a new and fully specialised chain of dealers for that spe-

cific purpose.

Let's take the Mining sector, where Diesel engines are required in an ample variety of equipment, such as electric power generation, compressed air supply, water and mud extraction pumps, ore transportation conveyors, pre-processing (crushing, pelletizing, cominution, etc.) and in duty vehicles: according to MODASA's Marketing Manager Edgardo Ramires, the company does not exercise this type of customer direct handling, "*because it is up to the dealers to tackle that aspect of business*". Evidently, this single-sided vision will have to change. Given the strong pressure for privatising in the Mining sector, with many new frontiers being opened, this is definitely an unexplored field for MODASA. According to Raúl León, adviser and technical consultant to CEPRI-MODASA, with a substantial professional experience in the Peruvian Mining Industry scene, the present Diesel Engine contenders there are solely Cummins and Caterpillar. Both brands are represented in Peru by a range of captive dealers, and (guess what?) by Ferreyros! It is, thus, evident that a conflict of interests can be disturbing to MODASA's entry into the Mining sector. The only healthy way to cope with that is to jump over the dealership's so far immovable market entry-barrier and start selling straight to the "*new*" clients, with or without the respective dealers participation.

The same is valid, for example for the Agriculture market, with the aggravating fact that the small farm owners constitute a rather scattered population with limited financial ability, while Mining operations are usually larger enterprises, with better technical and economic planning possibilities. In the arid climate of Peru, any serious agricultural effort has to take irrigation as a production input. This is known there since the Pre-Colombian civilisations, like the Chimu culture (flourishing just outside of Trujillo), which built hundreds of kilometres of irrigation channels to enable the survival of their Chan-Chan megalopolis of the time, with above 400.000 inhabitants. Strangely enough, MODASA has a very small participation in irrigation today - either in Peru or the neighbouring countries. This is an unexplored potential...

A flourishing business to MODASA has been the supply of telecommunication support power sources, which include the very sophisticated remote control units for computerised line and equipment monitoring. With the privatising of Teléfonos de Perú (TELE PERU), the strong emergence of the cellular-phone market, and the high standard habits of Teléfonos de España, which holds the control of the Peruvian Telecomm giant now, this market is to grow expressively. Here the caution is with problems like the reported AVR Circuit Board frequent field failures, in order not to compromise the so far excellent image of the MODASA specific Gen Sets for that application (please refer to Chapter VI. A., for details).

Regarding the power supply Gen Sets, as back-up units, Peru is to undergo a transition. With sufficient generation capacity (essentially hydroelectric, with some thermoelectric plants) and a fully interconnected system, the electricity supply will improve very much after the system is totally privatised, which is to happen soon. What is still open - as a relative opportunity to MODASA Gen Set sales - is the still incipient quality and efficiency of the transmission lines and urban distribution network, an expensive though solvable problem without major technical challenges or impediments. That put, we shall bear in mind that MODASA will not have the same kind of market it potentially has today in terms of prime power supply: back-up units will tend to be applied at sites and locations with still fragile electric supply or for conditions that cannot withstand "*apagones*", like telecomm, data processing and critical plant and hospital electrical power sourcing. In other words, Gen Sets are going to be in less demand...

C. Marine engines

MODASA's marine applications are not visible. Although their prior partner (Volvo Penta) is a notable supplier of such special versions, Perkins is not a strong contender in that field. Marine engines require a certain expertise and connections with the naval industry that MODASA has not, so far, suc-

ceeded to establish. This is probably due to the present crisis[22] affecting the Fishing Industry in Peru, with reflexes in the respective ship-yards. For years now, Peru is facing a steady reduction in the small fishing boat coastal activity due to a longer distance between the shore and the economically justifiable fish catching provinces, requiring larger boating capacity to explore.

Same as in the Transports sector, though, this is both a threat and an opportunity, because a suitable arrangement with a naval construction supplier could change the picture. Since the policies for Fishing foment are stable and the Government is willing to take advantage of this competitive edge based on the Humboldt Stream natural blessing, MODASA could find a durable and growing market for marine applications. One word of caution, though is needed: the good opportunity for MODASA is not in the marine PROPULSION side, where larger power outputs will be required. The real market is in the so-called Auxiliary Onboard Units, which are constituted of a Marinised Diesel Engine[23] with a suitable Generator Set (to provide electricity, freezer chamber prime power and propulsion for the operation of galley drainage pumps, which can be made via mechanical power-take-offs). The technology for that installation must be acquired from a joint venture partner, which MODASA can only find abroad (possibly in Brazil or USA).

What this short chapter about market perspectives tells us is that MODASA could be doing better, had it got fit in time for the changes in conditions that it is now facing. The lack of a clear and proper perception about those changes by the time the situation started to shift, forced the company into a series of defensive actions (production reductions, amplified mix decisions, personnel lay-offs, inadequate or insufficient investments in the distribution network, late production equipment rationalisation decisions, excess inventory build-up, new business ventures like the beton mixers deal, etc.) some of them inhibiting the company's reaction capacity when the demand - old or new - will show up...

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[22] The "*El Comércio*" edition of May 7, 1996, on page E8 - Economía y Negócios, reflects some alarming figures (a drop of 23.7%) in the Fishing sector in the first quarter of 1996. This, according to the newspaper, was due to the fishing ban from late January through the end of March, on certain types of catch for the species reproduction season. Apparently, the Fishing Industry is facing a durable crisis with the industrialised products, as the direct human consumption production has not dropped (it actually increased 2.8%).

[23] By "marinised" we mean an engine endowed with a dual heat exchange system (fresh water in a closed circuit and sea water in a simple open circuit, or, alternatively, a fresh water keel cooling system).

V. MARKET DEVELOPMENT

A. Present distribution network

We have briefly discussed the subject in Chapter I. C, when reviewing MODASA's present status. We have also made comments about the situation when analysing the Market, in the preceding Chapter. This is a documented type of discussion, where a list of all dealers is going to be presented, based on their regional position, participation in the respective volume sales, etc.

The essential caption to be extracted from the present information is subdivided in three topics, as follows:

- The present dealer network is concentrated in Peru.
- There is a potential for more dealers in Peru or for the participation of direct MODASA sales, in new market segments that are highly technical and depend on proper professional personnel to be conquered.
- There is an enormous potential for an international network of dealers to take advantage of the Andean Pact competitive advantage possibilities. This can only be established with the help (not to say consent) of Perkins.

The MODASA dealer and clients network by Region (Peru)

Dealer	1993	1994	1995	Ytd 96	Cum. 3.25 Years Total	%
Central Region						
Importaciones Riviera S. A.	3	18	4		25	0.62
Organización Victoria S. A.	3	16	2		21	0.52
Automóviles S. A.	4				4	0.10
SubTotal 1	10	34	6		50	1.25
Lima						
Enrique Ferreyros S. A.	346	1163	266	90	1865	46.57
MODASA Comercial S. A.	63	76	52	3	194	4.84
J.C. Representaciones S. A.	70	94	30		194	4.84
Mac Donald y Co. S. A.	129	38	14	4	185	4.62
Motorindústria S. A.	111	50			161	4.02
J. C. Automotriz S. A.	57	88	10	1	156	3.90
Diesel Peruana S. A.	34	43	50	4	131	3.27
Telefónica Del Peru S. A.		43	64		107	2.67
Rosales Diesel S. A.	71	18			89	2.22
Volvo del Perú S. A.	72	7	1		80	2.00
Wiese Representaciones S. A.		35	33	10	78	1.95
Grupo San Juan			36	38	74	1.85
Hidro's Pool S. A.	4	28	20	6	58	1.45
Motores y Repuestos Diesel S. A.	32	17	2		31	1.27
Repuestos Inga SRL.	45				45	1.12
Luvegi Ingenieros S. A.			22	4	26	0.65
Santa Agustina Automotores S.A.	13	7	3		23	0.57
Federación de Choferes y Anexos	13	8			21	0.52
Rivera Diesel S. A.		6	8	5	19	0.47
Motorex S. A.	2	3	6	5	16	0.40

Empresa Nacional de Ferrocarriles				14	14	0.35
Crossland Técnica S. A.	5	4	1		10	0.25
Empresa Construct. Vigote			4	3	7	0.17
Diesel Andina S. A.	6				6	0.15
Motores Diesel Andinos S. A.			4	2	6	0.15
Federación de Choferes del Peru	4				4	0.10
Energo Motors			4		4	0.10
Mantenimiento Hidrostal S. A.			3		3	0.07
Carbones del Pacífico S. A.	2	1			3	0.07
Alternadores Y Grupos Eletrógenos	2	1			3	0.07
Importaciones Rivera S. A.	3				3	0.07
Agro-Guayabito			3		3	0.07
Promasa S. A.			2		2	0.05
Hidráulica S. A.			2		2	0.05
Hidrostal S. A.	2				2	0.05
Not identified (?!)			1		1	0.02
Transp. Y Serv. Multiples Huayta			1		1	0.02
Transportes Peres			1		1	0.02
Gavino Ayala Rivera			1		1	0.02
J. Walter Flores Bravo				1	1	0.02
Adrian Hugo L. Galvez			1		1	0.02
Castor				1	1	0.02
SubTotal 2	**1086**	**1730**	**645**	**191**	**3652**	**91.19**
Northern Region						
Carlos A. Mannucci S. A.	106	49	11		161	4.02
La Predilecta S. A.	27	15	8	2	52	1.30
FONDEPES Fondo Des. Pesca	17		1		18	0.45
Kubota Maquinarias Tumbes	2	10	2	3	17	0.42
Autos y Camiones S. A.	12				12	0.30
Vehiculos S. A.	4				4	0.10
Metal Andina S. A.			2		2	0.05
Hospital Docente Trujillo			1		1	0.02
Carrocerias Morillas			1		1	0.02
Inversiones y Repuestos S. R. I			1		1	0.02
SubTotal 3	**163**	**74**	**27**	**5**	**269**	**6.72**
Southern Region						
Inca Motors S. A	3	7	1		11	0.27
Sur Motors S. A.	5	3	1		9	0.22
Inca Motors S. A.	3	1	1	1	6	0.15
De Ferrari Comercial S. A.	3	1		1	5	0.12
Exp. & Imp. Hispano Peruana	1	2			3	0.07
SubTotal 4	**15**	**14**	**3**	**2**	**34**	**0.85**
GRAND TOTAL	**2533**	**3690**	**1359**	**394**	**4005**	**100.00**

source: MODASA Plant in Trujillo

The next table is a suitable Regional Sales Summary which demonstrates the extreme volume-wise concentration of the MODASA Sales in the Lima region.

The MODASA Sales by Region (Peru, only)

Region		1993	1994	1995	Ytd 96	Cum. 3.25 Years Total	%
Central	SubTotal 1	10	34	6		50	1.25
Lima	SubTotal 2	1086	1730	645	191	3652	91.19
Northern	SubTotal 3	163	74	27	5	269	6.72
Southern	SubTotal 4	15	14	3	2	34	0.85
GRAND TOTAL		2533	3690	1359	394	4005	100.00

source: MODASA Plant in Trujillo

The MODASA Exports by Country (Abroad)

Dealer	Country	1990	1991	1992	1993	1994	1995	Total	%
Dieselectros	Colombia	10	4		11	50	25	100	19.96
Chaneme Malvecosa	Colombia	12	18	33	6	4	6	79	15.77
Antonio Spath	Colombia					23	41	64	12.77
Jose Sanin Galvis	Colombia	2	2	5		26	16	51	10.18
Ignácio Gomez	Colombia						46	46	9.18
Andiesel	Ecuador	1	9	12	8	14		44	8.78
Euroquipos	Colombia		7	31		5		43	8.58
Ronald Covo	Colombia	3				7	8	18	3.59
Electromecánica	Colombia	7		5	1			13	2.59
Sisex	Ecuador				5	8		13	2.59
Fernando Duque	Colombia	8	2					10	2.00
Auto Sueco	Ecuador						8	8	1.60
Jose Joya	Colombia				4			4	0.80
Alejandro Garces	Colombia	1	2					3	0.60
Cia Invers. Textiles	Colombia						1	1	0.20
Baru Beach	Colombia					1		1	0.20
Construct. Novoa	Argentina					1		1	0.20
E. Parada	Colombia					1		1	0.20
Distrib. Técnica	Colombia					1		1	0.20
Total Exports		44	44	86	35	141	151	501	100.00

source: MODASA Plant in Trujillo

Summary - MODASA Exports by Country

Country	1990	1991	1992	1993	1994	1995	Total	%
Argentina					1		1	0.20
Colombia	43	35	74	22	118	143	436	86.83
Ecuador	1	9	12	13	22	8	65	12.97
Total Exports	44	44	86	35	141	151	501	100.00

source: MODASA Plant in Trujillo

Exports in the analysed period represent 501 units in comparison with 4005 units sold in the domestic market; this means that 11.12% of MODASA sales are for export, or 501 out of 4506 engines from 1990 through 1995.

MODASA has submitted a brief table with the respective Invoicing Values along the period 1990-1995, which can serve as a "*magnitude indicator*". Since the respective data were supplied two days before the report was issued and the back-up information was not sufficient, we have decided to reflect the figures "*as sent*", in Nuevos Soles[24], even because we did not have, at home base, ways or means to evaluate the effects of the Peruvian inflation along those years, as well as the eventual exchange rate fluctuations therein. Our assumption is that the readers would anyway have a fair notion of the values evolution, which is what counts for the interpretation of MODASA's present status.

MODASA'S INVOICING VALUES REFLECTED IN ANNUAL TOTALS IN NUEVOS SOLES

Historical Sales	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**
Domestic Market	2.659.875	19.869.559	26.205.892	29.035.689	44.874.091	22.149.723
Export Market.	133.839	321.879	812.382	528.429	2.943.616	3.298.608
Sub-Total	2.793.714	20.191.438	27.018.274	29.564.118	47.817.707	25.448.331
Spare Parts	N/A	1.291.195	1.599.434	6.474.113	9.169.622	4.920.892
Total Invoicing	2.793.714	21.482.633	28.617.708	36.038.231	56.987.329	30.369.223

source: MODASA Lima - General Manager's Office

Also as a reference at this point, it is useful to include the percentual variation/evolution of the Peruvian GNP, as published by INEI. The tabled values are:

Evolution of the Peruvian GNP, expressed as an Annual growth percent

Year	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996(*)**
GNP%	+2,3	+9,2	+8,5	-8,3	-11,7	-5.4	+2,8	-2,5	6,5	12,9	6,9	-1.7

(*) Actual for the first quarter and full-year projection by INEI - Peru.

What strikes the eye in the above time series is the nervous cyclic pattern, three years positive, three years negative, one year positive, one year negative, three years positive, this year's projection negative (?!)...

A last comment to make, regarding this economic outcome, is that Diesel Engines demand has a very high statistical correlation with the respective GNP development. In a recent study - done for one of the TECKNOWLEDGE INTERNATIONAL clients -we have come to a 0.9867 correlation coefficient in a 12 years time series involving 15 countries of varied economic structures and general development status, based on a 42-variables multiple regression analysis. The reasons behind the high correlation are a compound of hypergeometric modal values that also bear a tight connection with the GNP development, as for instance: industrial activity expansion indicators, transport activity indicators, general civil construction activity indicators, public investments in utility supplies (energy, fuels, oil exploration, telecommunications, etc.). Inflation and interest rates, as well as exchange rate policy, also play an important role in that relation. Therefore, MODASA may be collecting residual effects from the economic activity drop in 1995 (from 12,9% expansion to just 6,9%) and anticipated effects of the general projected drop in economic activity as already denoted by the 1996 projection. According to Peter Drucker, "*in these turbulent economic times, you get what you expect...*" The classical solution to overcome that inexorable link is to promote a sales diversification, going to other markets, where the economic fluctuation might compensate for the domestic market dip.

B. Andean Pact opportunities

It is virtually impossible to talk to a Peruvian entrepreneur, authority or scholar, without hearing the expression "*Pacto Andino*" in the first five minutes of the discussion, regardless of subject. The free trade agreement is a strong presence in the business discussions, in the political speech and in the media. Still so, one has difficulties to see practical applications of that concept in any trivial activities of the daily life.

[24] The exchange rate at the time of the field mission was S$ 2.39 = US$ 1.00.

No wonder that the Presidents of Bolivia, Colombia, Ecuador, Peru and Venezuela, plus Panama (acting as an observer), have been to Trujillo for a two-day meeting (May 8 & 9) to edit the *"Modifying Protocol of the Cartagena Agreement"* and create the **Andean Nations Commonwealth** and the **Andean Integration System,** to provide larger functionality to the Andean Pact, not only in the aspects relative to commercial integration, but also in fields like culture, education, social welfare, combat to narcotics, as well as for the strengthening of democracy and human rights. The document was called the *"Acta de Trujillo"*.

According to the words of President Fujimori, *"the Andean Presidents represent something more than 100 million people within 6 nations. About a third of that population lives under the rigours of poverty, and half of it survives critically amid extreme distress. The reports from Unicef, FAO, OMS, OPS, World Bank, IDB and other organisms are very clear in this respect. As a consequence, the Andean nations must direct their steps towards a supreme objective, which is to eradicate poverty, a direct result from unemployment, malnutrition, hunger, lack of adequate housing and basic services, as well as of absence of minimally efficient health care."*

It seems, from the sudden renewed interest in the subject, that the Andean Pact will indeed seek for practical relief of some endemic regional problems. But behind the scenes, what this can mean to Peru is much more. With the Pact's strengthening, Peru, more than any other regional nation, will collect the dividends. And that is specially beneficial to Peruvian enterprises like MODASA.

Seen from the past performance statistics, though, the Andean Pact sales at MODASA have been very low and very concentrated in Colombia. This is something that can be changed - perhaps independent from any governmental change in attitude or policy. Indeed, given the regional similarities, the same demand causing conditions existing in one, are present in all other countries of the free trade zone. The conclusion is that, if MODASA can start a series of actions to gain market shares in those countries, it will succeed. And what should those actions be? Basically, MODASA must change its present market representation structure in the nations where the participation is small or null. This must, of course, be done in harmony with Perkins. If the so-called Andean Pact benefits (Duty Free Transactions) are a durable goal, then, there should be a definite new volume in sales to the MODASA controlled dealership.

If we look at Fujimori's diagnostic about the problems, cited above, and believe that the solutions will be tackled on a collective basis - with incremented bi- and multi-lateral trade, support to combat unemployment, malnutrition, effective housing and basic services deployment programmes, and with improved health care - the business prospects for MODASA are excellent! All of these measures require from moderate to intensive Diesel engine application turning the Andean Pact into a positive economic growth factor for the company. But, here again, it won't be enough to leave the tasks up to the existing dealers. They have proven not to be able to influence the decision makers and are failing into crucial sectors like Mining, Fishing, Agriculture, etc. even inside Peru, where theoretically MODASA's surveillance can be maximised!

So, if MODASA wants to conquer that important part of the emerging Diesel Engine Market, a reinforced and well trained Dealership is a very important resource that has to be specifically developed. Even to the disarmed eye, sales in the neighbouring countries should be higher.

C. Mercosur - threat or opportunity?

MERCOSUR is a free trade zone comprising Argentina, Brazil, Paraguay and Uruguay, which is in full function at the moment. Chile, although signalling their intention to jump in, has been deferring their adherence because of a possible vinculation of that nation with NAFTA[25] (the North American

[25] On May 26, 1996, a meeting was held in Canada, precisely to define a *"fast track"* agreement to enable Chile to adhere to NAFTA...

Free Trade Agreement). MERCOSUR will comprise approximately 230 million consumers by year 2000, with an industrial capacity equivalent to a third of that of the European Community. For several years now, the MERCOSUR has been active, granting duty free commercial transactions between the member nations, with very nominal, limited and gradually decreasing exception lists. It is important to remark that it is a consolidated vision that the segment of Industry taking best advantage of the MERCOSUR incurred benefits is the Automotive Segment, namely the producers of Transport Equipment and Diesel Engines .

Once and often, we hear news and indications that the neighbouring nations, like Peru, Bolivia, Ecuador, Colombia and, eventually, Venezuela "*are in the verge of a decision to also adhere*" to the free trade zone. This is a very crucial step, that can change the fate and the value of many enterprises installed in the region. For this report, we have limited ourselves to judge the effect over MODASA of an eventual adherence of Peru to the MERCOSUR. Our conclusions are:

At a first moment, the entry of Peru into MERCOSUR can mean a serious shock to MODASA. This conclusion is based on the sudden availability of competitive products from Brazil and from Argentina, the two stronger industrialised nations of the region. In terms of Engines, Maxion (Brazil and Argentina), MWM (Brazil), Cummins (Brazil and Argentina), Scania (Brazil and Argentina) and Volvo (Brazil), would be suddenly free to enter the Peruvian market with their highly competitive products[26], even without recurring to dumping practices. Ford, VW, GM, AGRALE and other vehicle producers would also be ready to come. The result would be a very fierce competition for quality, performance and PRICE. It is not yet clear what the effect would be over MODASA in terms of profitability, as we have not entered into those details during our short survey visit. But given the benefits of the much higher production scale (which MODASA would not have), such foreign invasion would mean a very hard battle.

As an exercise, we could say that, given the current extremely high absorption of the respective fixed costs by the Brazilian and Argentine producers - given their present and immediate future predictable volumes - MODASA would have extremely hard challenges to cope with, due to its comparatively lower production scale/rank and, therefore, overhead absorption. It would, then, take an extremely lean production scheme (not visible at MODASA nowadays) to remain competitive. Would the company be capable of taking that route?

A crucial example: Maxion (Brazil) is an exact clone of MODASA, including the historical liaison with Perkins! The "*differences*" are that Maxion is financially healthy, is producing to very vast volumes far above the respective break-even point, is not as dependent on external CKD supplies as is MODASA, has its own designed range of products, and has an international experience by already being bi-national. It even holds a USA venture which gives Maxion a world-wide competitive guideline. It is doubtful, by reason, that MODASA can be as economically efficient as Maxion is now, given the respective structures, line-ups, product ranges, volumes, fixed OEM customer bases (GM 100%, VW 50%, Ford 35%) and proficient supply network, etc. The nationalisation (national integration) indices of Maxion are indeed above 96% by weight and by value... Still so, what can prevent Maxion from "*invading*" Peru is their contract with Perkins, which limits the valid transaction territory to Brazil and Argentina[27].

But there are also compensations from the entry: if, by the time of Peru's eventual adherence to MERCOSUR, the strategic alliances that may give MODASA a light duty vehicle line, a naval industry wing, and a suitable volume participation in the Andean Pact are consolidated, then, MODASA could

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[26] Their superior specifications, adherence to Euro 2 norms, low prices and eventual source financing from Brazilian Banks (or even from the Federal Government of Brazil) can have a devastating effect over the current Peruvian market contenders, inclusive MODASA.

[27] To be able to operate in Argentina, a decision actually deriving from GM's move of the light duty truck lines to that country, a legal battle had to be faced by Maxion, because the contracts in vigour (to that date) indicated Brazil as the only authorized sales territory. Finally, after hard negotiations, Perkins accepted that the "*follow my client*" allegations by Maxion configured a typical "*force majeure*" fact!

take the opposite route and commercialise products in Brazil and Argentina, by offering to its strategic allies a really new competitive edge.

Another possibility, considering that the Leroy Somer range of Gen Sets can indeed be produced in larger quantities than those now done, is their placement in the newly formed mega-market. MERCOSUR would, therefore, add value and volume to the MODASA operation, enabling automation and better technical resources to quickly reach international economic efficiency in Gen Set production.

Conclusion: The eventual entry of Peru to MERCOSUR can be a threat to the MODASA of today. If the company will succeed, after privatised, to celebrate and keep the necessary strategic alliances for product diversification, then the threat can be minimised and even converted into a positive advantage. The only variable to keep in mind is that of a proficient production at economically justifiable and competitive[28] costs must be kept. Otherwise, MODASA will vanish, as already occurred in Peru with the other three sister-companies cited in the beginning of this report.

D. New applications

MODASA's value and valuation process are a hard bet (see specific Chapter on that). This is mainly due to the concept to be applied. One thing is to look at MODASA as it is today. Another is to look at the effects of a reinvigorated MODASA, by means of strategic alliances and partnerships. Considering that CEPRI-MODASA, acting on the behalf of the Government, is conscious of the public nature of their effort, it is self-explanatory that the valuation will follow what Luiz Piazzon and David Ritchie defined as "*the highest and most legitimate general public interest given the ownership of the capital to be auctioned*".

In that context, new applications are essential to endow MODASA with a new competitive edge and to adjust the company to the new realities of the market. Two lines of thought, along the same pathway, are being presently investigated by MODASA. Both refer to the entry into a new market segment, that of light duty vehicles that can employ Perkins Diesel Engines and offer new perspectives to both MODASA and the current or (hopefully) expanded dealer network. We are now making some comments about what we could see, during our field mission in Lima and Trujillo, regarding this very important activity.

1. light duty - distribution - vehicles

As already mentioned, MODASA, out of the need to find new business opportunities in the Peruvian market, has, by mid October 1995 and through a Management decision, defined that a special project activity would be started, aiming at developing a suitable line of vehicles, including a truck and a bus chassis. The first idea, fruit of some contacts with the Chinese Embassy and a technical visit by representatives of a non-identified chassis manufacturer (probably the vehicles being adapted are from Auto Complex 1, simply designated as 'Number 1" in China), was to use certain structural components and adapt other within MODASA, to reach the objective.

To devote full attention to the project and speed-up the technical activities, Mr. Horácio Aguilar Z., was assigned Project Manager for the new activity, receiving the mission of revamping the applications area, in the South edge of the Trujillo Assembly Plant, to transform it into a Vehicle Prototype building workshop. A total number of 8 vehicles were imported and torn-down, including 4 complete trucks and 4 cab-less chassis.

Two trucks were quickly adapted to get a MODASA Perkins Engine, a Clark Gear Box (acquired in

[28] MODASA must be alert that the criteria for this judgment cannot be Peruvian values only. In this respective, MODASA competitors are all the companies producing the same range of engines with the same basic technical performance independing of country, capital origin, societary composition, shape and form of organisation and market position.

Brazil) and a few other adapting components, including the respective superstructures for cargo transportation. The two trucks are rolling, on a field test, doing special transport work, mainly between Trujillo and Lima. The original Chinese Cab, as well as all the interior items, the electrical and other vital systems, like the brakes, were initially kept original.

Presumably, the results were not as good as expected, because of the very hard usage conditions imposed by the Peruvian road infrastructure. This led MODASA into a quest for new components, first to try to replace items like the Hydra-Vacuum type brake system, among others. A new system was being adapted, of the full air type, more consentaneous with the operating needs in Peru.

The Cab-over-engine design of the Chinese chassis appeals to the Peruvian urban distribution operators, because it enables a longer platform length for the cargo. Although this can have a certain advantage in urban traffic, though, it will present a disadvantage for those hauliers briefly going to the road (like green-belt food crop and orchard products transporters) as the vertical oscillation in the cab can be an annoying characteristic due to its direct mounting, with a short leaf spring set, right over the front axle. The overall impression from the observation of the chassis still in Plant, at MODASA, is that the referred units are rather fragile in construction, which consist into a probable source of field problems, given the local loading and driving habits.

A very weak rear axle housing and differential case indicate that the vehicles might face serious trouble when operating under the Peruvian road conditions. Other characteristics that called the attention of the UNIDO adviser were the very low ground clearance and the fragile suspension and steering brackets, pitman arm, propeller shaft and other such critical components. The Steering Column and Steering Control Mechanism also look very fragile for the expected driving conditions. The wavy shape of the vehicle frame also represents a practical problem for lowering the ground clearance and exposing items like the propeller shaft intermediate carrying bearing to shocks with pavement bound obstacles, including the omni-present speed limiting "*bumps*".

The Clark Gear Box was being replaced by a Brazilian made Eaton Fuller unit, more adequate for the hard duty (stop & go) driving cycle inherent to intra-city or vicinal traffic.

The reason for the quest of a Chinese chassis supplier is an attempt to keep costs extremely low, as a consequence of the already cited Peruvian market devotion and undoubted preference for low priced units, independing on the respective technical features.

The idea to seek for another ally - AGRALE from Brazil - was a natural choice after the Chinese vehicles started to present performance and endurance problems. Indeed, AGRALE has a better technology and much more regional experience than the Chinese, which could lead to a more favourable vehicle specification for the Andean Pact conditions.

A light duty truck with approximately the same transport capability of the mentioned prototypes can be an excellent replacement to the old Dodge, Ford and Chevrolet antiques, having their lives prolonged beyond reasonable economic justification and by means of costly down time and improvised "*Repuestos*". What remains to see is if the current MODASA dealer network will be capable to handle the new products and render the required technical services and maintenance.

The UNIDO adviser has serious remarks about implications, liabilities and Certification requirements for these trucks, which will be handled in Chapter VI. G.

2. city buses

When we come to the light-duty city buses, this is a market so far in the hands of the low-end body builders and other intrepid "*producers*" living out of backyard solutions. A frequent sight in Peru is a strange breed of improvised light duty buses, atop not seldom post-crashed reformed truck chassis, "*stretched*" passenger car frames or built by combining components from different makes in a real

"*salad*" of parts, surrounded by what can only be regarded as a precarious and hardly recognisable bus superstructure. Even larger companies, like MORILLAS and SATESI, perform such daring adaptations at the request of the respective owners/drivers, counting on the tolerance of the traffic authorities[29]. One evening, in Ruta Norte, just out of Trujillo, the UNIDO adviser spotted such a unit which was driven at high speed, full of passengers, in the dark road and without a single operative light (front or rear!)...

Such primitive buses exist by the thousands, all over Peru, Bolivia, Ecuador, Colombia and Venezuela and a considerable number is entering into use every year. They reflect an indulgent attitude by the traffic authorities, a critical decapitalization from the part of the operators, a passive attitude from the passengers, a lax public transportation policy and (to MODASA's luck) the lack of a suitable moderately priced substitute. Some of these factors will almost certainly change by force of Governmental decisions, appropriate lobbying and also by the raising of public clamour against the unsafe and uncomfortable way to carry passengers around. Everyday, during the UNIDO adviser's mission in Peru, without a single exception, the newspapers brought shocking reports (with pictures) about tragic accidents involving that type of unit, not seldom with a dozen victims...

Therefore, MODASA's concept of developing a bus chassis that could be offered to the transporters - possibly as a ready unit, specified and body-built to decent standards- makes sense.

The same actions, regarding the Chinese sourced truck chassis were tackled for the case of the buses, including the full construction of two prototypes, one of which could be extensively observed by the UNIDO adviser in Lima, during the mission. The unit is a light duty city bus with an elegant, though realistic, body building specification offering very good ride and seating comfort. Here too, the Chinese base chassis was suitably modified, to house a Perkins Diesel Engine, an Eaton-Fuller gear box, an improved gear shifting mechanism, a simple but very well designed instrument panel, along with what could be a national novelty: effective brakes!

The subject unit was exhibited to Perkins British executives by the year end in 1995, receiving very positive words of incentive. One of the Executives present recalls the request that the PERKINS name plate attached to the unit should be more prominent. The unit was exhibited also to the "Bus Drivers Association", in Lima, receiving very favourable acceptance from the part of the member professionals. We are referring specially to an adaptation that received a SATESI "Milano" type superstructure.

But if that sounds very positive and reassuring, other details about the project must receive some warning comments, as well. The Chinese chassis is not definitely suited for such an application without major reinforcements and critical adaptations. The same comments already made regarding functional items, suspension, steering and brake system are valid. To circumvent those problems, MODASA's engineering team had to improvise - almost along the same lines as those of the initial comments of this section. This de-characterised the chassis as an OEM. It is now more a hybrid product than a body built "*Chinese bus*". Besides adapting engine, gear box, and a few suspension reinforcements, MODASA had to also start tampering with clutch, propeller shafts, leaf spring shackles, the electrical system, chassis reinforcements where the respective body superstructure will sit, ground clearance, the short wheel base, the narrow track, the steering gear intrinsic fragility, etc., all requiring extensive modifications.

The result of all this effort, though appreciable from the visual stand point, is a non-integrated patchwork style solution, which is far from a tested and approved technical construction. Worst still, by modifying to that extent the Chinese design, MODASA is relieving them from any incurred vehicle liabilities, assuming the ponderable risk of the "*parenthood*" for the respective design. And here - we must say it bluntly - MODASA does not have the experience, the expertise and the technical evaluation

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[29] When asked about this, Walter Pun Ayo, Technical Director of MORILLAS, replied that "*we are simply following the practical realities of the market: all the units you saw (and considered technically deficient) have been formally licensed, meaning that they are authorised to circulate carrying passengers*" (sic)!

resources to present such a vehicle as its own produce! Therefore, MODASA is at high risk. The "*salad*" of components has gone too far and the eventual fact that the present local standards favour that type of improvisation does not grant MODASA the permission to use the same regrettable methods of vehicle engineering inconsequence. Still so, a few points could not be resolved, like the wheel hubs and drums, the rear axle and differential case, etc.

MODASA, fortunately, is looking for another solution, the AGRALE joint venture, which could resolve most such problems by providing tested AND FULLY CERTIFIED products, a fundamental issue when it refers to liabilities and legal duties. If a suitable arrangement can be celebrated with AGRALE, or other equivalent producer of light duty vehicles, then MODASA can enter the market without the high risks involved in the solution at hand. On the behalf of MODASA, one must say that the people involved did not have a clear vision about all these external and international involvements, like the need for type certification from an accredited test lab, the existence of world-wide norms and concepts, etc.

E. The intended city bus business concept

We have spent some time discussing with different MODASA executives about their intended city bus business concept. In summary, the situation is as follows:

1. MODASA, in a joint venture with a foreign chassis producer, assembles the unit with the necessary local adaptations, including the Perkins Engine and gear box set.

2. MODASA, observing the specific client preferences, sends the unit for customised body-building.

3. MODASA delivers the ready built, tested and approved unit to the "Cooperativa de Choferes[30]" which will then assign it to one of its eligible members, normally also its 10-hour daily shift driver.

4. MODASA gets a contract on the sale, with the collateral being the unit, itself, and having the "*financial guarantee*" of the Cooperativa.

5. The Cooperativa will collect WEEKLY payments from the bus driver and pay MODASA in that same basis.

6. In case the drives "*defaults*" payment, the Cooperativa will assign another driver for the unit and resume payments to MODASA, while cancelling his affiliation and reassigning his concession line to the new member.

7. At the end of the financing term, MODASA will transfer the final ownership to the current driver/owner entitled in the last contract amendment available.

The following comments are pertinent: the financial security of the business is not ensured, as denoted by the need to charge weekly instalments, an unusual practice anywhere else in the world! If a defaulting client will dispute the bus and line concession ownership in Court, MODASA will be in quandary, while the unit may remain on duty or under judiciary custody. Given the driving habits and the possibilities for fatal accidents involving the units, a very thorough insurance is required, to provide the proper financial guarantee to MODASA. Given the instabilities of the respective market, the large mobility entailed in the proposed "business" plan, etc., MODASA runs the risk of ending up with a shed full of used buses whose owners could not honour payments and decided to let the units be retaken by the fiduciary owner - in this case MODASA, if not the Cooperativa - creating a large inventory of refused buses.

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[30] There is one such entity for each large city in Peru, but they operate just on a local basis.

For the plan to be satisfactory, from the financial security stand point, MODASA should seek for governmental support - under the form of a special line of credit - where the main visible objective is to increase the quality and safety standards of urban transports, by the setting of a minimum entry standard and a plan to ban the improvised units along a reasonable time frame (say 5 years). In this case, the financial support and incurred liabilities would reside in the hands of the Government, which has the adequate instruments to safeguard the public interests. This could be inducted as a governmental programme for the upgrading of traffic and transports safety, as well as a social and welfare plan to improve the quality of life of both the passengers and the drivers/owners. As an added feature, the programme could enforce healthy standards for maintenance, emissions control, and operating regularity, by which operators could benefit from tax and financial incentives, like subsidised interest rates on the capital. If properly done, such a program could even entail the gradual capitalisation of the owners, through the adequate computation and retention of the corresponding monthly depreciation fund values, to enable automatic unit replacement at the end of the legally permissible useful duty life of the units, something that cannot be achieved with the present rules and practices in vigour. MODASA, when capable of producing such buses to the "renewed National Standard" would, of course, be the main beneficiary!

F. MORILLAS and/or SATESI as potential partners

The most important and distinctive part of a light duty vehicle is the corresponding body building or superstructure fitting. This signifies to the owner and to the general public the IMAGE of the product, despite the possibly impeccable mechanical qualities of the respective chassis. Therefore, it is essential - if MODASA is really going to follow that route - that a durable technical partnership is established with a suitable supplier. The two possible Peruvian companies with sufficient potential for such a venture are MORILLAS and SATESI. Both have a long-standing experience in the field and a basic established competence to perform the necessary duties.

MORILLAS, situated in Trujillo (North Route, about one kilometre from the road entry point), has the following PROS:

- Three plants, one of which brand new, though entirely idle.
- Proximity to MODASA.
- Proficient tools and fixtures for an ample variety of body concepts and models.
- Also has experience with truck body building, including freezer vans and container type superstructures.
- A well accepted trade mark.
- Rolling arrangements with local third-party suppliers for key services like body finishing, painting, etc.
- Self-sufficient production of seats, shelves and fibreglass panels.

MORILLAS has the following CONS:

- May be facing a temporary cashflow problem in view of heavy investments[31] done and not

[31] The new plant's capacity is three to four times larger than the older combined two-plant complex. As an example, the new paint booth, a hefty investment - totally out of proportion with the present production level - is not used at all, while the UNIDO adviser was shown third party painters working on commission in the old plant's yard, using air dry lacquer and operating without any safety protection.

used.

- May not be willing to invest, or to follow higher technical standards[32] for body work.

- May have other objectives, like celebrating a strategic alliance with MARCOPOLO for specialisation in road buses and long hauling coaches, moving into another level or category of market..

On the other hand, SATESI is already involved with MODASA's urban bus programme, having been responsible for the body building of the two existing prototype units. SATESI is located in Lima, which could offer slight logistics problems for the necessary partnership, like hauling away operations of bus chassis units or their driving with a provisional solution, offering ponderable risks of accidents.

The SATESI PRO's are:

- Has already proven to have a suitable design (see comments on the respective chapter).

- Has MODASA's "*preference*" for the good technical support offered during the first two prototype building occasions.

- Counts also with the preference from the "*Cooperativa de Choferes*" because of rolling business relations.

SATESI CON's, despite the fact that it was not surveyed by the UNIDO adviser, are estimated[33] to be:

- The location in Lima, with incurred logistics and co-ordination problems.

- Is not as big as MORILLAS as a company and does not have an equivalent production capacity.

- May not be willing to abdicate from the current practice of improvised vehicle solutions.

Independent of which of them will be selected for an eventual participation in MODASA's new product range (it might even be that both will be involved), it is natural to expect that there will be investments to make. Such investments might be "*traded*" for stake at MODASA. If we think about MORILLAS new and totally empty plant, it would be an excellent complement to the bus programme, by enabling the setting up of a proper assembly line, with integral body building, high quality paint, etc., without requiring any investment in new facilities from the part of MODASA. MORILLAS could enter the venture by "*offering*" the new plant and eventual tooling and fixtures as part of their capital contribution to the "new" MODASA. As far as we know, SATESI would not be in the same position, but might be interested to make a "cash" contribution, instead.

Conclusion: if MODASA is going to enter the light-duty vehicle market, the key factor is the ability to start production quickly, by taking advantage of existing facilities (which are not available in the MODASA Trujillo current plant). A crucial strategic variable is to have a working agreement (even better,

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[32] This is indeed a very import point, as the selected partner must adjourn any practices that are destructively competing with the new standard, i. e., discontinue the services of the "*current*" improvised solutions for good...

[33] For this brief evaluation we have counted on information supplied upon request by Orestes Cáceres Zapata, Technical Secretary of CEPRI-MODASA. A deeper evaluation is recommended, possibly including a plant visit by a qualified technician.

if possible, a "*partnership*" agreement) with a suitable superstructure supplier. The next consequence is that such a supplier would have to shift technical standards and refrain from current market cannibalising practices, like the practices involving the improvised truck and bus body-buildings of toda That can only be achieved by a stronger liaison than just the order flow, i. e., through their formal participation in MODASA's capital.

VI. LATENT PROBLEMS

A. Field claim and warranty figures

A good way to evaluate the technical abilities of a company to fulfil the requirements and expectations of the market is to look at the Field Claim and Warranty Figures. We have done this, in the case of MODASA, by using their own statistics. The results indicate potential and real problems, not because of the value involved but because of the customer annoyance and incurred liabilities. The table below reflects these data as supplied by MODASA. Then we will make the appropriate comments:

Warranty and Claim Statistics in the last 15 months (JAN-DEC 95 + JAN-MAR 96)

Item	# of cases	% of cases	US$ value	% of value
Instruments and Indicators	22	10.0	N/A	N/A
Sensors	21	10.0	5460	10.0
Oil Pressure Switch	18	8.5	1908	3.9
Engine - Internal problems	16	7.5	7200	14.4
Turbo-Charger	16	7.5	N/A	N/A
Printed Circuit Board (Gen Set)	14	6.5	7000	14.0
Flexible Disc	13	6.0	6100	12.0
Injecting Pump	11	5.0	3000	6.0
Oil Draining Pump (daily Tank)	06	2.8	450	0.9
Oil Heat Exchanger	05	2.3	1000	2.0
Leroy Somer Alternator	05	2.3	5714	10.9
Other Scattered Problems	61	28.0	N/A	N/A
Total Value of all Failures		100.0	50.000	100.0

The above table shows problems that are particularly annoying to customers, like the failure of Instruments and Indicators, Sensors, the Oil Temperature Switch and Turbos and Injecting Pumps. The most important implication from the annoyance factor is that those problems cause unit downs, i. e., the engines cannot be operated at failure. Another notable point is that, almost without exception, those problems are caused by items that come in the CKD Kits, and, therefore, from good source! One point the strikes the eye is that there were 16 cases of Engines with Internal Problems (!!!), meaning assembly defects. The second most expensive item in the statistics is a printed circuit board, also a Purchased Finished item, which interrupts the function of the Gen Set.

The UNIDO advisor could not contain his surprise at the nature of the failures and at the apparent lack of deeper analysis on their causal factors. We could not extract more than conjectures about the reason for such failures, for example the ones relative to the Oil Temperature Switch, which could denote either excessive assembly torque (with internal parts rupture) or improper grounding during installation. Other usage conditions could also cause the subject failures. But MODASA could not clarify the cause and therefore is at great risk of having continuous repetitions of the same vice.

Five Leroy Somer Alternators failed in the field. If we consider the volumes produced, the unitary value of the items, and the fact that the whole Gen Set units can be out of duty for weeks, before the problem can be resolved, this signals to a rather loose handling of the subject from the part of MODASA. According to the discussion held, the "*dealers*" are the ones acting when these problems take place. The recommendation here is that the Service and Warranty Policies within MODASA be realigned, so that a more direct company involvement and response can be noticed by the affected customers. Another recommendation is that a more complete and accurate reporting system be provided., so that Management can be properly informed about trends, as well as causal factors, for the Warranty Field problems the company is facing. Last, but not least, Perkins should be better informed about failures being experienced with items that do not present the same frequency of incidence in England or

other equivalent markets. This would point to local MODASA practices as causal factors and help solve the problems at their source.

A last comment is that 61 *"other"* problems have occurred, many of them in the same category of unit down causers, which in the long run can produce a strong rejection to the MODASA trade mark if the problems persist and cannot be solved.

B. Competition

The Peruvian situation has evolved to a practically open (free) market. At least in thesis, any Diesel Engine Manufacturer of the world is able to penetrate that market, explore it and settle, as he wishes. But if that is easy saying, it is very hard to do: one needs a certain bravery to open-up a totally new market, with the incurred development costs for the suitable service network, for the training of the sales force, and more over, for the development of a reasonable population of the respective engines in the market.

That put, Peru becomes a narrower possibility, because the existing population of Diesel Vehicles, Diesel machinery and Diesel Stationary Engines is solely dedicated to a few traditional contenders. The main traders in Peru have been Volvo, Scania, Perkins, Cummins, Caterpillar, Fiat-Allis and John Deere. Other minor contenders have been in and out, along the years, including Deutz, Bounus, Komatsu, Yanmar, Yamaha and Mitsubishi. More recently, after the free opening of the market, some Detroit Diesel and Navistar (International) branded engines have appeared back. If we limit ourselves to the useful power range where MODASA is competing, then the list narrows down to Volvo, Scania, Cummins, Caterpillar and eventually Komatsu. When it comes to applications, Perkins is a large park, which is mainly constituted by vehicles and the so-called separate engines, used in repowering operations.

Seldom engines, real rarities, still exist, like Hungarian engines equipping buses (Magyrus) or old British products (Lansing-Bagnall, Chalmers, etc.) and Rolls Royce equipping eventual Leyland trucks and buses, inclusive fire combat cars. These odd models, though, tend to disappear in favour of products presenting guaranteed spare parts supply and a proficient field service. Therefore, changes in the market scene are not likely to take place in the short run.

Caterpillar and Cummins are dominant in sectors like Mining and Road Construction, where they became like a national standard in the early Seventies. John Deere is essentially agricultural.

In practical terms, MODASA's competitors are Caterpillar, Cummins, Volvo (to a certain extent) and Scania. No competitor has assembly operations in Peru or any other Andean Pact country. Not a single one has a local developed range of components, unless those improvised by the suppliers without involvement (or under a benevolent eye) of the respective manufacturer. Indeed, that has been a flourishing industrial segment (that of *"Repuestos"*), where even the so-called *"pirate parts"* suppliers from Argentina and Brazil have a prosperous sale return in Peru. Our time in Peru, though, did not allow for an analysis of this type of business. A quick look into an Auto Parts distributor shelves in Trujillo, indicated that most of the said parts are still imported, being the local entrepreneurs chiefly involved with car pieces, mostly past model items, indispensable for the already mentioned creativity and craftsmen based repair of the vintage models still in use in Peru.

So, for MODASA, competition will continue to come from where it has always come.

C. Perkins as a partner

One thing, still difficult to anticipate, is what shall be the general attitude of Perkins in relation to the privatising. All questions asked about the subject point at MODASA Lima, MODASA Trujillo, CE-

PRI-MODASA and elsewhere, always produced an indetermination. Perkins, the sole technically able partner at MODASA, has not pronounced yet about their intentions and views relative to the privatising campaign. Although this may seem strange, it stands to reason: apparently, Perkins has not pronounced a word about the privatising because they HAVE NOT BEEN ASKED to do so, and so far...

In other parts of this report, the UNIDO adviser has indicated concern with this situation and with the future role of Perkins in the Society. Indeed, MODASA is a Perkins production unit, with an odd ownership. But since Perkins is the sole current supplier of engine components and engine technology, and since the engine range available in Peru is almost international state-of-the-art (Euro 1 level), with supposedly free and unlimited access to new technical specifications, design, process and quality instructions, policies and procedures, etc. , as well as SUPPLIES, it is fair to expect that Perkins is fairly INTERESTED in keeping MODASA active. The size of the Peruvian market, the influence MODASA already exercises in Colombia, the effective and advantageous link with Leroy Somer, the spare parts market, etc., all point favourably to the maintenance of the present arrangement, with Perkins keeping - perhaps increasing - its stake at MODASA.

On the other hand, the fact that Perkins sells CKD kits to MODASA and collects a margin indicates a situation where Perkins already earns profit regardless of its condition as partner. More over, Perkins does not need MODASA to retain the market, because they could go on, without major disturbances, in case MODASA ceases operations. The market is well set and established, the dealer network is in place and Perkins controls other regional markets without having to bother with MODASA (Bolivia, Chile, Ecuador, Venezuela) by selling straight CBU units. Therefore, Perkins may not be "*worried*" about the fate of MODASA and does not feel encouraged to leap into the discussions about privatising before the time is ripe. Seen from a distance, it seems that Perkins is keeping a prudent alienation from the fire zone, until their pronouncement will be inevitable.

This could be perceived by the UNIDO adviser in his informal conversations with Andrew Britton, from the Latin American Division of Perkins, stationed in the USA and working in all the regional markets of the Andean Pact to perform Marketing functions. Mr. Britton assists MODASA with their CKD needs and other related supply problems. By a mere coincidence, Andrew Britton was also visiting MODASA Lima during the same week of our field mission. This created an informal opportunity (over a lunch table) to check a little about Perkins' view. Although we cannot even think about considering the conversation an official matter, Mr. Britton presented an informed opinion about the situation which points precisely to the situation described above. For Perkins, the most important variable at the moment is the maintenance of the market share. Second, in priority, is to ensure that the CKD flow is kept in good shape. Third, is to make sure that sufficient information about the privatising actions reaches the proper authority within Perkins. When confronted with a direct question (about who might the new partner be?), Mr. Britton then opened the shade a little bit, to let us know that the attitude of Perkins will possibly only change after the name of the future partner will be revealed. He firmly stated that Perkins does not accept a current competitor to be that partner... This brings to the front scene one of the main strategies for CEPRI-MODASA: move the strings of the privatising campaign so that Perkins will have to indicate if they would or not consider increasing their participation in the capital, if not for any other reason, to have a better control of whom is acceptable as a future partner in Peru. The complication with this strategy is that the situation for Perkins will not change substantially UNLESS an undesirable partner is entering MODASA.

Conclusion: if Perkins is convinced about the future opportunities in the Andean Pact, using MODASA as a home base, then the increase of their stake at the company is just a matter of time. If not, they might consider leaving MODASA, which - to a certain extent - is to condemn MODASA to immediate extinction.

D. Perkins as a competitor

Perkins must also be seen as a competitor to MODASA, first because they already sell (CBUs) to the regional markets (though not in Peru), without involving MODASA at all, second because they do not need MODASA to remain active even in Peru.

By selling the CKD sets to MODASA at alleged international market prices, Perkins is setting the Peruvian market standard price bracket, while earning their profit margin on that independent of MODASA's profitability and other societal variables. This also sets a scenery where MODASA is controlled by Perkins in both ends (supply and price level). So, if from one side we can say that Perkins is extremely collaborative with MODASA (by making all possible efforts to keep it fed with information, parts and technology), from the other we see that Perkins - with just 26% of the capital - exercises the real control of the company's profitability and market share. That is almost the same as seeing Perkins as an external competitor.

Still more important: Perkins has the capacity the declare the fate of MODASA by just deciding the price for the CDK sets, or limiting its availability, or by declaring that they also want to exit the Society (as Volvo already did), sealing the failure of MODASA for good.

Conclusion: all of this points to the urgent need of a serious discussion about the role of Perkins at MODASA, with Perkins, before any other measures can be tackled regarding the privatising.

Important: the VALUE of MODASA is highly dependant of this factor. If Perkins will remain and cope with the restructuring needs of MODASA, then the value of the shares is high and the future of the company is assured. Otherwise, MODASA's value is small, confined to buildings, machinery, facilities - without a product to sell - which means with very little (or not a single) fair chance of survival. CEPRI must always bear in mind that MODASA without Perkins is a plant without a meaning. Dreaming about getting new engine brand producers as partners in the essentially captive plant is fruitless, because CBU imports limit the interest to any of the formal contenders identifiable as "*potential*" auctioneers...

E. Known and unknown liabilities

A very important variable in the valuation of MODASA is the one relative to Known and Unknown Liabilities. There are many topics and points to be checked regarding this subject. Although this is not specific of this study, being a question to be observed and evaluated by Apoyo, CEPRI must keep in mind that the total sum of Known and Unknown Liabilities represent a value to be EXCLUDED or SUBTRACTED from the total MODASA's current Assets Value.

This was the subject of a long discussion on Saturday May 4, at MODASA Trujillo, when the criteria to help Apoyo in the valuation started to be set-up. In general, the subject topic refers to obligations already defined by contracts, infractions, mulcts, penalties, direct of diffuse rights that MODASA may have to honour to be privatised, to change capital composition, to release or dismiss Managers, Executives, employees, to determine supplier cancellation charges, tooling amortisation charges, etc.

The tricky part of this is that a vast number of documents has to be searched and scrutinised to identify such clauses and promote the required compensatory actions before MODASA incurs in the Liability triggering situations. "*Golden Parachute*"type clauses in contracts, agreements, licenses, patents, etc., are a real threat and have to be observed and completely evaluated before any formal act can be performed regarding the auctioning of the company. Our recommendation is that CEPRI MODASA really orders a specialised international company to search the applicable document bases for a complete circumscription of the problem.

F. Product Diversification responsibilities

MODASA's product range diversification, moving to Beton Mixers, to the vertical production of items like Gen Sets and the respective high-tech control panels (even the respective software), as well as the fabrication of parts and implements, reaching further to the present intention of deriving to the assembly and commercialisation of light-duty vehicles, entails new and very serious responsibilities.

We are now talking about the product incurred liabilities, which require a more structured action from the part of MODASA and the eventual sub-contractors or vital suppliers, like body-builders and technology vendors. But not only that! Also new legislation, like the Consumer's Defence Code and the new Patent Protection Law indicate an imminent risk that is being neglected by the involved parties. The UNIDO adviser felt a worrying lack of awareness about these things, amid *a "business as usual"* atmosphere. In practice, the product diversification can be like a time-bomb ticking against MODASA's future.

This report would be seriously incomplete if we didn't include some information about the subject.

1. Vehicle certification affairs

Vehicle certification is a very complex field. Virtually hundreds of technical norms, test procedures, third-party evaluations and type approvals are required BEFORE a vehicle (even a prototype) can enter public roads for use. Several different schools exist regarding the methods to be employed, but all of them start from a pre-qualification of the vehicle producer, its technical abilities, laboratories and AUTO-CERTIFICATION abilities. The process, then, derives regarding the set of applicable norms, some of international scope, others referring to the local traffic and civil responsibility duties on vehicle deployment, use, maintenance, performance, emissions, noise, safety, comfort, dimensional and operational requirements and restrictions, even final disposal, materials recycling, etc.

To apply for Certification, a producer must comply with a long list of pre-requirements. This is usually the daily duty of a large number of people at each vehicle factory, as the applicable norms and technical regulations vary from country to country and even with respect to the duty of the vehicle. Type and model Certification is usually a pre-condition to vehicle fiscal classification and to the respective licensing fee (and eventually Customs Duties in the case of imported units).

The vehicle Certification activities are normally a manufacturers' duty, exercised towards the local national traffic authority, usually a part of the Justice Ministry or Department. We are sure that, despite the apparent lack of formal compliance, such procedures exist in the legal framework of Peru as a nation, and - sooner or later - will become a formal obligation. The same must be also true for the other Andean Pact member nations, which will eventually derive to a multi-national technical standard and be enforced with rigour.

Not seldom, such certification process entails costly tests, like vehicle crashing, cab and bus body-building static and dynamic stress tests, involving collision and roll-over simulations according to very strict norms and test procedures.

The same is valid to items like marine onboard auxiliary unit engines, which have to be certified by internationally accredited bureaux, for obtaining navigation clearance and insurance coverage at the usual risk compensation rates. In this case, strict follow-up rules, not seldom going back to the raw material originator, up to the fully built-up unit, carefully supervised performance tests, etc., are required.

That put, we must state that:

1. Regardless of local opinion, MODASA does not have the expertise, the technical ability, the laboratory resources and the required knowledge of the applicable norms and technical regulations to perform Product (and specially Vehicle) Certification.

2. MODASA must follow the international standards from day 1, in the vehicle production and deployment issues, in order to safeguard the company from the incurred liabilities.

3. Regardless of today's practical standards in Peru, MODASA must act in conformance with the highest achievable technical standards, so as to be able to compete in the international market (Andean Pact or Mercosur), given the opportunity.

4. MODASA must immediately establish the necessary Task Force to investigate this subject and formulate a Product (and - specially - a Vehicle) Certification policy, eventually counting on the help of an international organisation or in agreement with the respective vehicle technology supplier.

5. MODASA must be made aware, through legal counselling, about the liabilities incurred in vehicle accident casualties and other related civil responsibility clauses in Peru and surrounding target markets.

2. Consumers Defence Code and anti-Trust protection

On April 18, 1996 - just 10 days before the UNIDO adviser's mission to Peru started - a new Decreto Legislativo (No. 807) was published. It is a 40 page long legal title, describing the redefined Consumer's Defence Code and the INDECOPI, the formal entity controlling such rights in Peru. INDECOPI is the result of the intensive State Reform Process initiated by the Peruvian Government in July 1990. INDECOPI, besides controlling and promoting Consumer Defence, has also activities destined to avoid monopolistic and restrictive market practices, in practice also acting as an anti-Trust regulatory commission. Among the interesting and unusual postures of the Peruvian legislation are useful decision like reducing bureaucratic claims treatment, setting up Summary Procedure Arbitration Chambers and, on the behalf of a rational production and competitive environment, creates a support framework, through a new Procedure for CERTIFICATION and ACCREDITATION, including full access to the National Metrological Laboratories and the promotion of the suppliers abilitation for auto-certification, including industrial Quality Audits and calibration services.

In summary, as there wasn't sufficient time for a more extensive and detailed analysis, the vast document is setting new and improved procedures for an effective protection of the surveillance of the public interest in the Peruvian market and the Consumers Rights based on the Laws 26553 and 26557, which contain the institutional framework for the subject Defence. Many important concepts and legal principles are buried in the long text. The respective Executive Summary, constituted of three full newspaper type pages, cites several dozens of specific norms. rules, additional or complementary laws, which constitute a very broad modification in the Peruvian market surveillance practices. It marks the adjustments deemed necessary after a 3-year experience from the actual work of INDECOPI.

Regarding MODASA interests, the new Code states that "*class actions*" can be tackled by the Judicial Power, to represent the interests of an indeterminate quantity of consumers. By that concept, the authorities can initiate a compensatory suit against a producer of a DEFECTIVE DESIGN when it may cause damages to a non identified series of customers. That may perfectly be the case of traffic accidents involving vehicles with improper or technically deficient design.

There are provisions about spare parts, market prices, credit conditions, sale of services bound to a product, warranty and policy, claim periods and the respective legal processing deadlines. A special provision is given to the use of simplified procedures, where no lawyer or legal counselling is required for claim process and suit acceptance by the Courts! All of this signals to a new era in Customer/Supplier relations and we do recommend that MODASA establishes a proficient work group to

analyse the real practical impact that the new legislation may have over the company's operations.

Conclusion: the reorganisation of the State machine in Peru is bringing that nation closer to the international practices regarding market surveillance, anti-trust and consumer protection legislation. This will indeed affect MODASA and all of its competitors. Part of this notion has been in vigour for three years now, which makes it more serious that MODASA appeared refractory to certain concepts like vehicle certification and appropriate design specifications for the new business concepts. The modified and re-enacted legislation pack turns the State better equipped and fit to act on the field, with less bureaucracy and more effective punitive methods, including hefty mulcts and financial compensatory penalties, even in relation to diffuse rights and collective indeterminate "*class action*" suits.

3. New Patent and Industrial Property Protection Law

On April 24, 1996 - 4 days before the start of the UNIDO adviser's mission in Peru - a new "*Ley de Propiedad Industrial*" (Decreto Legislativo No. 823) was enacted, describing important changes in the prior legal framework governing the subject. The original legislation (Decreto Ley No. 26017) from 1992, regulating the matter, was found in conflict with procedures and requirements of other legal titles and international agreements signed by Peru, including Decision 344 of the Cartagena Agreement (Andean Pact Industrial Property Common Regimen) and the so-called Paris Convention requirements (Resolución Legislativa No. 26375 and 26407).

Essentially, the new document is unifying in a single legal text the Andean Pact and the National practices regarding Industrial Property, Patents and Trade Mark protection. In addiction it is confirming INDECOPI as the organisation responsible for the subject detailed treatment and surveillance. Last, but not least, the new text defines simplified procedures for the operation of the respective Patent Registers, Conflict Arbitration, etc.

The "new" law is in most aspects - specifically in the technical requirements - equivalent to the international congenial instruments. In practice this means that, again here, Peru is moving towards a modern and internationally enbased regulation of the subject.

For MODASA, several open points can derive from the subject positioning, as follows:

1. Is MODASA ready to defend its trade marks, patents, license agreements and local design solutions?

2. Is MODASA completely covered with respect to technology licensing, local integration items, local produced implements (like the already mentioned clutch type couplings) and the sophisticated control panels and software employed therein?

3. Is MODASA authorised to omit from the Beton Mixers the trade marks and supplier designations and identification?

4. Is MODASA authorised to announce that Bounus Diesel engines are a product of MODASA, as reflected in the public distribution technical literature?

5. Despite the positive encouragement by a representative of Perkins England, about the attribution of the PERKINS brand name to the urban bus prototype, is MODASA really and formally authorised to apply that brand to such a product?

We could eventually go on, with a long list such questions, but do not think it is really necessary, because the essential point to make is that MODASA may not be entirely in line with the existing legislation.

If we go back for a second look into the question of the local couplings, where an ex-supplier design is being reproduced, MODASA runs the risk of facing liabilities in case the original producer will hypothetically request compensatory action for undue or unlicensed use of his technology. This is an easy thing to solve, if MODASA can celebrate a simple licensing agreement with that source, or, better even, if MODASA can introduce suitable technical changes that justify the register and certification of the resulting product as its own.

In the case of the bus prototype, unfortunately, our opinion is that, not even Perkins home company back in England[34], would be able to permit the incorporation of their brand to a vehicular product, as they are not the original generators of the respective technology and do not hold the competent technical certification documents to ensure that the incurred liabilities are not being transferred there-over!

Conclusion: MODASA has some house-keeping tasks to start, immediately, in the field Industrial Property legislation, and some counselling from a specialised firm is required to avoid unnecessary risks. The situation, as observed by the UNIDO adviser, is not under control and eventual cost penalties may arise from that condition, with potentially high company image and financial exposure.

G. The privatising effort

CEPRI-MODASA has a complex task ahead. Selling minority of a troubled company, which is technically bound and captive of a 26% Partner, in the verge of tactical and strategic decisions that can completely undermine the established assets value, is not simple. Still more critical, depending on the results of the "*Subasta*", the fate of MODASA can abruptly change, if, for instance, an "undesired" partnership is forced in.

As understood by the UNIDO adviser, CEPRI-MODASA has to define its action according to a pre-established time table, leading to a theoretical auctioning session by mid November 1996. In the auction, the only article on sale are the governmental shares, representing 48% of MODASA's capital. Several interpretations can derive from the just mentioned duty. A simplistic one is that CEPRI has to sell MODASA as it is, without considering what MODASA may become. A more elaborate one is to take into consideration possible corrective actions that enhance the value of MODASA, such as the proposed celebration of strategic alliances to give MODASA a better competitive edge and market penetration than it has now. Although this second idea seems sensible, it bears a timing conflict with the defined auction season.

According to Isaac Espinosa Arana, a member of COPRI and also of CEPRI-MODASA, "*it might be so that there won't be enough time to take all the necessary actions to improve MODASA before the auction. Also, it might be so that, for achieving it, MODASA must invest capital, which in a way is against the privatising rules*"... This means that CEPRI-MODASA has a key role in the definition of MODASA's fate.

If, by altering the formal calendar for the privatising, CEPRI can allow MODASA time enough to seek from the alliances, then there is a fair chance that the value of MODASA will be higher, defending the interests of the general public represented by the government in the company's stake. And if, in addition, CEPRI can adjust the auctioneers pre-qualification procedures, so that MODASA's new-coming allies, Peruvian or Foreign, can pre-commit to acquire determinate fractions of the stake at the Subasta by the public offering resulting quotations, then the value of such shares is maximised.

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[34] Our interpretation of the cited encouragement is that its author is not sufficiently aware of the restrictions, limitations and incurred liabilities contained in his statement. The international legal practice is very clear in attributing full liabilities to the most prominent brand controlling agent, being - all others - solidary with the main appointed producer for their respective partial contribution or participation. In this case, the uninformed Perkins executive was suggesting that the integral responsibilities, from the Chinese chassi origin to the final body building, passing along by the eventual components adaptations, replacements and adjustments, should be assumed by Perkins!

So, CEPRI-MODASA is the real controlling factor for the value of MODASA, which depends fundamentally on the interpretation of the privatising rules and legally permissible detouring routes.

Conclusion: Considering the vital role that the privatising may have over the fate of MODASA, the UNIDO adviser dares to recommend that CEPRI takes the longest time allowance legally viable to set the auctioning session season, stimulating the company executives to accelerate their quest for the mentioned value enhancing strategic alliances. Needless to say that this has to be achieved in full respect to the terms of the law, in a completely transparent process, so as not to expose the company, its executives and the respective CEPRI members to any infringement of the respective regulations.

H. Undesired partnerships

Under this title we have just a brief comment. It refers to the already mentioned opposition of Perkins, that a current competitor acquires stake at MODASA. This limits somewhat the type of auctioneer that would be acceptable. Instead of facing that risk, all the work is leading to another approach, of having MODASA to celebrate strategic alliances that enhance and improve the role of Perkins, by encountering new applications for their products, overcoming the present market limitations. i. e., protecting their stake.

Although there is nothing in the horizon that might justify such a fear, it is clear that an unknown and not identified contender might try to acquire stake at MODASA[35] to provoke its extinction. And, although, it is patent to everybody, aboard MODASA and CEPRI-MODASA, that this would not eliminate Perkins from the market in the long run, it would cause that company a mighty stroke, taking several months to be overcome. For that reason, the mentioned auctioneers pre-qualification procedure, discarding such potentially harming participants, is of essential importance.

Other undesired partnerships might be found in situations like that of the Ferreyros Group, because of its already large influence and control power over the commercial practices of MODASA. This is because such ownership might derive into societal conflicts when deciding on expanding and diversifying the respective dealership in Peru and abroad. Despite the known fact that Ferreyros has manifested interest in the acquisition of part of MODASA's capital, CEPRI should judge and devise means to prevent or limit that, for example, "*because of diffuse but factual conflicts of interest*"...

[35] in view of its rather low value, corresponding to a few days of international publicity costs for a large worldwide active engine manufacturer, this shall not be overlooked...

VII. THE EXECUTIVE SEMINAR

The idea for an Executive Seminar started to take shape during the visit to Trujillo, when the UNIDO adviser (Aguiar) and his Counterpart (Piazzon) perceived that there wasn't a unified vision about MODASA, its status, meaning, fate, value, problems and solutions, from the part of the people involved in its operations, as well as from the part of CEPRI-MODASA and its support functions (Apoyo and Special Advisory experts).

By May 4, Saturday, while the visiting group was meeting at MODASA to provide support to Apoyo Consultoria S. A. in their definition of the asset value of MODASA, this point was again raised and the Seminar was decided to be held back in Lima, on Tuesday, May 7, under the Co-ordination of the UNIDO adviser.

A. Method

The method applied for the Seminar is internationally known as "*Quest*" and consists of selecting a range of questions that have to be replied through competing brain-storming groups that are then united in a plenary session to consolidate a single concerted reply to each question. After defining the work method, two (or more) groups are led to different conference rooms, where they work, pressed by time and led by a co-ordinator, to reply each of the questions with the most effective attainable accuracy. These replies are annotated in standardised posters and have to be reached upon by discussion and consensus, stimulated by the group co-ordinator. After the elapsing of the pre-established time, the groups meet for a plenary session, when the respective posters, one per question are displayed on the wall for debate. The General Co-ordinator, then, questions the plenary group for discrepancies, inconsistencies and omissions, formulating a final answer that has to be the FINAL position of all participants. If doubts or confronting positions exist, they have to be sorted out by debate, reaching consensus, or, "*in extremis*", by a vote.

In the MODASA Seminar, two groups were defined, to handle, in two consecutive sections, 12 strategically formulated questions. The groups, of mixed origin and led respectively by Luiz Piazzon and David Ritchie (both from ESAN-Lima and CEPRI-MODASA), did not require any voting, as general consensus could be reached, but took far more time than allowed to formulate all replies. The questions and the leading rules for the Seminar were discussed and arranged so as to achieve the best possible results. This was done in two preparatory meetings and through several telephone consultations with the respective Counterpart leadership. The Seminar results were highly rewarding, as the opportunity also served as an important integration factor to the Analysts and Managers of Apoyo, which had barely started their evaluation work (their contract with CEPRI-MODASA was signed on April 29, after they having won a public tender for the task).

Although the conclusions of the Seminar are far from revolutionary, they have to be seen as the first approach to homogenise the knowledge about MODASA, in a shared vision by all the interlocutors and forces actuating in the privatisation attempt, with the only possible exception of Perkins (despite the honourable presence of the Peruvian Board Member representing them during part of the activities...).

The Quest method foresees that the questions be formulated in direct order, focusing exclusively one single subject. The replies have to be itemised, direct order phrases, bearing the smallest possible number of words. It is the duty of the respective group leader to scribble the replies from the group and encourage participation to sort their individual contributions down to the final "shared version" which is then transcribed onto the respective posters.

The questions and their reply posters are the only documents left from the exercise and the group may - as indeed it did twice - reply questions through verbal debate and interdict the written registration when sensitive subjects are dealt. The method also ensures that no "*authors*" of any ideas, phrases, com-

ments or other contributions be formally identified, which would de-characterize the idea of a collective vision.

B. Participants

The following people took part in the MODASA Executive Seminar, held at the MODASA Lima Central Headquarters on May 7, 1996:

Participants:

Augusto Cezar S. de Aguiar, General Co-ordinator	UNIDO
Luiz Piazzon, Co-ordinator Group I	CEPRI-MODASA
David Ritchie Ballenas, Co-ordinator Group II	CEPRI-MODASA
Alvaro Quijandria	APOYO
Cesar Andrade	APOYO
Edgardo Ramírez	MODASA
Franco Giuffra	APOYO
Gianfranco Castagnola	APOYO
Héctor Garcia Béjar	MODASA
Horácio Aguilar Z.	MODASA
Horst Sommerfeld	APOYO
Isaac Espinosa Arana	CEPRI-MODASA
Manuel Villaran	CEPRI-MODASA
Orestes Cáceres	CEPRI-MODASA
Ricardo Puntriano	APOYO

Justified absences:

Elizabeth Pretzer Yunek	UNIDO
Raul León	Consultant to CEPRI

Obs: Some of the participants, due to the short notice call, had to leave earlier by force of other professional appointments and commitments. This did not affect the general result.

C. The 12 questions formulated & answered

A pre-studied and agreed upon rank of twelve strategic questions about the MODASA's status and privatising operation were formulated, in two blocks of six questions. Two of them, due to their nature and confidential character, were just verbally handled as the group, unanimously, agreed with the General Co-ordinator's view that they should not be reflected in reports accessible to the general public. By the way, all materials generated during the Seminar were recovered and remain in the possession of CEPRI-MODASA's Technical Secretary for reference. We are now transcribing (translated into English, as the Seminar was conducted in Spanish) the 12 questions and the 10 consensus answers provided by the plenary sessions:

1. What does MODASA make?

- Assembles DIESEL ENGINES of the PERKINS trademark, in the power range from 20 kW to 150 kW, for vehicle, stationary and marine applications.
- Assembles ELECTRIC POWER GROUPS, in the power range from 6 kW to 670 kW, with Leroy Somer generators.

- Machines (fabricates) parts and components for the engines and their applications.

- Commercialises its products and renders aftermarket services to those products (including the sale of spare parts).

  Unido adviser's comment: this reply confirms and consolidates awareness that MODASA is a Perkins assembly plant It still maintains the hope for a "*dealer*" type role for Volvo Penta applications (gen sets, motor-pumps, compressors, etc.) and shows the Leroy Somer gen sets as a proper part of the MODASA core business. The groups did not consider that the beton mixer business pertains to MODASA, which is a correct evaluation. No mention about vehicles (trucks or buses) was made by either group when answering this question. This vision, expressed by the consensus group, was not clear to all participants in the discussions held prior to the Seminar.

2. **What is peculiar of MODASA ?**

   - The plant is located in Trujillo.

   - It is the only Diesel engine assembly plant in the Andean Pact and South American Pacific Ocean coast line.

     Unido adviser's comment: the groups annotated many other individual topics as peculiarities, but after prolonged debate at the plenary, defined just these two distinctive MODASA peculiarities. The fact of being isolated in Trujillo appears again in the answer to question 4, as an operative restriction. The fact that it is unique, as the sole Diesel engine producer in the region, is indeed important, if the practical effects of the Andean Pact are to weight on its behalf. So far they aren't...

3. **What are MODASA's competitive advantages?**

   - The Perkins trademark with after-market technical services by MODASA.

   - A great deal of the national Diesel vehicles park uses Perkins engines.

   - The good image of MODASA in the Peruvian market.

   - The nation-wide distribution network.

   - Sells also in Colombia.

   - Product adaptations to meet particularities of the Peruvian market.

     Unido adviser's comment: indeed, both groups have highlighted a range of competitive advantages. But, not even when provoked, the plenary group derived to the conclusion that some of them are partial trues. For instance, the Perkins trademark is also strong in Ecuador, Venezuela and Chile, where MODASA is not at all active as an important source of those engines. There was no mention to the stationary engines population, which constitute a major asset to MODASA. Despite active questioning, there was no mention to the Ferreyros dominance of about 50% of all commercial activities of MODASA for this answer. The statement that MODASA "*also*" sells in Colombia reflects the unconscious wish to omit that it DOES NOT SELL in Chile, Ecuador, Venezuela and Bolivia, as it might...

4. What are the operative restrictions of MODASA?

- Logistics complexity due to the plant location in Trujillo.
- Rigid supply of parts (CKD).
- Limited distribution capacity at Andean Pact level.

Unido adviser's comment: The logistics complexity would be just very slightly modified if the plant was in Lima, considering the massive supply of Perkins and Leroy Somer CKD sets: just the Lima-Trujillo transport operation and incurred costs would be avoided. All the rest would remain rigorously the same. **The real operative restriction of MODASA is the rigid supply** term (single sourcing, frozen period, specific breakdown, etc.). The lack of a proper distribution capacity at the Andean Pact does not stand to reason, unless Perkins has contractual limitations that impede that spreading. It is a known fact that Perkins indeed sells in those markets, bearing CBU distributors for engines originated in England and a heavy participation in the flourishing regional spare parts trade.

5. What could happen that affects MODASA?

- Perkins withdrawal from MODASA.
- Strategic alliances with other enterprises.
- Peru's adherence to Mercosur.
- An increase in the sales through Ferreyros S. A.
- The appearance of a new competitor to MODASA.
- The privatising.
- That incorrect decisions are made concerning new Diesel engine applications.

Unido adviser's comment: long discussions preceded the plenary consolidation of this reply. Finally, after the group agreed about the meaning of "*affect*", as being either positively or negatively, the answer became the one shown above. The **disaster scenery** of the first topic marks the realism of the consensus plenary group. Strategic alliances are seen as both a threat and an opportunity. Peru's adherence to the Mercosur means the entrance in Peru, via Brazil and Argentina of new competitors, like MWM and Maxion. But it may also mean new opportunities for Peru in new markets, like Argentina. The increase of Ferreyros S. A. already excessive participation in MODASA's sales is, definitely, a handicapping prospect. Another voice of sound realism derives from the last statement, and refers specifically to the trucks and buses with improvised Chinese chassis adaptations and to the escaping of the core business by omission from market segments that will show expressive growth (Mining, Fishing, Agriculture, Telecomm and Gen Set applications). Again, no reference to the Beton Mixers was made, even at "stimulated" co-ordinator questioning.

6. **What is on sale?**

- 48% of the MODASA capital.
- Metal-mechanic potential; know-how about Diesel engines.
- A significant part of the Diesel engine and generator sets markets in Peru and of gen sets in Colombia.
- Depends on the auctioneers and their business vision.

UNIDO adviser's comment: the groups finally "*perceived*" that CEPRI has to sell minority. This is a difficult task that may pose complex situations depending on how the new ownership will be composed. Technically, Volvo still holds (up to the moment San Juan Group will integralise the remaining capital) 13% of the stake and a part of these shares can be applied for capital majority reaching. A pulverised or diluted share ownership transfer is less of a problem than their acquisition by a fierce Perkins competitor (leading to a market confrontation) would be. Such an occurrence might disrupt the relations with Perkins and leave MODASA at risk for time enough to become insolvent... The group's idea that a "*significant part of the Diesel engine and generator sets markets*" is on sale may be an illusion if Perkins leaves MODASA and keeps feeding the market from outside the company. The last topic reflects the only factual possibility, that MODASA will find suitable alliances with companies producing complementary lines to Perkins Diesel (hydraulic pumps, compressors, even vehicles) that can enhance the volume. Those could pre-commit to acquire shares at the "*subasta*"[36] providing the entry of capital cash and technology to gain new market shares in Peru and the other member nations of the Andean Pact. It also entails a surreptitious fear: that an auctioneer might try to buy the company to let it be extinguished, opening the floor for another brand of similar products. But this can be avoided if the cited legislation, already in force, governing the auctioneers pre-qualification, is applied to full rigour.

7. **What shouldn't MODASA do?**

- Maintain its current commercialisation attitude centred in the Transports sector.
- Be distracted from its core business.
- Invest without technical and economic foundation.
- Change the current relationship with Perkins.
- Make unnecessary fuss.
- Cease having operating margin.
- Lose its distributors.
- Divert from what generates added value.

[36] The Peruvian COPRI (Privatising Coordination Entity) rules establish that all public capital acquisition must be made through public offering auction type operations ("Subasta"means auction). Pre qualification of the auctioneers is possible but pre-sale or purchase agreements comprising price and conditions are strictly forbidden by the current legislation governing the matter.

UNIDO adviser's comment: all topics reflected by the consensus group are legitimate concerns that characterise MODASA's present status. The first topic is in conflict with the idea of exploring a strategic alliance with a chassis producer to enter the market with light duty trucks and buses. Still so, if such an alliance is made, it still conforms with the second topic, because it is still to sell more Perkins engines that the idea is being promoted. The most crucial topic of all is the one requiring a careful maintenance of the present relations with Perkins. The two last ones, though, are essential for the maintenance of MODASA's stability. Despite the concentrated participation of just a few dealers in most of the sales volume (Ferreyros with 50%, another 7 to reach 65%), the distribution network is a real value. If supported by adequate financing - which is the factor giving Ferreyros its present status - the network can be strengthened and expanded. The topic about added value can mean a recognition that the beton mixer business is out of the present operational objective of MODASA. The added value here may be too small on a per unit and on a total business perspective basis to justify the effort...

8. Who could be interested in MODASA considering its present status?

The answer to this question is the first that the group decided not to reflect in public documents, due to the strategic and confidential nature of the reply. It suffices to mention that the question was thoroughly and satisfactorily debated and answered during the Seminar and that the people who should be aware of the answers were present and bear them in mind.

9. Who might be interested in MODASA's disappearance?

The answer to this question is the second that the group decided not to reflect in public documents, due to the strategic and confidential nature of the reply. It suffices to mention that the question was thoroughly and satisfactorily debated and answered during the Seminar and that the people who should be aware of the answers were present and bear them in mind.

10. Which economic sectors offer strengthening opportunities to MODASA?

- Mining.
- Fishing.
- Agriculture
- Civil Construction.
- Telecommunications.

UNIDO adviser's comment: According to the result of the intensive debate about this question, those are the sectors and incurred market segments that will grow further and faster than the Peruvian GNP average expansion. It is important to notice that most of these economic sectors aren't being sufficiently explored by MODASA now. The dealership is not active, there are no expressive sales to either Mining, Fishing or Civil Construction, for instance. Although Perkins engines are not traditionally employed for Mining in Peru, that is a segment where compressor, gen sets, mud and water pumps are intensively applied. If we look at the Andean Pact as a whole, Mining is definitely a segment that should provide much more business to MODASA. But this is an essentially technical sales market. The dealership may not be capable to perform the necessary advancement. Therefore, MODASA must specialise a team of engineers and mining experts to expand its participation in the Mining sector. Regarding Fishing, the Perkins engines are definitely

not for propulsion. They should be specialised - with the respective gen sets - as on-board auxiliary units. Again here, the dealership may not be technically qualified to intervene and interfere with the acquisition decisions made by the nautical construction industry. Open point: marine applications require certification due to insurance companies impositions that are international in scope and range, MODASA lacks that expertise. The Telecomm sector is the only where MODASA has been successful with the back-up power sources and respective monitoring systems.

Another comment is that, despite the evident deficiencies - that can be detected with disarmed eye - regarding public transportation systems, namely buses, the sector is not structured in Peru to be considered in growth or sufficiently capitalised to justify the heavy investments that MODASA would have to make to be proficient and competitive in urban buses. As a consequence, the group did not mention the Transports segment as relevant for MODASA!

11. What technological changes might threat MODASA?

- Preference for Natural Gas engines.
- Harder legislation about environmental protection.
- Ceramic engines.
- Consumer protection legislation requirements.

UNIDO adviser's comment: Natural Gas engines are, at today's technological level, Otto cycle engines, not Diesels. Perkins, as many other Diesel Engine producers, may offer adaptation solutions to cope with the fuel base change at a performance prejudice. If Perkins will remain active within MODASA, this should not be a major impediment. The restrictions to the use of Natural Gas may be elsewhere, in the vehicle and engine ownership practices, where adequate maintenance is not existing. The risks for serious accidents (gas kept at 250 bar in pressure vessels) and the incurred liabilities may prevent MODASA from adhering to that form of fuelling. If the environmental legislation will follow the Euro 2 (perhaps 3) standard, Perkins straight Diesel engines will be fitted to clear the requirements. Problems would arise if the legislation moves to the US based standards, like ZEV and ULEV, respectively Zero and Ultra Low Emission Vehicles, which do not conform with the typical emission characteristics of conventional Diesel engines. Ceramic engines are still behind the corner, but breakthroughs, in Australia and Japan, may cause a quick leap into the new technology. The threat is not the availability of the new technology but the loss of a great deal of the machinery park at MODASA. Real ceramic engines do not require a large series of items which are now part of the local vertical or horizontal integration. Also, they will not require machining in the sense MODASA is used to perform. Regarding consumer's protection legislation, the threat is a large number of technical litigations and incurred liabilities on topics like warranty, performance, endurance, environment, noise, etc., not excluding eventual Diesel health effects...

12. Who is competing with MODASA?

- MODASA itself.
- Perkins.
- Ferreyros.

- Other brands of Diesel engines

  UNIDO adviser's comment: This was the most interesting debate. It took a while for all participants to agree that MODASA competes with itself. It indeed does, because it has to become more efficient each year (to face external competition) while its market is diminishing and the inflationary effect is causing domestic costs to go up. Along the same line, it was a surprising "*revelation*" the statement annotated by one of the groups, that Perkins is a competitor to MODASA. It indeed is, specially in the other markets of the Andean Pact. It is also a competitor in the sense that Perkins may remain active and profitable there even if MODASA ceases existing! Another "*shocking*" conclusion is the adding of Ferreyros as a competitor, despite its massive participation in MODASA's sales volume. But the group agreed - unanimously - that Ferreyros has the capacity to set the market standard price and financial terms for most of the Perkins engine sales in Peru. Moreover, Ferreyros sells a home-made line of gen sets in direct competition with Leroy Somer. Last, but not least, Ferreyros also sells Caterpillar and other brands of Diesel engines and equipment that overlap the MODASA power output range.

General conclusion: the Seminar reached the intended objectives and marked an important moment for the understanding of MODASA's present status and its privatising ado's.

VIII. Criteria for the valuation of MODASA

The mission of performing the valuation of MODASA is a hard one! First because it comprises several different methods and approaches, all of them theoretically perfect, although leading to quite different results. In order to try to define, among the many possibilities, those that are best suited for the task at hand, we are handling the subject according to some basic assumptions or scenarios.

The first thing to have in mind is that the mentioned valuation is a task for a Peruvian Consulting firm - APOYO - recently contracted for that, and on duty since April 29, 1996. The original task is estimated to take 90 days but it is already expected that more time will be required given the complexity of the detailed work. In order to have a good technical perspective of MODASA, and by a recommendation from CEPRI, Apoyo has decided to hire, as Technical Consultant, Mr. Horst Sommerfeld, a highly qualified technician who up to January 1996 acted as Quality Control Manager within MODASA. Mr. Horst has an "insider's"knowledge of MODASA and the reasons for his withdrawal from the company reside in differences of opinion and approach regarding product diversification and modernisation of administration methods. The inter-personal relations, though, and the loyalty of said executive were not affected in the dismissing process and his contributions already during the UNIDO adviser's mission must be highly praised.

As already mentioned, there is an ample choice of methods and assumptions involved in the valuation. From these we selected only three methods of selling the governmental shares, to be discussed:

1. Sell based on a rolling business assumption.

2. Sell based on a slightly improved situation, without major enhancements or strategy changes.

3. Sell based on a much improved company, by means of celebrating strategic alliances and attracting new partnerships, interested in the future potential of MODASA.

The three alternatives, above, comprise three sets of assumptions that lead to different economic outcomes, different potentials, and therefore, different values for the MODASA assets, with a direct reflection over the shares value. We will discuss these variables in the next section.

A. Scenery setting

The **first possibility** is to use the "*rolling business*" assumption, where the basic parameters are:

MODASA governmental shares are sold by their net assets value. For that computation any liabilities, rights, certain or diffuse, termination charges, debts, etc., are subtracted from the value. The sale of the shares is public and CEPRI-MODASA complies with the strict term of the law. While this is being provided, MODASA freezes all investments, refrains from new decisions involving capital disbursements, continues selling the current line of products through the current network of distributors and make contingency adjustments, like selling off the excess inventory presently carried, besides adjusting the production schedules according to the current demand trends - that is, DOWN.

Under these circumstances, the basic value of the assets, buildings and machinery, possibly at a discounted replacement value, will guide the valuation of the physical properties of MODASA. This a very unfortunate scenario, because it retrieves from MODASA all managerial actions which tend to improve the present company status according to a newly formulated products and production policy. This is a contingency measure that should be avoided at all cost. This is also the most DANGEROUS of the three possibilities, because it lowers the value of MODASA up to a point where a possible contender might acquire it to promote its future extinction. To sell MODASA under these circumstances

would be unfair to the present capital holders, including the government, and would not be beneficial to Peru, because it favours the eradication of a company that is still worthwhile saving, as it is amply demonstrated by this report.

The second possibility is to sell MODASA based on a slightly improved situation. This is an improved scenario in relation to the first assumption and has the following parameters:

MODASA governmental shares are sold by their net assets forecast value. Of course, and same as in alternative 1, any liabilities, rights, certain or diffuse, termination charges, debts, etc., are subtracted from the total projected value. The sale of the shares is preceded by a careful Management Crash Program, to improve the PRESENT CORE BUSINESS of the company. CEPRI-MODASA still complies with the strict term of the law, but introduces permissible changes in the calendarisation, to allow more time for the planned improvements to materialise. These comprise strengthening of the dealer network, the setting up of better and more proficient Marketing action in relation to key segments, like Mining, Fishing, Agroindustry, etc., depending on technical sales. It also entails the structured market attack to the other Andean Pact nations, to gain volume and new market shares.

Perkins is consulted, as well as Leroy Somer, regarding their interest in acquiring capital shares. The San Juan Group, still owing 13% of the Volvo stake, accepts to trade those share in favour of a majority block in the hands of Perkins/Leroy. While this is being provided, MODASA performs moderate investments, and ensures that any capital disbursements are made to continue selling the current line of products through the current network of distributors. Excess inventories are depleted and import and production schedules adjusted to reach the 1996 year end with a normal stock of both CBU engines and CDK sets. Intensive action is devoted to rationalisation. Projects like the Beton Mixers and light duty vehicles are postponed and MODASA concentrates in its present main products: Perkins Diesel Engines and Leroy Somer Gen Sets. The national integration is reanalysed with strict economic principles. Parts that are cheaper to import ready, move back to the CKD set listings. A complete Make or Buy analysis is made, based on current (meaning new and current) local supplier quotations. In process inventories and the present frozen 5-month period for CDK set ordering are thoroughly revised to the lowest attainable figure, to protect MODASA's liquidity. Reorganisations and re-engineering of the MODASA activities are provided to reduce administrative costs. Third party operations for clerical and service operations is promoted, with the aim of reducing indirect costs.

The result is the same MODASA, but much stronger in terms of competitiveness, with new markets to exploit, with higher production volumes. This increases the forecast value of the shares and enables a smooth auction, where the main contenders are the same private partners of today, plus Leroy Somer, which would benefit immensely from the acquisition of a small stake in alliance with Perkins. The San Juan Group promotes the change in the majority share holding in the hands of the auctioneers, reduces its pending debts with capital integralisation and can take a direct and leading role in the activation of the "new" market segments, still serving to reduce the relative importance of the Ferreyros Group in MODASA total sales.

MODASA, assisted by CEPRI-MODASA, Apoyo and eventually UNIDO, should prepare a detailed Business Plan contemplating this scenario and three alternative volume assumptions, respectively, Low, High and Most Probable, which will then guide the valuation of the assets and shares.

The third and most daring alternative is to defer auction decisions to the maximum attainable time limit and work in a concerted series of Managerial and Administrative measures, involving all the already indicated measures of alternative two, plus the celebration of strategic alliances with a suitable supplier of vehicle chassis (Chinese Number 1, AGRALE or other), one or more sub-contractors from the body building field for the product completion, and, in addition, one possible supplier of other equipment/technology like Diesel Engine Marinisation sets (aiming at onboard Auxiliary Units, requiring high tech solutions and know-how to obtain market acceptance).

This alternative can entail heavy investments in product adaptations, prototype builds, international

standard certification rounds, production tooling, nationalisation of components, demonstrations, the setting of an effective field sales and support activity, etc., which could eventually be shared by the interested partners, who would sign agreements committing to take part in the auctioning for determinate percentage acquisitions. The prospect auctioneers would then be pre-qualified, reducing the "*surprise*" effect of an unwanted or undesired "*partner*" to a nominal percentile participation.

All of this done, MODASA would surge, reinvigorated, fit for higher volumes, new markets and hopefully competitive enough to stand on its feet and face the international competition in Peru and neighbouring markets, perhaps even within the Mercosur free trade area. This can have a substantial effect over the assets valuation.

Also here, a complete and very extensive Business Plan is required, to guide the estimations of Market, Revenues, Investments, Costs, Margins, Risks and Liabilities. Without such a detailed analysis, it becomes very difficult to precise the real potential of this alternative and its effect of the shares value. Again here, this is a task for MODASA, CEPRI-MODASA, Apoyo and, eventually, UNIDO.

Important: Given the present enthusiasm at MODASA, the company is working towards the third alternative. If, for any special reason, CEPRI-MODASA will define a different course of action, then this has to be immediately announced, so as to avoid that new costs and investments on vehicles development compromise still further the already tight MODASA finances.

A last word about these assumptions. Any of the three is a realistic approach. Any of the three enables CEPRI-MODASA accomplish the set goals and solve the task at hand (which is to sell the 48% governmental stake). What differs, from case to case, is the value of the shares, and therefore, the measure of efficiency in the performance of that duty. It is up to CEPRI-MODASA, after consulting this study and ordering whatever complementary analyses they deem necessary for a definition, to establish which of the alternatives will be pursued. The earliest the definition is made, the better for MODASA, because of the inexorable auctioning dead line, elastic, but finite...

B. The advice to Apoyo

Apoyo is a multi-interest consulting firm of very large dimension. This characteristic, of operating in different areas of business, trade, banking, publicity, requires certain assistance when it comes to enter in such complex details as the valuation of a company like MODASA, unusual to their expertise.

The first help, and very welcome, was their acceptance of CEPRI-MODASA's proposal to hire Horst Sommerfeld as a special technical advisor during the process.

In addition, and at the request of Luiz Piazzon, our Counterpart in the mission, the UNIDO adviser has made a special list of unusual check points, that should be searched and replied for the assurance that all critical variables regarding the valuation of MODASA's passive contingencies are properly identified. This was done in a meeting held Saturday, May 4, in Trujillo.

The list, as dictated to Benito Zarate Otarola and Horst Sommerfeld during the mentioned meeting, is reproduced below, for reference only:

1. Summary of all important landmarks, since the creation of MODASA.

2. All strategic changes occurring along MODASA's life length, specially- but not exclusively- those registered in the Management and Societal Meeting protocols.

3. Historical and chronological value of all registered investments in building and facilities, machinery and equipment, supplier tooling, cash capital integralisations, at firm currency

and present economic value, as of June 1, 1996.

4. Complete listing of all excess and obsolete materials, toolings, equipment. jigs, fixtures and other assets that shall be deemed as salvage, to be deducted from total assets value. All items not required for Perkins Engines, and related peripherals, should be considered as obsolete or properly justified.

5. Value of eventual technology transfer fees, patent licenses, royalties, etc., at firm currency and present economic value, as of June 1, 1996.

6. Eventual charges, losses, special payments, duties, cancellation charges, rights and other expenditures and capital contributions. caused by or incurred in the Volvo decision to leave the Society, if any. Such values should be computed in firm currency and present economic value, as of June 1, 1996.

7. What charges, losses, special payments. duties, cancellation charges, rights and other expenditures and capital contributions, caused by or incurred in the eventual decision of Perkins to leave the Society. Such values should be computed in firm currency and present economic value, as of June 1, 1996.

8. Typical distributor contracts, if existing. and eventual liability clauses if the present participation of any (for instance Ferreyros) is changed. Eventual cancellation charges and other incurred rights and dues. Such values should be computed in firm currency and present economic value, as of June 1, 1996.

9. Typical technology vendor contracts, if existing. and eventual liability clauses if the present participation of any (for instance Leroy Somer, Volvo, Deep Sea, Perkins, Bounos and others) is changed. Eventual cancellation charges and other incurred rights and dues. Such values should be computed in firm currency and present economic value, as of June 1, 1996.

10. What financial and legal responsibilities are incurred in supplier and sub-contractor agreements, contracts, purchase and blanklet orders, etc.? Such values should be computed in firm currency and present economic value, as of June 1, 1996.

11. Do recent investment decisions, like the NC Machining Centre, the new shears, etc., impose any obligations, such as contingent passive liabilities? Such values should be computed in firm currency and present economic value, as of June 1, 1996.

12. Are there any By Laws-bound rules regarding fees, penalties, rights or other financial dues, if and when the Societal participation is altered? In positive cases, what are the bases, preceding cases and values involved.? Such values should be computed in firm currency and present economic value, as of June 1, 1996.

13. What kind of pre-agreement or contracts exist regarding the Beton Mixers deal with the Argentine supplier? What royalties and other licensing fees are involved? What are the Industrial Property clauses incurred there in? What about cancellation charges, minimum volume absorption obligations, fees, etc.? Such values should be computed in firm currency and present economic value, as of June 1, 1996.

14. What kind of compensation and amortisation schedule bonus is incurred in the vendor tooling contract agreements? Are the fees volume dependent? Are there any specific fines, or economic rights, deriving from the accelerated obsolescence, source deviation, volume drop or engineering changes? Such values should be computed in firm currency and present economic value, as of June 1, 1996 for all national integration items, if applicable.

15. What are the third-party contracts in vigour, for services, rental, leasing, licensing of use, software, machining, heat treatment or other operations? What values are incurred on a per unit and per volume (or annual basis)? What are the dues for contract cancellations, changes, sourcing deviation, etc.? Such values should be computed in firm currency and present economic value, as of June 1, 1996.

16. Are there any typical fixed assets goods or equipment that do not belong to MODASA, though physically installed - whether of not in use - inside the premises of MODASA, either in Trujillo or Lima? In positive case, detail the items, the motives and involved values. Such values should be computed in firm currency and present economic value, as of June 1, 1996.

17. Are there any typical fixed assets goods or equipment that currently belong to MODASA, though physically installed - whether of not in use - outside the premises of MODASA, either at suppliers, sub-contractors, etc.? In positive case, detail the items, the motives and involved values. Such values should be computed in firm currency and present economic value, as of June 1, 1996.

18. Are there any pending judicial and legal claims or suits not yet settled? In positive case, estimate such values to be computed in firm currency and present economic value, as of June 1, 1996.

19. Are all fiscal and tax obligation up to date? If not, which, what values and why? Such values should be computed in firm currency and present economic value, as of June 1, 1996.

20. Is the PERKINS trade mark legally bound to MODASA? What grants that right? Are there any special and legal impediments to that use? Are there clear procedures and instructions from Perkins regarding that subject?

21. Same, for the other trade marks used by MODASA.

22. What rights, benefits and protections exist in the present employment terms for MODASA workers, technicians, Managers and Directors? Are there any financial funds, compensation terms or rights in case the company is liquidated, sold-out, or changes ownership? Any "golden parachute" type clauses? In positive case, such values should be computed in firm currency and present economic value, as of June 1, 1996.

23. What rights, benefits and protections are offered to the members of the San Juan Group, while employees, at termination, retirement, dismissing or other such occurrences? Are there special contracts governing those? In positive case, what is the total liability concerning those rights? Such values should be computed in firm currency and present economic value, as of June 1, 1996.

24. Are there any special agreements with the Peruvian State, Ministries or Agencies, regarding the transfer of the MODASA stake to private hands? Any fees, rights, dues, mulcts, penalties (or eventual benefits, deductions, tax exemptions, etc., to be refunded, etc.)? In positive case, detail such values in firm currency and present economic value, as of June 1, 1996.

25. Are there practical obligations and public commitments - like the maintenance of spare parts in the market for a definite period? In positive case, what are the regulations and incurred obligations? Are there any penalties for non conformity? In positive case, detail such values in firm currency and present economic value, as of June 1, 1996.

In addition to those points, a list of variables prepared by Apoyo was also discussed. It is also reflected below, translated into English, for reference:

List of required[37] information for the valuation of MODASA

1. Descriptive memory of real state, land property, building, facilities and installations.
2. Legal situation of said properties.
3. Production Cost Sheets, by product and process.
4. Personnel payroll and function assignment list.
5. Personnel social benefits situation statement.
6. Labour contracts and pacts.
7. Corporate Organisation Charts.
8. Audited Financial Statements, and respective remarks and notes for the period 91-95.
9. Regular accounting balances for 1996, year-to-date.
10. Sales prices, sales conditions, terms of payment.
11. Income forecast, per type.
12. Non-operational income.
13. Monthly sales statistics, by product, dealer, etc.
14. Market share statements.
15. Accounts Payable and Accounts Receivable, by debtor or creditor.
16. Insurance policies and premia.
17. Sales projections and margins.
18. General merchandise flows, values, acquisition conditions, terms of payment, inventory.
19. Main customers listings, with details.
20. Main items and products on storage.
21. Special client contracts, special discounts, etc.
22. State owned enterprises agreements, contracts and commitments, with details.
23. Projects, studies made (market, costs) and Status

[37] Many other such topics will be required. The supplied list is just an indication of the type of information that is going to be surveyed by the Apoyo analysts during the valuation phase. The UNIDO Adviser was asked to remain available by telematic means to discuss eventual findings and assist in technical points.

IX. CONCLUSIONS & RECOMMENDATIONS

This report is full of recommendations and conclusions about such a complex issue as the privatising of a large company. Many of them are operational advices, or detailed instructions to the CEPRI-MODASA, or to the Management of MODASA, regarding what can be considered as an Enterprise Development and Restructuring Plan. Since such points do not have direct relation with the mission objectives and Terms of Reference, **we are leaving such recommendations and conclusions where they are cited, along the text,** and not reporting them as Conclusions in this closing summary.

This does not diminish their value, or reduce their strategic importance. But we leave at the discretion and initiative of the involved personnel, the task of analysing and implementing those suggestions.

Therefore, what we are reporting here, are those Conclusions and Recommendations with strict relation to the STRATEGIC PLANNING of the Privatising.

As already reported, in the opening of the report (see page 10), the crucial recommendations from that stand-point are:

- Accept and act under the notion that MODASA is a captive and now exclusive Perkins Engine assembly plant and perform the necessary negotiations to keep the British partner deeply interested in the maintenance of its stock and - even better - in increasing their equity.

  Justification: Any other solution, like the involvement of another technology supplier, engine manufacturer or engine line-up, entails hefty investments for plant conversion, specific jigs, fixtures, tooling, material handling devices, process and personnel training campaigns, field and dealer network capacitation, including workshop replanification and special tool-up, which cannot be tackled under any justifiable economic reasonings - due to the free CBU import possibility.

- Retard the time schedule of the privatising programme, within the permissible legal time range, in order to offer MODASA a chance to celebrate strategic alliances that reinforce the company's market position and add value to the present stock.

  Justification: MODASA and CEPRI-MODASA indeed need much more than the original pre-established time to work in the Restructuring of MODASA, even under the conservative assumption, mentioned as Scenario 2 in the strategic plans.

- Consolidate the strategic alliances by inviting the involved companies to commit in acquiring determinate volumes of the MODASA shares, including Leroy Somer, a suitable vehicle chassis producer (already under discussion with either a Chinese non identified supplier or AGRALE), one or two Peruvian based vehicle superstructure builders, and some other producers of equipment in the areas that are going to offer the fastest growth possibilities in the Peruvian Economy : Fishery, Mining, Agriculture, Civil Construction Energy and Telecommunications sectors.

  Justification: the attraction of other major investors - involved in just engines - may not be feasible because of the captive nature of the current Perkins production, meaning that only companies that may live in reasonable agreement within MODASA (which excludes direct competitors to Perkins) would be willing to develop strategic alliances.

- Develop, through expansions and attraction of new capitals, a broader commercialisation structure to avoid the present odd concentration, when - consistently along time - a single dealership (Ferreyros) sells around half of the money value of the MODASA production and 7 dealers respond for around 65% of the turnover. Take the opportunity to increase

the presence in markets like Ecuador (with all time insignificant sales), Bolivia and - eventually - Chile, where a good potential exists for the products of MODASA, to explore the advantages of the so-called Andean Pact.

Justification: let MODASA do more and better what it is fit from birth do do. Explore the possibilities of a broader market penetration and consolidate its image in the neighbouring markets, where its presence is not significant up to the present time.

- Consider the possibility of an alliance with MORILLAS and/or SATESI, for exclusive body building of eventual Perkins engined bus and truck chassis to be assembled in Peru, which might derive into their interest to acquire a stake of MODASA's capital in the "*Subasta*".

Justification: take advantage of their involvement in a crucial new activity and assemble the conditions for the utilisation of their facilities as a basis from an eventual light-duty chassi operation. This means avoiding investments in building and installations. This also may attract their willingness to invest and expand MODASA with new money.

- Specialise a group of Sales Engineering people to exercise influence over the technical purchasing cycle of prospect clients. This solves the improper market penetration in segments where a clear demand exists for the type of products MODASA is able to produce and/or commercialise.

Justification: resolve a pending problem which is the weak and frankly deficient attitude of the dealership crews in approaching technically oriented acquisitioners to influence their decision process. Eventually, also, MODASA could resolve some of its endemic problems, like the large influence and control ability of the Ferreyros Group over the company's market practices, by seeting new competing edges where such group is not sufficiently active or able.

- Be extremely prudent in the choice of derivative applications for Diesel Engines to ensure that Perkins Engines are the main core business of the company.

Justification: to discard low added value products and obrain optimised utilisation of the corporate assets and market potential.

- Evaluate MODASA according to a concept that is a combination of a ROLLING BUSINESS venture and a REALISTIC FUTURE MARKET domain prospect. Exclude from that value any known liabilities, which will require extensive search and proper economic implication valuation for unknown clauses, diffuse rights and other such conditions in the existing By Laws, Capital Sharing Modifying Acts, Dealership and Suppliership Agreements, Employees and Management Contract Terms, etc. Also check for eventual Governmental restrictions, rules and liability or compensatory clauses before the auction is announced.

Justification: a decisive step, not entirely at the reach of Apoyo - the Consulting firm in charge of that task - in view of their still insufficent involvement and familiarity with the MODASA operating characteristics.

- Seek counselling and advice to follow the strict legal terms regarding Industrial property, Patents, Trade Marks, Consumer Protection Code, Anti-Trust Regulations, Vehicle Certification, etc., to minimise exposure to liabilities and civil responsibility claims relative to products, parts, services, etc., including diffuse rights and "class claims" possibilities.

Justification: adopt a "normal business practice" attitude in relation to the subject, to minimise exposure and identify potential areas of friction, conflict, claims, image and economic damages that can be totally avoided by expert action.

X. ANNEXES

The following Annexes correspond to documents required by the UNIDO Technical Report Submission Rules for Documentary Outputs and to other relevant documents for a full overview of the mission.

The Table of Contents reflects all the Annexes included in the forward section of this report, observing a continued page number sequence.

Annex 1

UNIDO Terms of Reference[38] (original version in Spanish)

TERMINOS DE REFERENCIA

1. NOMBRE DEL PUESTO :

Experto en Matalmecánica.

2. DURACIÓN :

18 días calendario (7 días campo[39] y 11 días home base)

3. FECHA REQUERIDA :

28 de avril de 1996

4. LUGAR DE DESTINO:

Lima y Trujillo - Perú

5. OBJETIVO DE LA CONSULTORIA :

Prestar asesoria técnica en el proceso de privatización de la fábrica Motores Diesel Andinos S.A. (MODASA).

6. RESPONSABILIDADES :

El experto trabajará en estrecha coordinácion con las personas que designe el Comité Especial de Privatización de MODASA y realizará fundamentalmente el trabajo en las instalaciones de la empresa, realizando las siguientes labores:

1. Inspeccionar y evaluar las instalaciones de MODASA, determinando su estado actual y su potencial productiva y de mercado.
2. Analizar las posibles estrategias de venta y las posibilidades de colocación internacional.
3. Identificar las gamas de posibles usos y compradores a nivel internacional.
4. Indicar criterios sobre valoración de la empresa.

7. CALIFICACIONES:

Amplia experiencia en actividad metalmecánica.

8. IDIOMA:

Inglés - Español

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[38] Transcribed by the UNIDO adviser because original was transmitted by Fax...

[39] In reality, the field mission had to be extended at a request from the counterpart to 9 days field work due to the complexity of the affairs involved (see activity summary, reflected as Annex 3).

List of all contacted personnel, names, functions and addresses

The following people have been contacted along the UNIDO adviser's field mission in Peru:

From UNIDO:

Mariano Valle
Vera Gregor
Claudia Linke
Octávio Maizza Netto
Maria Theresa Cuevas
G. Winkelmann
from the UNIDO Headquarters, Vienna
Visiting the UNIDO Office in Lima

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Lima - Perú

From the Brazilian Embassy:

João Carlos P. De Castro, Primer Secretario
Jefe Del Sector Economico y de Promoción Comercial
Embajada Del Brasil
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From the Counterpart of UNIDO/UNDP - CEPRI-MODASA:

Luis Piazzon Gallo, Presidente
Orestes Cáceres Zapata, Secretario Técnico
David Ritchie Ballenas, Miembro del Comité
Isaac Espinoza Arana, Miembro del Comité
Manual Villaran, Miembro del Comité
Raul León, Asesor Técnico del Comité

CEPRI - MODASA Headquarters
Paseo de La Republica 3361
Vox: (0051) 442 -5000 442 - 5003
Anx. 4971 - 4972
Lima 27- Perú

From MODASA Motores Diesel Andinos S. A. :

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San Isidro - 27
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Telefono 4429988
fax 4400535

Benito Zarate Otarola, Manufacturing Division Manager
Horacio Aguilar Z. ,Gerente Division Ingenieria de Producto

MODASA Trujillo Plant
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Fax: 44- 23-5290
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From Perkins Engines Latin America Inc:

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From APOYO Consultoria S. A., as advisers to CEPRI MODASA:

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Trujillo - Peru
Apartado 860

Annex 3

General Schedule of the field mission

Date		Time	Activity
Apr 28	Sun	07:25	Departure from S. Paulo (home base) flight AR 1153, via Buenos Aires
		14:20	Arrival to Lima flight AR 1382 - lodging at José Antonio Hotel
		19:00	First meeting with CEPRI-MODASA in business dinner
Apr 29	Mon	11:00	Meeting, at Unido Office in Lima, with Elisabeth Pretzer - report format
		11:15	do, with Mariano Valle - mission briefing and UNIDO objectives
		11:30	do, with CEPRI-MODASA (full Staff)
		13:30	Business lunch - introduction to COPRI and CEPRI concepts and rules
		14:30	Initial 4-hour contact with MODASA's General Manager - mission objectives
		19:30	Business dinner with Raul León - Peruvian Economic and Social Drives
Apr 30	Tue	08:30	Discussions about MODASA strategic plans at their headquarters
		11:30	Protocol meeting at the Brazilian Embassy
		14:15	Meeting with MODASA General Manager & Perkins England representative
		15:00	Start of MODASA operational data collection
		20:00	Business dinner - Consumers Defence Code in Peru
May 01	Wed	11:00	Departure to Trujillo
		12:30	Arrival to Trujillo - lodging at Hotel El Libertador
		16:30	Strategic discussions with CEPRI's Technical Secretary - Data Needs
		19:30	Business dinner - Trujillo business environment and regional economy
May 02	Thu	08:00	Departure to Trujillo MODASA Plant
		08:15	Start of site visit, Offices and first reconnaissance plant tour
		11:00	First Meeting with Apoyo Auditing Company personnel
		12:00	Business Lunch - MODASA's background and history
		13:30	Definition of input data required by the UNIDO adviser
		16:00	Departure for quick visit to SENATI-Trujillo
		20:30	Business dinner with Apoyo, MODASA Trujillo Management & CEPRI
May 03	Fri	08:00	Continuation of Plant activities - products and applications
		10:00	Visit at Morillas bodybuilders plants
		13:00	Business lunch at MODASA cafeteria - Saturday schedule
		14:00	Plant tour, including all visitors - Leroy Somer activities and NC machining
		17:00	Brief visits to two Trujillo University Campuses
		21:00	Business dinner with CEPRI-MODASA - general impressions
May 04	Sat	08:30	Meeting at MODASA, all visitors - support to APOYO auditing strategy
		12:30	Lunch at Huancayo - including the Dean of North University - local trends
		14:00	Vehicle prototype workshop - truck and bus adaptation effort review
		16:00	Wrap-up discussion - end of Trujillo field activities
May 05	Sun	17:00	Return Flight to Lima
		18:30	Arrival to Lima and re-lodging at José Antonio Hotel
May 06	Mon	08:00	Preparation work at CEPRI-MODASA - Executive Seminar Materials
		12:00	Business lunch with CEPRI Technical Staff - Seminar Strategy
		14:00	Return to MODASA - Briefing to General Manager - Data requests
		17:00	Return to CEPRI - continuation of Seminar material preparation
		21:00	Family dinner at CEPRI MODASA's Technical Secretary home
May 07	Tue	09:30	Visit to ESAN-Lima site - strategic discussions about Seminar Objectives
		11:30	Meeting with UNIDO Counterpart (Piazzon) - potential auction auctioneers
		14:00	Preparatory Meeting with Seminar Group leaders - briefing and instructions
		15:30	Start of Seminar Activities at MODASA headquarters (see specific topic)
		21:45	Farewell dinner with CEPRI MODASA members & MODASA General Manager - final information exchange - future steps in the plan - follow-up
May 08	Wed	11:40	Departure to S. Paulo, via Buenos Aires, Flight AR 1385
		22:15	Arrival to S. Paulo (home base), Flight AR 1132

Annex 4

Briefing of a short protocol meeting at the Brazilian Embassy in Lima

As an initiative of CEPRI-MODASA, through Orestes Cáceres Zapata, Technical Secretary, the UNIDO adviser **Augusto Cezar Saldiva de Aguiar** was led to the Brazilian Embassy in Lima, on April 30th, for a meeting with the Embassy's First Secretary and Economic Sector and Commercial Promotion Head, **Dr. João Carlos P, de Castro**. This was a protocol encounter due to the nationality of the adviser and to the manifest interest of said diplomat in CEPRI-MODASA activities in view of the potential involvement of Brazilian companies as suppliers and/or auction bidders.

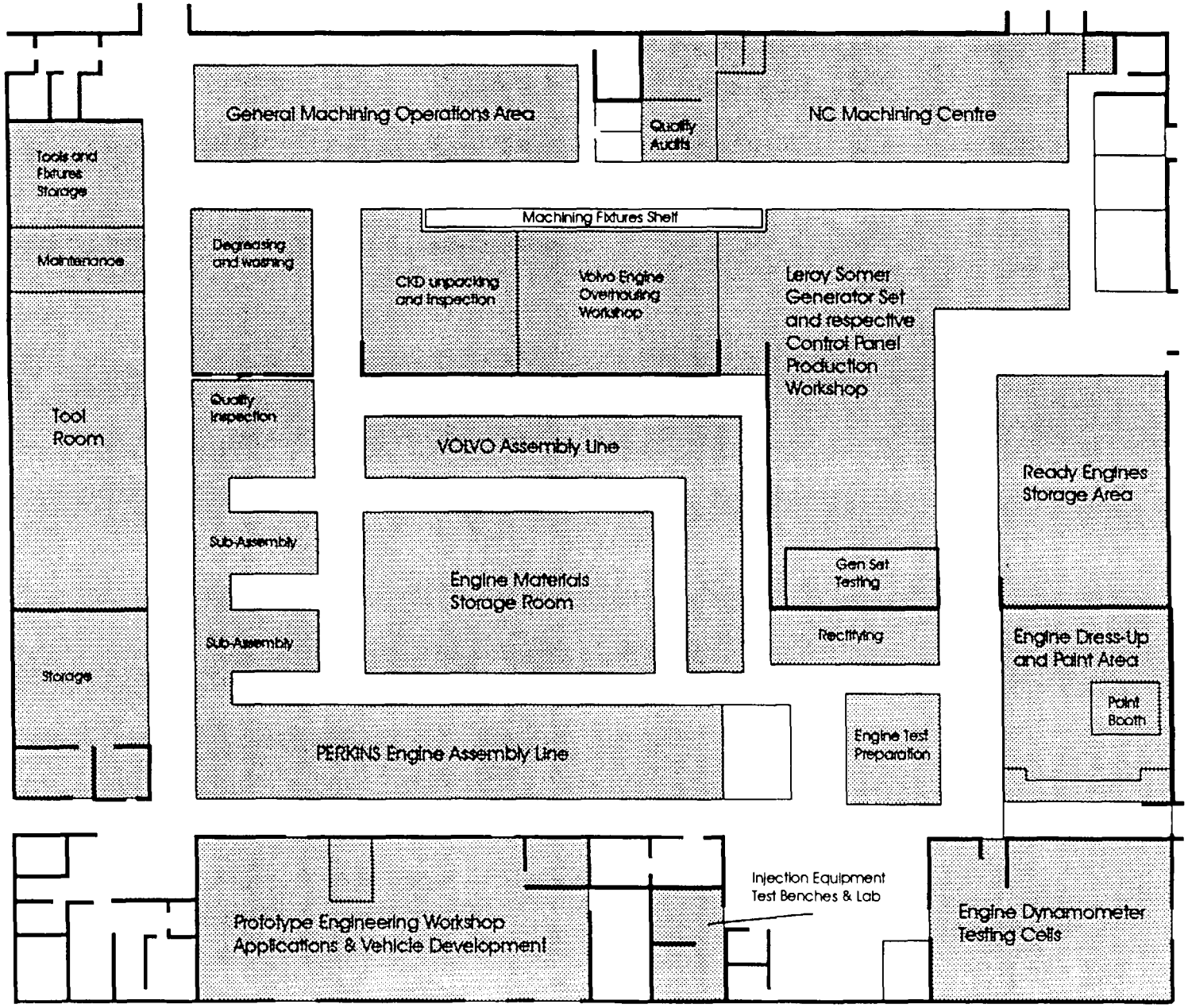
The meeting lasted approximately 45 minutes and the following topics were handled:

- Presentation and introductions.
- Short briefing about the UNIDO mission by the adviser, highlighting its temporary nature and character.
- Brief discussion about the CEPRI-MODASA objectives and the possible involvement of Brazilian companies for strategic alliances.
- Brief discussion about Mercosur, Andean Pact and the Brazilian economic interests in bi-lateral trading in the region.
- Indication of the approaching visit by an executive group from AGRALE for acquaintance with MODASA and the Peruvian light duty and city bus sector opportunities, that favour a strategic alliance between that company and MODASA.
- Wrap-up and agreement that it is still too early for the Embassy's involvement in the MODASA privatising affair. The UNIDO adviser was requested to inform CEPRI-MODASA, MODASA and the eventual Brazilian firms[40] to be involved in the negotiations in Peru, to maintain the Embassy posted about developments, so as to count on their legal support and advice.
- Conclusion and farewell.

[40] These might be AGRALE, INTERMARINE, MAXION, MWM, BRASEIXOS ROCKWELL, CLARK, EATON-FULLER, MARCOPOLO, COFAP, METAL LEVE, BRASINCA and an ample range of autoparts producers and distributors.

SIMPLIFIED BLOCK LAYOUT OF MODASA TRUJILLO ENGINE PLANT

CAD by Augusto Cezar S. de Aguiar, UNIDO adviser - May 24, 1996.



Annex 6

MODASA's NATIONAL INTEGRATION HISTORICAL LANDMARKS

(Expressed as a percentage of the CKD sets value)

Model	Power	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95
Perkins	kW																
D3.152 I	29.00				5.0	25.5	25.5	26.0	26.5	26.5	26.5	26.5	26.5	32.1	32.1	32.1	32.1
4.236 I	49.00			4.0	27.0	27.0	28.0	28.0	28.0	28.0	28.0	28.0	31.9	31.9	31.9	31.9	31.9
T4.236 I	69.50											24.8	31.9	31.9	31.9	31.9	31.9
6.354.4 I	86.00			15.0	17.0	19.0	20.0	20.0	25.1	25.1	25.1	25.1					
T6.354.4 I	102.50						19.1	19.1	25.1	25.1	25.1	25.1	32.1	32.1	32.1	32.1	
4.236 V	61.00	2.6	7.4	16.0	18.0	18.0	22.6	23.0	25.3	25.3	25.3	25.3	25.3	25.3	25.3	25.3	25.3
C4.236 V	61.00			18.0	20.0	22.0	22.5	25.2	25.2	25.2	25.2	25.2	32.1	32.1	32.1	32.1	32.1
T4.236 V	69.50										25.2	25.2	33.2	33.1	33.1	33.1	33.1
6.354.4 V	95.50					23.5	23.5	25.5	25,5	25.5	25.5	25.5					
C6.354.4 V	95.50	17.6	20.1	22.0	22.0	23.0	23.0	23.5	25.4	25.4	25.4	25.4	25.4	31.6	31.5	31.57	31.57
T6.354.4 V NCC	108.00	5.9	10.2	17.0	18.0	18.0	23.5	24.0	24.4	25.4	25.4	25.4	25.4				
T6.354.4 V ACC	108.00					18.3	18.3	18.3	25.4	25.4	25.4	25.4					
160 T1 Phaser	119.00											25.4	25.4	25.4	25.4	25.4	25.4
180 T1 Phaser	134.00											25.4	25.4	25.4	25.4	25.4	25.4
Volvo	kW																
TD 70 G/H	171.75	1.20	1.30	10.0	10.3	15.6	18.0	18.5	18.5	18.5	18.5	18.5	18.5				
TD 101 G/F	207.00	1.20	1.60	11.4	11.6	15.8	18.5	18.7	21.4	21.4	21.4	21.4	21.4				
TD 102 FS	236.25									21.1	21.1	21.1					
TD TD 121 G/F	247.50	0.7	1.3	11.2	11.6	15.8	18.3	18.7	21.7	21.7	21.7	21.7	21.7				
TD 122 FS	292.50									21.2	21.2	21.2					
THD 101 GD/KC	228.75			10.2	12.0	18.0	18.0			14.6	14.6	14.6					
TD 71 AGP	139.00										25.1	25.1					
TD 100 GGP	179.00									25.1	25.1	25.1					
TD 121 AGP	226.00										25.1	25.1					

The above table, reproduced from the information submitted by MODASA, shows this historical landmarks achieved per engine type and power output category, for both Perkins and Volvo engines.

The first three years, 77, 78 and 79, had no nationalisations to be reported. From 1980 on, the figures start to grow, reaching about a third of the indicated CDK set value 1990, and remaining in that neighbourhood from then to date.

Since 1992, no values are reported for Volvo, as a tacit confirmation that those engines are being phased out. For the Perkins, models without figures from a certain year on, mean that those engines were discontinued, being substituted for those bearing indices up to the present time.

OBS: Please bear in mind the methodological constraints indicated in the comments on Chapter III. E., relative to the correct interpretation of the above figures.

Annex 7

Geographic Map of Peru

As published in the May 1996 issue of the National Geographic Magazine, containing an interesting feature article about Peru.

Annex 8

Dealership market coverage in Peru (who is where)...

Dealer name	Location
Northern Region	
Kubota Maquinarias S. A.	Tumbes
Enrique Ferreyros S. A.	Piura
Enrique Ferreyros S. A.	Chiclayo
La Predilacta S. A.	Chiclayo
Vehiculos S. A.	Chiclayo
Enrique Ferreyros S. A.	Trujillo
Carlos A. Manucci S. A.	Trujillo
Organizacion Victoria S. A.	Tarapoto
Organizacion Victoria S. A.	Iquitos
Autos Y Camiones S. A.	Pacasmayo
Lima/Central Region	
Enrique Ferreyros S. A.	Lima
Wiese Representaciones S. A.	Lima
Santa Agostina S. A.	Tarma
J. C. Automotriz S. A.	Lima
Mac Donald S. A.	Lima
Motores Y Repuestos	Lima
Diesel Peruana S. A.	Lima
Importaciones Rivera S. A.	Huancayo
Rivera Diesel S. A.	Lima
Motor Industria S. A.	LIma
Motorex S. A.	Lima
Hidropool S. A.	Lima
Organizacion Victoria S. A.	Pucallpa
Enrique Ferreyros S. A.	Ica
Automoviles S. A.	Huancayo
Luvegi Ingenieros S. A.	Lima
Grupo San Juan S. A.	Lima
De Ferrari Comercial S. A.	Lima
Southern Region	
Enrique Ferreyros S. A.	Arequipa
Hispano Peruana S. A.	Arequipa
Inca Motors S. A.	Arequipa
Sur Motors S. A.	Arequipa
Enrique Ferreyros S. A.	Cuzco
Abroad	
Dieselectros Ltda.	Colombia
Antonio Spath & Cia. Ltda.	Colombia
C. I. Ignacio Gomez Y Cia. Ltda.	Colombia
Euroequipos S. A.	Colombia
Jose Sanin Penaranda	Colombia

Annex 9

An excess Inventory[41] condition at MODASA by April 30th, 1996...

1. CKD ENGINES	CKD List	Process	Ready	Total	
C4.236 V UK	LD-9A540		7	7	
C4.236 V BR	LH-6030	34	3	37	
T4.236 V	LJ-97461	9	2	11	
6.354 V	TW-96051		18	18	
C6.354 V	TX-96081		91	91	
T6.4 Vncc	TU-96071		77	77	
PHASE 160T	9A571	2	14	16	
PHASE 180Ti	9A570		8	8	
D3.152 I	CE-99541	15	3	18	
4.236 I	LD-99641	36		36	
T4.236 I	LJ-9A721	29		29	
T6.354 I	TU-96491	10		10	
1006TG(I)	9A771	20	6	26	
6.354 M	TW-97351		1	1	
TD 70GG-I	1541052		1	1	**Total = 386**

2. CBU ENGINES	CKD List	Process	Ready	Total	
M130-C	Phaser Marino		1	1	
4.182	Titan		1	1	
Q20B 4.V	8750/67175		6	6	
Phaser 90	RP36120	1		1	
Phaser 110	RP36130	1		1	
Phaser T6.60	RP36330	2		2	
3.1524(I)	E02	24		24	
D3.152(I)	E02	25		25	
1004G	RP36110	1		1	
1004.4T	RP36140	1		1	
1006TAG(I)	YD35028	3		3	
1306-8	WGE03	5		5	
1006TG1A	YBE04	2		2	
TWD1210	868673	1		1	**Total = 79**

3. MOTO-PUMPS	CKD List	Process	Ready	Total	
103-10	MHC-08		1	1	
Deutz	MHC8/13		1	1	
D3.152 I	MHC-26		3	3	
4.236I	MHC-43 38	1		1	**Total = 7**

4. GEN SETS	Modelo	En Proceso	En Stock	Total		
DS7,5J/F3M10	MLS7		2	2		
DS 15J/FEL101	MLS14		2	2		
NS22/D3.1521	MLS22		1	1		
D3.152 I	MLS20		3	3		
T6.354 I	MLS83		2	2		
1006 TG	MLS96		5	5		
G/Marine	MLS96MA		4	4		
1006TAG	MLS122	10		1		
TD 71 GG	MLS125		2	2		
TD1010 GG	MLS185		4	4		
TD1210 GG	MLS230		3	3		
TWD1210	MLS250		2	2		
TAD1230	MLS315	10	1	2		
TAD1630	MLS400		4	4		
TAD1631	MLS450	20		2	**Total = 39**	**Grand Total = 511**

[41] MODASA also carried 6 M-240 beton mixers (in process) and 2 MC-350 units (ready in stock).

Documental Photos

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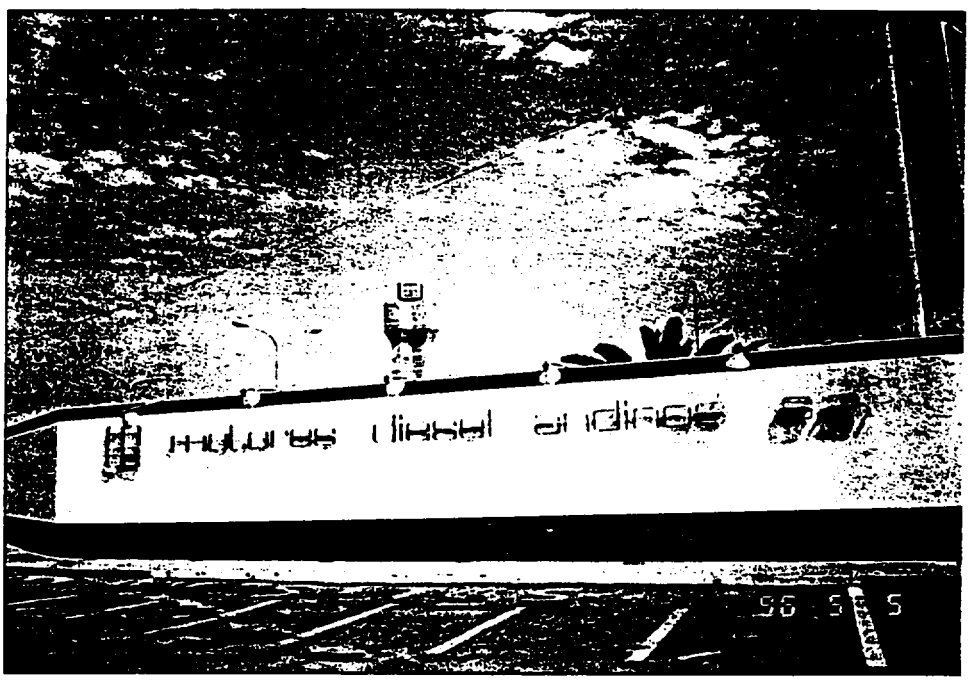

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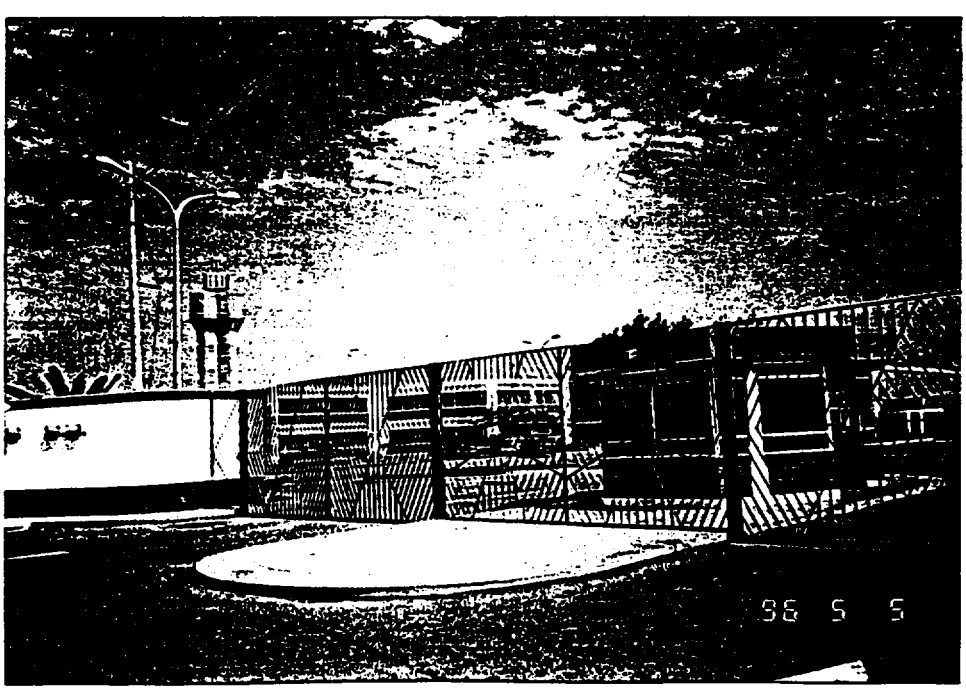

Documental Photos

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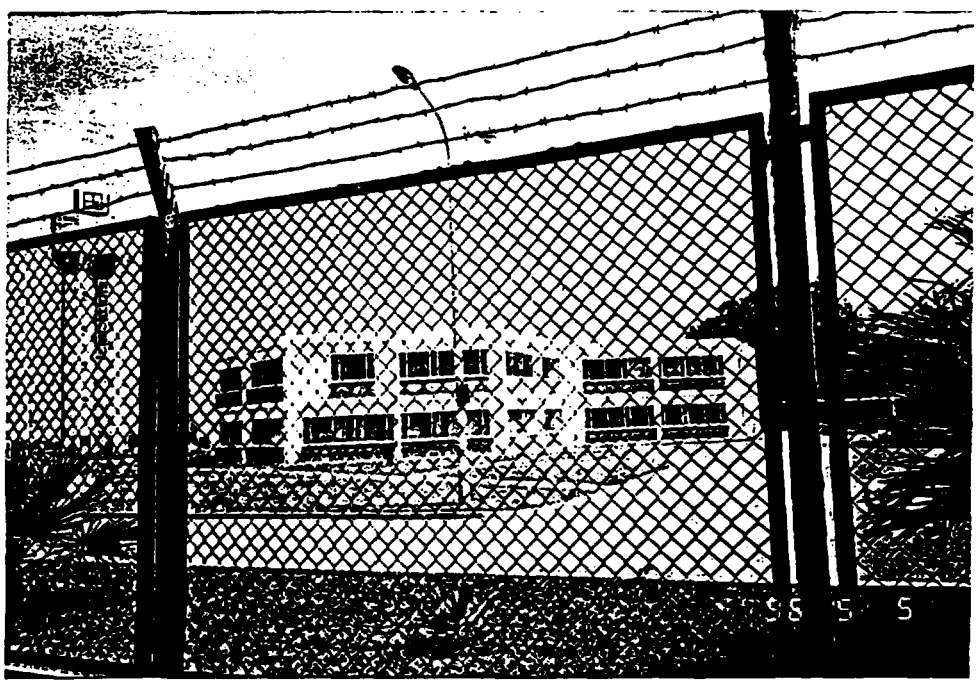

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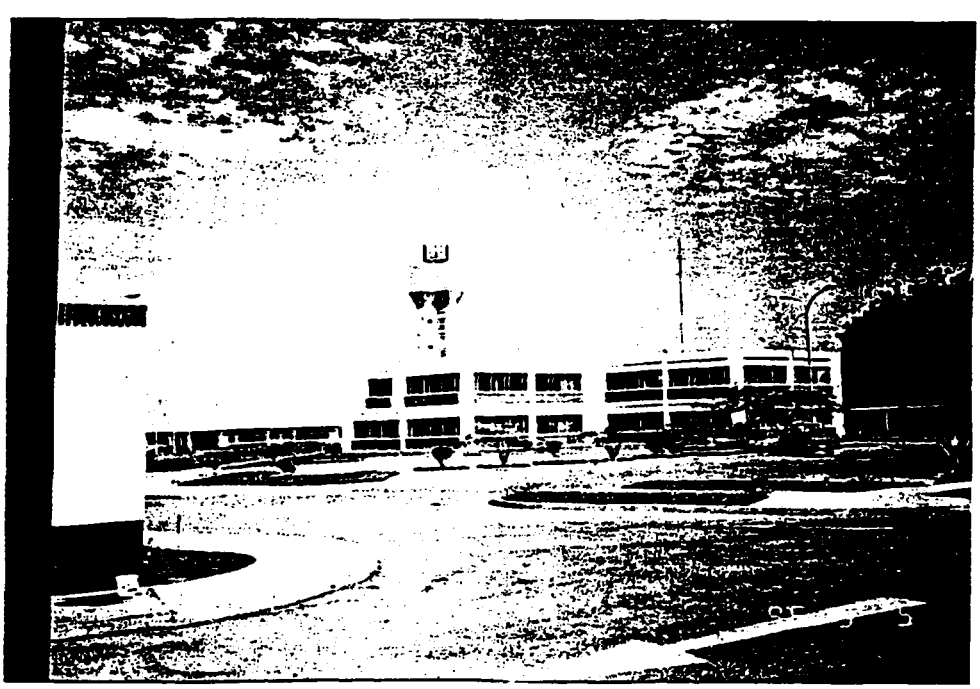

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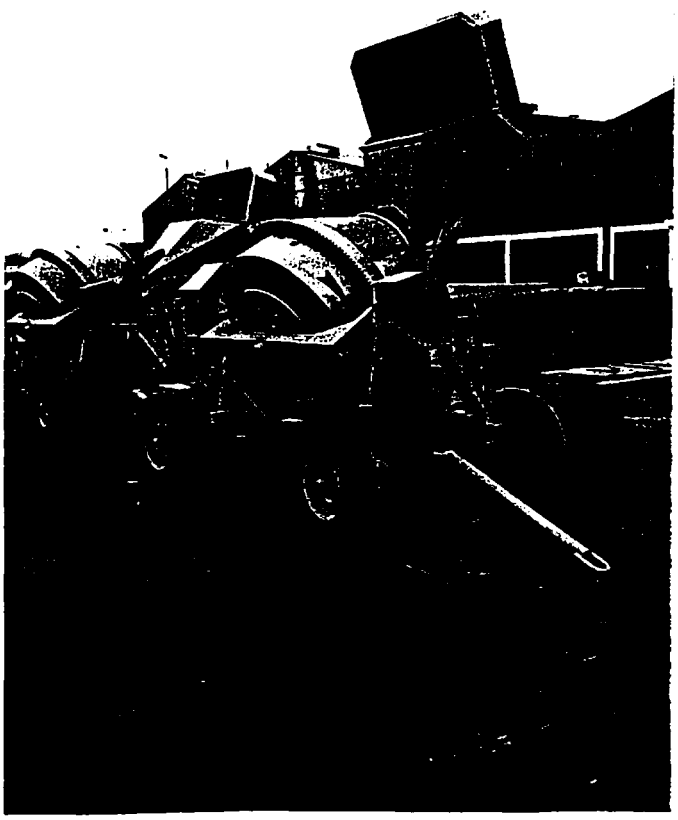

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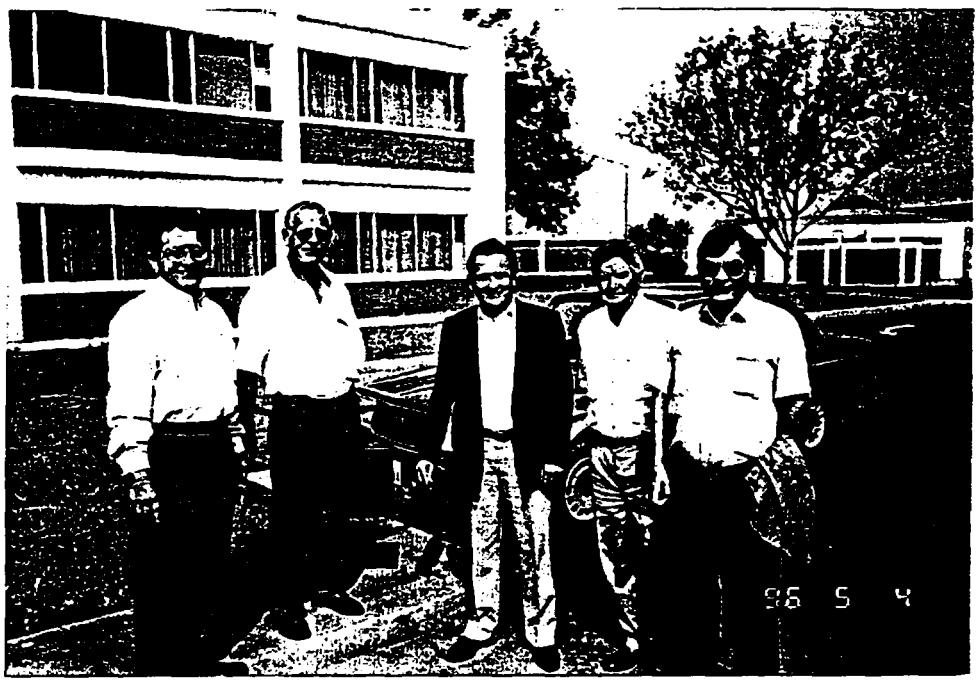

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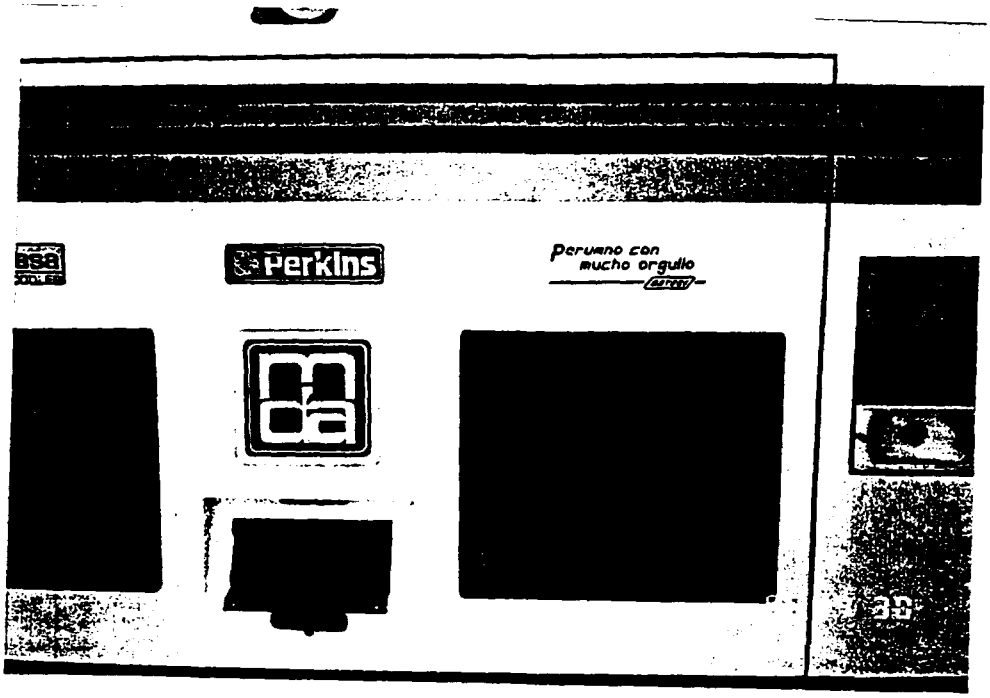

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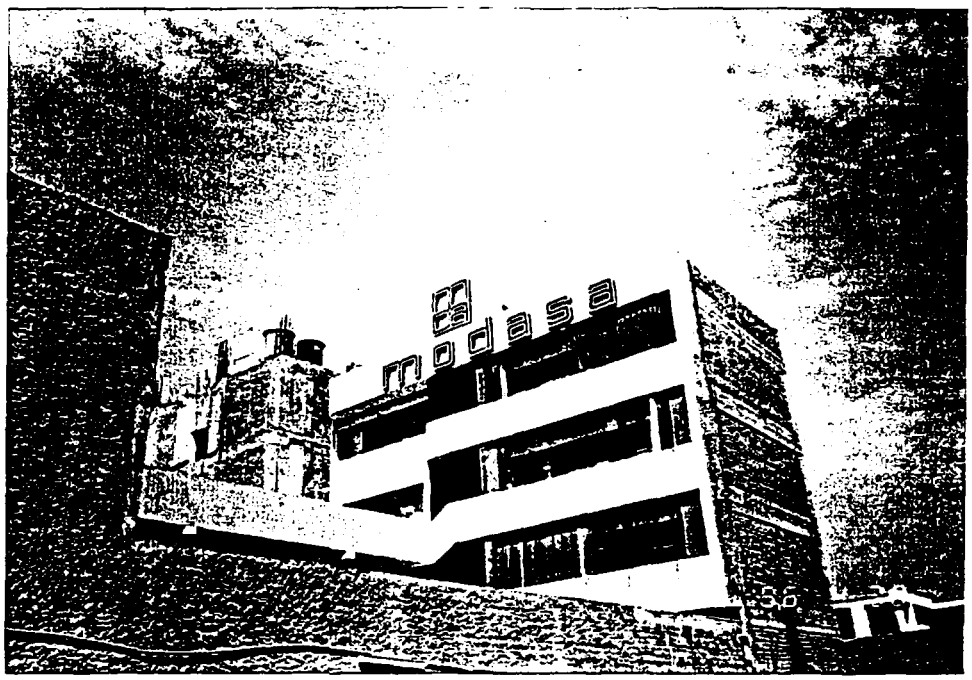

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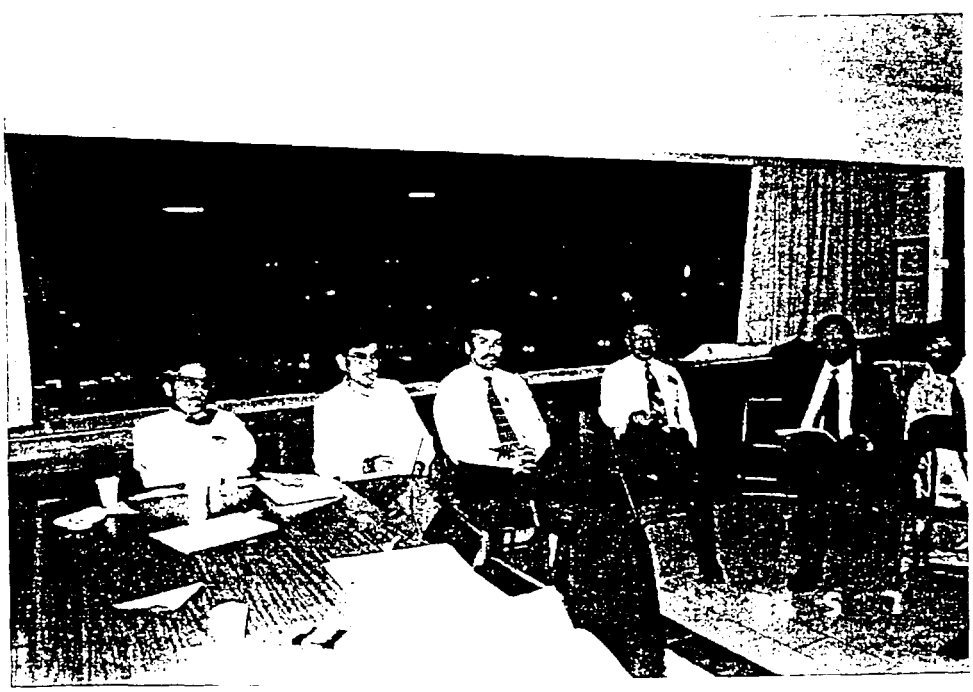

Annex 11

Index of the included photos, with legends

1 View of MODASA's entry gate property and corporate identification.

2 Main gates and guard house.

3 The Office Building and water tower, seen through the Ruta Panamericana fence.

4 The Office Building, the visitors parking area and the Cafeteria seen in the left, back.

5 The CKD and Materials Receiving Apron. The crates contain CKD materials awaiting audit.

6 An incomplete Beton Mixer type MC-350, awaiting from completion.

7 From left to right, Benito Zarate Otarola (MODASA), Horst Sommerfeld (Apoyo), David Ritchie and Isaac Espinosa Arana (CEPRI-MODASA) and Horácio Aguilar Z. (MODASA).

8 From left to right, Raúl León (CEPRI MODASA technical advisor), Luiz Piazzon (CEPRI-MODASA President and UNIDO Counterpart Senior Staff) and Orestes Cáceres Zapata (CREPRI-MODASA Technical Secretary).

9 The green arrow states "WAY OUT" and points to CEPRI, in a suggestive display of the different CEPRI's provisionally installed in the Headquarters of PETRO-PERU (2nd floor). In PERU, nowadays, the way out for many governmental companies is to be included for privatising and get the assignment of a CEPRI.

10 Héctor García Béjar, MODASA's General Manager proudly exhibits the Chinese based urban bus chassis and adapted SATESI superstructure.

11 The engine compartment door of the prototype shows the Perkins trademark, the MODASA logo and the SATESI motto "***Peruvian, with much pride***"...

12 The Lima Headquarters, shop façade.

13 The Office Building in Lima, seen from the adjacent parking lot.

14 Orestes Cáceres Zapata and his Secretary, Carmen Rosa, declare opened the session of the MODASA Executive Seminar. The time is 4:05 pm.

15 Group A in function, meeting at MODASA's Executive Board Room to reply the Seminar questions.

16 Group B in function, meeting at MODASA's traning room to reply the Seminar questions. To the left is the Board Chairman and official representative of Perkins in the MODASA directorate.

17 Luiz Piazzon and Group A, at work on the second group of 6 questions.

18 View of the final Plenary Session, when the last question was being sorted and consolidated. The time was 9:40 pm. The seminar would be concluded with a confraternisation dinner at the "Regatas" Yacht Club of Lima, where the wrap-up and final appraisals of the activities were made.

UNIDO Adviser's Personal History

Augusto Cezar Saldiva de Aguiar, 53, a Brazilian industrialist, is currently President of **TECKNOWLEDGE INTERNATIONAL** and Executive Vice President of the **MTE-THOMSON INTERNATIONAL GROUP**. He is a Business Administration expert, specialized in computer science and applied logistics, with longstanding experience and total immersion courses in Brazil and abroad, in Automotive Design and Manufacturing Technology, notedly Diesel Engine Product and Applications Design, Development and Manufacturing.

Cezar started his career in the Product Engineering Office of Ford Motor Company - Brazil, in February 1962. At Ford he occupied several key positions. Hired as Engineering Cost Analyst, he soon became Special Forward Planning Studies Analyst, Plant Comptroller, Supplier Technical Assistance and Quality Development Manager, Production Planning and Control Manager. During his Ford years, he led several large scope Task Force studies related with company expansion, specially as Technical Adviser in affairs related with the crucial corporation merge FORD-WILLYS OVERLAND, and the incurred organization adaptation, structuring, plant concentration, manufacturing process integration and upgrading. His last position was Production Planning Manager - Staff with responsibilities related with supplier development, systems integration, technical assistance on new components development and all related activities. That function also entailed intra-company supply coordination, Plant Capacity and Manufacturing Scheduling modelling, including the participation in the International Group in charge of defining the respective computerized algorithms for the achievement of the multi-model, open structure, materials requirement, production planning and an advanced manufacturing scheduling system. The resulting application (PMIR) was carried over for use also in Argentina, Mexico and some other Ford Operations Overseas.

In October 1973, he accepted an invitation to become Corporate Planning Manager for Saab-Scania in Brazil, to conduct a very vast Production and Plant Expansion program which demanded an intensive control systems and supplier follow-up/capacitation program. There, he occupied several technical positions, serving as Components Nationalization Program Manager (75), Energy and Alternative Fuels Program Manager (alcohol, generator gas, vegetable oils, natural gas, wide-cut diesel, electric traction for buses, etc) (75-83), Technical Regulations and Norms Enforcement and Compliance Manager (83-85), Advisor in Forward Planning Activities to the Industrial Director (85-86), Product and Production Technology Manager, with the responsibility to coordinate the Type and Models Forward Planning Activities (86-90). He also assisted the company in critical activities, like the international market expansion experienced by Scania through CKD-type assembly plants abroad (Uruguay, Argentina, Perú, Mozambique, etc). His last function was Governmental Affairs Advisor, with Director's status (90-93), dealing with high level contacts in Brazil and abroad. This entailed Vehicle and Products Certification, Emissions and Noise Abatement Control, Legal and Technical Norms surveillance and compliance, as well as the responsibility for Public Affairs and Social Communications on technical grounds, including the assistance to National Normative Organizations (ABNT, CONAMA, CONTRAN, AEA, ANFAVEA, SINDIPEÇAS, etc) regarding Transports and Traffic Technology in a broad scope.

During all these years, Aguiar was a frequent lecturer in the Brazilian and International technical scene, on questions related with energy, engines, lubricants and conventional and alternative fuels, new production concepts, plant floor machinery advancements, engineering support software, computer integrated manufacturing, automation, materials and logistics management and simultaneous engineering. He took part as a scientific advisor in his field of expertise to the National Energy Board in the difficult years of the International Energy (Oil) Crisis, the National Pro-Alcohol Program Commission, the National Traffic Administration Council, the Council for Industrial Development, the Industrial Technology Secretariat and the Science and Technology Ministry.

In June 1993 he left Saab-Scania to take command of his family's business, an entrepreneurial group started by his father in the early Forties, comprising now 9 high technology(*) international companies. Cezar still remains active in the Brazilian Automotive Industry by force of his own companies (involved in producing vehicle components and rendering engineering services), and - more specifically - through permanent or temporary Consulting contracts, for affairs related with Governmental Relations, Environment, Energy, Traffic & Transports Laws, Technical Regulations and Norms, Product Certification and other scientific research and special study issues. He has had continuous role in matters relative to company mergers, sales, leveraged acquisitions, privatisation, plant surveys, Quality Certification (ISO 9000/14000), supplier-base investigations, and in assisting international companies wishing to initiate manufacturing activities in South America. Such is handled by **TECKNOWLEDGE INTERNATIONAL**, one of the Group Companies, also responsible for many other high level services to the Automotive Engineering community, like technical purpose (automation & research/lab) software and scientific documentation products in several formats, from paperback to specialized InfoBase CD-ROMs.

For six years, and up to recent date, Cezar was a Council Member of FISITA (*Féderation Internationale des Sociétés d'Ingénieurs des Techniques de l'Automobile*) representing Brazil, where he reached the post of Vice-President External Relations in 1994. He was also Vice-President of the Board of AEA - the Brazilian Society of Automotive Engineers - entity which he presided in 1-year mandates for four non-consecutive years (84, 86, 90, 92). He also conducts intensive activities at SAE BRASIL since its induction in 1990 (as Member of the Senior Executive Advisory Board). Last, but not least, he is active as a specialized journalist on topics of scientific and technological interest (Scientific Editor of AUTODATA TECH, monthly review).

Cezar is fluent in English, French, Italian, Spanish, Portuguese and Swedish and has a fair working knowledge of Norwegian and German.

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