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Environmental Pollution
Prevention Project

A Report of the
Office of Environment and Natural Resources
Bureau for Global Programs
United States Agency for International Development

POLLUTION PREVENTION DIAGNOSTIC STUDY HILADOS Y TEJIDOS GARIB S. A . (HITEGA) SANTIAGO, CHILE

Final Report

Prepared for:

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The pollution prevention audit/assessment reported on herein was conducted by a team of EP3 and industry representatives. The primary purpose was to assist industry or facility management in creating a sustainable pollution prevention and waste minimization program. This report presents information from the first step in the process; a base line survey and a definition of actions which can be taken to prevent pollution, improve efficiency and pay back any required investments.

The overall EP3 program in the countries in which EP3 has activities includes a wide range of activities including audits/assessments, information dissemination, training and small scale demonstrations. These country programs are all designed to create the conditions in the country which will assure the continuation of urban and industrial pollution prevention and establish locally sustainable pollution prevention programs.

This report was prepared for RCG/Hagler Bailly, Inc. by Jorge Castillo, Environmental Engineering Consultant, Av. Blanco Encalada, 1975 Santiago, Chile.

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The assessment identified eight opportunities to reduce the impact of Hilados y Tejidos Garib S.A. (Hitega) on the environment and one opportunity to reduce costs with no net impact on emissions (installation of a peak-load generator). Of these opportunities, three were studied in enough detail to quantify savings. For an investment of just over $10,000, Hitega can reduce its water and salt consumption and save about $6,600 per year. The average payback period for these three actions is 20 months. Additional savings from bleach rinse recycling, steam trap repair and boiler combustion efficiency changes were not yet quantified at the time of this report. Table 1 summarizes the opportunities discussed in this report.

All amounts are shown in U.S. dollars determined at a time when the Chilean peso exchange rate was 430 pesos/dollar.

TABLE 1
Summary of Pollution Prevention Opportunities

Unit operation	Pollution prevention action	Implementation Cost	Financial Benefits	Environmental Benefits	Payback period
Recycling of dye cooling water	Installation of piping and valves	$750	$400/year	Conserve water	20 Months
Recycling of air conditioner system water	Installation of piping and a tank	$6,700	$4,900/year	Conserve water and chemicals	14 Months
Softener system	Installation of digital hardness monitor	$3,500	$1,680/year	Conserve water and chemicals	24 Months
Sewage system	Install screens in drain lines	$600	To be determined	Reduction of pollutant level in the industrial waste water	To be determined
Operator work system	Training courses	To be determined	To be determined	Reduction of power and water consumption	To be determined
Steam traps	Maintenance plan	To be determined	To be determined	VOC reduction	To be determined
Bleaching	Recycling of rinse water	$2,200	To be determined	Reduced use of water and chemicals	To be determined
Boilers	Installation of a digital monitoring system.	$1,000	To be determined	Reduced emissions	To be determined
Power Consumption	Installation of a peak load generator.	To be determined	To be determined	To be determined	To be determined

CHAPTER 2: OBJECTIVE

The purpose of this study was to train Chilean consultants in pollution prevention assessment techniques using a textile dyeing plant as the training site. The study was done for the Agency for International Development, Environmental Pollution Prevention Project (EP3) under the direction of AMCHAM - CHILE by RCG/Hagler Bailly, Inc. Mr. Francisco Acuna was the Industrial Pollution Prevention consultant to RCG/Hagler Bailly, Inc. Mr. Carlos Kanterowitz, technical manager of Hitega, assisted with all aspects of this study.

Hitega is an integrated textile mill located in Santiago, Chile. Two hundred and seventy employees work a 296 day work year. Starting with polyester and rayon viscose fibers, Hitega produces dyed yarn and fabric with an average content of 65% polyester and 35% rayon. All fabric is dyed in jets with nominal capacities of 50 kg (pilot plant), 150 kg, 350 kg (2 machines), and 750 kg of fabric. Yarn is dyed in a 200 kg cone-dyer. In 1993 production volume was 1,134,059 kg of material dyed with an additional 1,227.947 kg of fabric finished, but not dyed.

4.1 Recycling of Cone-dye Cooling Water:

Well water, with a hardness of approximately 600 ppm, is pumped to a tank with a capacity of 60 mt^3. From there it is sent through a softener that reduces hardness to 3-5 ppm. This softened water is used for most factory processes.

The cone-dyeing operation uses soft water for non-contact cooling in two places. The dye-bath is cooled by passing soft water through the jacket of the dye tank. Non-contact cooling water is also used to cool the dye-bath recirculating pump packing gland. Recycling these two streams is an opportunity and could be accomplished by sending the water back to the soft water pool that at the present time receives the cooling water from the jet-dyers.

Calculations:

Three factors contribute to the cost of softening:

A. Sodium Chloride Cost (NaCl).

NaCl is sold to the factory for a price of 5.8 cents/Kg. During 1993 the NaCl consumption was 432,000 Kg, and the production of soft water was 143,950 m^3, resulting in an average price of salt for softening of $0.17/$m^3$.

B. Cost for pumping hard water from the deep well.

The three phase deep well pump has a nominal capacity of 50 m^3/hr. Each leg draws 27 Amps as measured by an ammeter in the circuit for a total power consumption of 31 KWH (27 A x 380 V x 3) per hour of operation.

During 1993 the cost of power was $ 344,616. This cost includes charges for maximum and peak demand and total consumption of 7,286,000 KWH. The average cost of electrical power is therefore $0.047/ KWH. From these costs we can determine that the energy consumption for pumping is 0,62 KWH/m^3 and the cost of pumping well water is $0.03/$m^3$.

C. Cost of Sewer Use.

EMOS charges for sewer use of EMOS water used at the facility strictly on the basis of water usage. Since we are not considering EMOS water in this non-contact use, we need not concern ourselves with these charges. EMOS also charges for sewer use of well water and uses two different systems according to their knowledge of pumping volume. If the well pumping rate has been determined by a test, then that rate is assumed for a given number of hours per month and the sewer rate applied to that total. The monthly charge is invariant, once the test has been done.

If the well pumping rate has not been measured, then the allowed withdrawal rate certified for the well when it was permitted is used. The flow rate is multiplied by an assumed number of hours of pumping per month, and the sewer rate is applied to that total volume of water. Again, once the calculations have been done, the monthly charge is invariant. This second system is used at Hitega. EMOS assumes that 6,480 m^3/month is withdrawn from the well and charges \$0.09/m^3 for it.

In reality, the average amount of well water pumped is 22,000 m^3/month. Until water usage falls below that figure or EMOS measures the actual well withdrawal rate, the reduction in water use from this recycling opportunity will not result in a reduction in sewer charges. Adding together salt and pumping energy costs gives a total soft water cost of \$0.205/cubic meter.

For cone-dyeing, the flow rate for Pump Cooling Water (PCW) and Jacket Cooling Water (JCW) are 720 lt/hr and 2,600 lt/hr, respectively. The pump that cools water is on whenever the cone-dye operation is working. The JCW flow time is different for one and two bath cone dyeing.

One bath dyeing takes an average of 5 hours, two bath dyeing an average of 9 hours. The average flow for PCW per dye batch is therefore between 3.7 m^3 for one-bath to 6.5 m^3 for two bath. In one bath dyeing, two 30 minute cooling cycles are used consuming 2.6 m^3 of JCW. For two-bath dyeing, three 30 minute cooling cycles are used consuming 4 m^3 per batch. Not all pump cooling water is discharged directly to the drain. Some is used to fill the water supply tank, that has a capacity of 1,8 m^3.

In the first step of dye process, the filling time and the water utilization time are long. The tank can be filled (1,8 m^3) in 2,5 hr by a flow of 0,72 m^3/hr of pump cooling water. In the second step of dye process, the time available for filling is short because of the nature of the rinsing process. To fill the tank more rapidly, PCW at 0.72 m^3/hr, soft water at 6 m^3/hr, and hard water at 18 m^3/hr are all used. Based upon observation, it is reasonable to assume that 50% of PCW is discharged to the sewer.

In summary:

PCW = 1,9 m^3 for one-bath dyeing worth \$0.388.
PCW = 3,2 m^3 for two-bath dyeing worth \$0.663.

JCW = 2,6 m^3 for one-bath dyeing worth \$0.388.
JCW = 4 m^3 for two-bath dyeing worth \$0.819.

To recycle PCW, it will be necessary to connect the discharge of this water to the soft water pool, placed outside the process factory area (5 mt from the cone-dyer). The implementation cost will be $350, including piping (1/2") installation, and concrete work.

To recycle JCW, it will be necessary to connect the exit of this water with the soft water return lines from the jet-dye cooling jackets. Those lines are located on the factory ceiling (at 4 mt from the machine). The implementation cost will be $400, including piping, fitting and valve installation.

4.1.1. Payback Period

Recycling PCW:

During 1993, 242 one-bath batches and 139 two-bath batches were run in the cone-dyer. If we consider this year as representative of a normal year, we obtain a payback of 23 months.

Calculations:

In a normal year the total PCW lost is:
(N° one bath dye * $0.388) + (N° two bath dye * 285)
Total: $186
Total investment: $350

$$\text{Payback} = \frac{\$350}{\$186}$$

Payback = 1,88 year ≈ 23 months

Recycling JCW:

During 1993, 242 one-bath batches and 139 two-bath batches were run in the cone-dyer. If we consider this year as representative of a normal year, we obtain a payback of 20 months.

Calculations:

In a normal year the total loss of JCW is:
(N° one bath dye * $0.533) + (N° two bath dye * 352)
Total: $243

Total investment: $400

$$\text{Payback} = \frac{\$400}{\$243}$$

Payback = 1,65 year ≈ 20 months.

4.1.2. Obstacles to Implementation:

No technical or economic obstacle to implementation is contemplated.

4.1.3. Schedule of Implementation:

EP3 suggests that this recommendation should be implemented as soon as possible.

4.2. Recycling of Air Conditioner System Water (ACSW):

The air conditioner system for the spinning and weaving rooms uses soft water evaporation for cooling. At the present time this water is taken from the softeners that serve the dye room. Under normal operating conditions, this non-contact cooling is not contaminated in any way. Fifty percent of this water is lost to evaporation. The rest is dumped into the sewer system. The consumption of ACSW (4,4 m^3/hour) has caused problems in the dye room because of the lack of soft water that sometimes occurs. The air conditioner system is designed to function with water having a hardness of 30 ppm, which is higher than the 5 ppm water that the dye processes require. For both reasons, soft water shortage and using a water softer than is needed, Hitega has decided to buy new softeners solely to produce water for the air conditioner system. These new softeners have been purchased, but not installed. We therefore considered the possibilities for recycling the non-evaporated ACSW back to the new softener system when it is installed.

Calculations:

It was necessary to calculate the approximate cost for soft water of 30 ppm quality.

1. If the water is taken from the deep well:
   The plant's present softener system reduces the hardness of well water from 600 ppm to 3-5 ppm with a total cost of \$0.205/m^3 for a reduction of 595 ppm (600 - 5 = 595) or \$0.349/1,000 ppm. The air conditioner requires a reduction from 600 ppm to 30 ppm, a difference of 570 ppm. Assuming a linear relationship between cost and ppm-reduction, the cost would be \$0.20/m^3.

2. If the water is taken from EMOS:
   The softener system would begin with water having 400 ppm hardness. The hardness reduction would be from 400 ppm to 30 ppm with a cost of \$0.11/m^3. The reduction of 370 ppm (400-30 = 370) will cost \$0.349/1,000 ppm, taking into consideration the fact that is not necessary to pump the water. To this must be added the cost of the EMOS water itself. During 1993 this cost was \$0.265/cubic meter (including fixed cost, consumption and sewage utilization). The total cost of using EMOS water for the air conditioner softeners would be \$0.377/m^3.

Despite the fact that EMOS water is more expensive, this alternative will probably be chosen because of the shortage of well water capacity. The argument could be made that recycling will reduce the demand on the well system from the current situation and therefore there may not be a capacity problem. There was not time to explore this issue with the appropriate decision-makers. For all the following calculations we will assume an avoided cost of $0.377/m^3 for air conditioner system soft water (hardness: 30 ppm).

With no recycling of ACSW, the cost of water is $12,414 per year exclusive of taxes: (4,4 m^3/hr * 24 Hours/day * 26 days/month * 12 months/year * $0.377/m^3). This figure does not include the price increase that EMOS applies every three months to keep up with inflation.

If a recycling of non-evaporated ACSW is considered, we should keep in mind that:

1. This non-evaporated ACSW could be stored in a tank and then it could be pumped to the softeners to be reused. The amount of non evaporated ACSW is 2,2 m^3/hr. It would have a hardness of 60 ppm (concentration effect), and a temperature above ambient. After being re-softened, this water could be used again.

2. The tank would have at least two characteristics: the capacity to supply water continually to one softener, and at the same time it should have enough residence time to reduce the temperature of the water.

If the new softeners have X volume, the tank size required should be 1.5 times that volume (1.5 * X). If we suppose that two softeners with a capacity of 50 m^3 have been purchased (A and B), it will be necessary to construct a tank with a capacity of 75 m^3. This tank would supply water only to softener A, and softener B would work only with EMOS water.

To recycle the non-evaporated ACSW the return line should be connected to the tank. Caution must be used to place the tank below the level of the air conditioner or the flow through the fixed orifice bypass would be changed. This water would then have to be pumped to softener A. We estimate an implementation cost of $6,700, including piping installation ($2,000), tank (75 m^3) purchase and installation ($4,000) and a 3 HP pump ($700).

It is assumed that:

1. The water supplied to softener A would have a hardness of 60 ppm and must be softened to 30 ppm, a delta of 30 ppm. Salt for softening costs $0.349/1,000 ppm change or $0.01/m3. Pumping the 10 cubic meters per hour of water with the 2.2 KW pump will cost $0.01/m^3 for a total cost of $0.02 per cubic meter.

2. The water supplied to softener B would always have 400 ppm hardness with a softening cost of $0.377/m^3.

4.2.1. Payback Period:

Every year this system would save about $4,865. Softener A would operate with a running cost of $1.342/year versus $6,207/year for B. The payback calculated for the investment was 14 months.

4.2.2. Obstacles to Implementation:

The principal obstacle would be finding the space needed for the installation of a suitable tank. There seemed to be enough room on the floor below the air conditioning room. No other technical or economic obstacle was determined for the implementation of this recommendation.

4.2.3. Schedule of Implementation:

EP3 suggests that this recommendation be implemented simultaneously with the installation of the new air conditioner water softening system.

4.3. Improving Softener Regeneration and Service

The current dye-room softener system has three softeners, two of them with a capacity of 50 m^3 and a third with a capacity of 90 m^3. All of them treat well water. In the wash, regeneration, and rinse steps, the operators calculate the water hardness using a colorimetric method. Our studies concluded that the wash time is excessive, and that the point at which the softeners are regenerated is chosen solely on the basis of time since the last regeneration. These practices result in the loss of soft water.

We suggest the installation of a digital system to determine the rinsing and service hardness end-points. This could enable operators to determine the exact end point for the wash period and the maximal supply capacity of each softener.

Calculations:

We have determined above that soft water has a cost of $0.205/m3. The rinse period is 45 minutes with an average flow of 3.75 m^3/hr. It was determined that only 30 minutes of rinsing are necessary. In every rinse step, 938 lt of water are lost at a cost of $0.19. Assuming that the softeners are rinsed three times a day, we obtain:

$0.19 * 3 * 3 = $1.71/day
$1.71/day * 26 day/month * 12 month/year ≈ $533/year.

It was also determined that the service life of the softener, before regeneration, could be extended by 2 m^3/service. At 3 service cycles a day:

$\$0.205/m^3 * 2\ m^3 * 3 * 3 = \$3.69/day$
$\$3.69/day * 26\ day/month * 12\ month/year \approx \$1,150/year.$

The total savings from better monitoring of the softeners is therefore $1,680/year. A digital instrument with the proper characteristics has a cost of approximately $3,500 installed.

4.3.1. Payback Period:

The total savings are $1,680/year. The payback period is 2.1 years.

4.3.2. Obstacles to Implementation:

The obstacle is the lack of training needed for the workers operating the softeners. No other technical or economical obstacle was determined.

4.3.3. Schedule of Implementation:

EP3 suggests that this recommendation, depending on the priorities of the factory, will be implemented as soon as possible.

4.4. Reduce Suspended Solids in Effluent

EP3 suggests that 5 screens be installed in dye room drains (see Figure 1), with the objective of reducing the suspended solids level in Hitega's effluent. These screens should be constructed by making a slot of metal (channel) that would hold a frame in front of a parallel bar screen installed at the locations in Figure 1. That frame would contain a fine-mesh screen filter element and have a handle long enough to be easily accessible from above. When the screen clogged, it could be pulled from the slot by the handle, tapped on the ground to clear lint, and replaced.

4.4.1. Benefits:

If the screens were installed, there would be a reduction in suspended solids, sulphide and BOD_5.

4.4.2. Payback Period:

With the information that we have at present time, it is difficult to calculate the payback period of this investment of $600. It is possible that in the near future the plant will have to install an industrial waste water treatment system. Any decrease in loading will allow a reduction in waste water treatment plant initial investment and running cost.

4.4.3. Obstacles to Implementation:

The obstacles would be the training needed by the workers in system maintenance and cleaning. No other technical or economical obstacle was determined.

4.4.3. Schedule of Implementation:

EP3 suggests that this recommendation be implemented as soon as possible.

4.5. Improve Worker Training

During our study period, we noticed that the operators of the dye machines had different methods for operating each machine, despite the fact that a procedure sheet was supposedly being followed. Every time there was a shift change, the new operator switched to a different method, for example, increasing the number of rinsing steps or changing the timing for the different processes.

4.5.1. Benefits:

This phenomenon is due to the fact that worker training of workers is an "informal" process done by fellow workers. The actual training that the worker has on his machine and in the process is limited. Because of lack of process standardization, there are energy (steam), water and chemical losses.

4.5.2. Procedure:

It is suggested that training courses be established for the workers. These courses should be conducted by qualified people. As result of these courses, the processes of the factory could be standardized.

4.5.3. Payback Period:

With the information that we have at present time, it is very difficult to calculate the payback period of this investment. But we can conclude that the energy, water,and chemical costs will continue to increase without training.

4.5.3. Obstacles to Implementation:

At present time, the managers of the factory are fully occupied, therefore not allowing them to develop an adequate training course. However, with the help of the manager of each shift, a training course and an efficient system for working could be established.

4.5.3. Schedule of Implementation:

EP3 suggests that this recommendation be implemented as soon as possible.

4.6 Develop a Maintenance Plan for Steam Traps

During the period of our studies we discovered that there is no a plan for maintenance of steam traps, even though the factory has an ultrasonic tester for steam traps.

4.6.1. Benefits:

We estimate that heat transfer losses caused by leaking steam traps amount to between 10-15% of energy costs. These energy losses are due to steam trap failure or improper specifications. Using leaking steam traps not only wastes energy, but also results in inefficient dye bath heating and the cost of damage to steam lines, valves, fittings and other equipment.

4.6.2. Procedure:

It is suggested that a training course in the operation of ultrasonic equipment for the workers be established and a preventive plan for maintenance of steam traps be developed.

4.6.3. Payback Period:

With the information that we have at present time, it is very difficult to calculate the payback period of this investment. However, studies made in Chile by Universidad de Santiago (Eng. Pedro Cortéz Muñoz - 1994) concluded that the investment made to maintain and/or repair the steam traps is recovered, considering only the savings in energy, on an average of 2-3 months.

4.6.4. Obstacles to Implementation:

The obstacles are that at present time, the managers of the factory are fully occupied. This fact does not allow them to develop the adequate training course. However, with the help of chief of each shift, a training course and an efficient system for working could be established.

4.6.5. Schedule of Implementation:

EP3 suggests that this recommendation be implemented as soon as possible.

4.7. Recycling of Bleaching Process Rinse Water

During the bleaching process, there are approximately seven rinses of 4.05 minutes each, a total time of 30 minutes, with an average flow of 50 m^3/hr. For the jet-dyers with a capacity of 422 Kg, this represents a total 25 m^3 of soft water. The opportunity is to recycle these rinse waters and use them in the same process.

4.7.1. Calculations:

A bleach rinsing uses approximately 60 liters of soft water, worth $0.01 per kilo of product. We will ignore the value of the bleach chemicals in the calculations. Normally, bleaching is done in sequence. A 25 m^3 tank would be sufficient to store the rinse water of a batch and use it in the one that follows. A tank with this size would cost approximately $1,500. The piping and valves would cost approximately $700.

4.7.2. Payback Period:

With the information that we have at present time, we can say that it would be necessary to process 36 tons of bleached product to recover the initial investment of $2,200.

4.7.3. Obstacles to Implementation:

The obstacles would be the space needed for the installation of the adequate tank, development of an adequate training course for workers in system utilization, and adequate programming of bleach batches.

4.7.4. Schedule of Implementation:

EP3 suggests that this recommendation be implemented as soon as possible.

4.8 Improve Boiler Combustion Efficiency Monitoring

The combustion efficiency of the oil-fired boiler is not monitored continuously. Efficiency is measured by an outside contractor 4 times a year. We suggest the installation of a digital monitoring system at a cost of $ 1,000. With this kind of system, the efficiency of the combustion can be determined whenever parameters change, such as when a new lot of oil is received. It is also suggested that Mr. Kanterowitz contact Assler, a Santiago boiler equipment company, about their line of automatic combustion control systems.

4.8.1. Benefits:

Reduction in particulate matter emissions and decreased fuel use.

4.8.2. Payback Period:

The payback period will depend on the amount of combustible efficiency improvement. This amount could be calculated comparing the different operating periods. Each year Hitega spends $93,600 on number 5 fuel oil ($0.13/Kg, 60,000 Kg/month). One per cent of annual expenditures are for boiler fuel.

4.8.3. Obstacles to Implementation:

The obstacle is the lack of an adequate training course for boiler workers. No other technical or economical obstacles to implementation were determined.

4.8.4. Schedule of Implementation:

EP3 suggests that this recommendation be implemented as soon as possible.

4.9. Utilization of a Peaking Generator

During 1993, the factory paid a total $105,600 in maximum and peak demand charges. These charges are accrued for use of power during the 6-11 p.m. period. We suggest that Hitega consider the installation of a peaking generator for use during this period. The power generator could use fuel oil or gas.

4.9.1. Benefits:

Since Santiago's power comes from a base-load coal-fired power plant with supplementary power from hydroelectric sources, the net emissions effect of this change will be approximately zero. If a natural gas generator is chosen and uses bio-gas from the Santiago landfill, there may be a small net positive effect on emissions. Other textile plants in the Santiago area have noticed substantial reductions in net power cost after installing peaking generators.

4.9.2. Payback period:

Experience at other textile plants in Santiago indicate a payback of approximately 11 months. At the present time, we cannot calculate the size of the needed power generator. For reference we note that in Chile there are power generators available with the following characteristics:

Capacity (KWH)	Cost	Fuel	Fuel Consumption
75	$26,000	Natural gas*	Unknown
250	$29,000	Oil	40 lt/hr
500	$66,000	Oil	115 lt/hr
800	$101,155	Oil	209 lt/hr

*It is possible to find a power generator using natural gas with a bigger capacity.

4.9.3. Obstacles to Implementation:

The principal obstacle would be that a feasibility study is needed to select the proper power generator. For this purpose it is necessary to contact a specialist in energy generation. Other obstacles may be revealed by this study.

4.9.4. Schedule of Implementation:

EP3 suggests that this recommendation be implemented depending on factory manager priorities.

APPENDIX A

Industry Agreement

CONTRATO DE MUTUA COOPERACION
ENTRE
El Programa EP3 Y (EMPRESA)

Se celebra el presente Contrato con fecha 17 de Marzo de 1994, por y entre El Programa de Prevención de Contaminación (en lo sucesivo denominado "El Programa **EP3**") financiado por la Agencia de los Estados Unidos para el Desarrollo Internacional, (en lo sucesivo denominado como "USAID") en Chile, y que cuenta con el respaldo de la Cámara Chilena Norteamericana de Comercio A.G. (en lo sucesivo denominado como "AMCHAM"), y que recibirá asistencia técnica de RCG/Hagler, Bailly, Inc. como Contratista Principal (en lo sucesivo denominado como "**EP3**-HBI"), con sus oficinas situadas en la Cámara Chilena Norteamericana de Comercio A.G., Avenida Américo Vespucio Sur 80, piso 9, Casilla 82, Santiago 34, Chile, por una parte; y por la otra parte Industria HITEGA(GARIB) SA. (en lo sucesivo denominado "EMPRESA"); domiciliada en Rodrigo de Araya 951, Macul, Santiago, Chile;

Y

POR CUANTO "**EP3**-HBI" ha sido contratado por la Agencia de los Estados Unidos para el Desarrollo Internacional para que le proporcione al Programa **EP3** servicios de administración y apoyo técnico;

Y

POR CUANTO la EMPRESA manifestó su deseo de participar en El Programa **EP3**, de ejecutar un Estudio de Diagnóstico de Prevención de Contaminación y de implementar sus recomendaciones;

LAS PARTES VIENEN, EN VIRTUD DE LO EXPUESTO, A CONVENIR LO SIGUIENTE:

1.0 <u>RESPONSABILIDADES DEL PROGRAMA EP3</u>

1.1 El Programa **EP3** y EP3-HBI ejecutarán directamente y/o contratarán (sin costo para la EMPRESA) un análisis diagnostico de prevención de contaminación que será hecho por técnicos/expertos Chilenos asistidos por técnicos/expertos extranjeros, cuando sea necesario. Entre la primeras actividades del estudio diagnostico será establecer una base de referencia de las composiciones actuales de los efluentes de la EMPRESA.

1.2 El Programa **EP3** y EP3-HBI le enviarán a la EMPRESA, para su respectiva aprobación y consentimiento, un Alcance de trabajo recomendado para la EMPRESA.

1.9 El Programa **EP3** designa aquí al señor Mauricio Roldán como Coordinador del Proyecto, quien asume una responsabilidad contractual y operativa directa en virtud del presente Contrato.

El señor Roldán será también responsable de verificar el cumplimiento de las condiciones del presente Contrato.

2.0 RESPONSABILIDADES DE LA EMPRESA

2.1 La EMPRESA cooperará con los técnicos del Programa EP3, suministrará las informaciones técnicas, administrativas y contables, relacionadas a los procesos de fabricación necesarias para analizar los sistemas de producción. El objetivo de esto es identificar posibles cambios en ellos, en las materias primas (si es posible), en los productos químicos, en los controles de producción, y en otros variables para reducir la emisión de contaminantes, y que incidirá en el mejoramiento de la productividad y la rentabilidad operacional.

2.2 La EMPRESA también proveerá a los técnicos del Programa EP3 las informaciones, mediciones o datos relacionados a las actuales composiciones de los efluentes de nuestra EMPRESA y sobre proyectos de mejoramiento ambiental en ejecución o en planificación. En caso que no tengamos datos cuantitativos sobre la composición actual de efluentes, permitiremos que El Programa EP3 directamente o usando sub-contratistas de USA o Chilenos tome mediciones cuantitativas sobre la composición de los efluentes como parte del estudio diagnostico de prevención de contaminación.

2.3 La EMPRESA requiere que todos los datos confidenciales de procesos de propiedad de la EMPRESA, o datos relacionados a composición de efluentes que suministre, o cualquier información operacional o comercial que obtengan los técnicos del Programa EP3 en la EMPRESA, serán tratados con **máxima confidencialidad**, y que no serán divulgados a ninguna entidad Publica o Privada sin previa aprobación por escrito por parte de la EMPRESA.

2.4 La EMPRESA tendrá la última decisión y aprobación de cualquiera recomendación que haga el programa EP3, y por ende, la EMPRESA releva al Programa EP3 de toda responsabilidad legal relacionada a la implementación de las recomendaciones del Programa EP3 o de sus resultados.

2.5 La EMPRESA está de acuerdo con que el Programa EP3 inicialmente, tratará de identificar modificaciones que no impliquen mayores inversiones o costos.

2.6 La EMPRESA implementará las modificaciones identificadas y recomendadas por El Programa EP3, siempre y cuando estas, según evaluación de la EMPRESA, no sean perjudiciales a los productos, a los sistemas de producción, ni a las prácticas comerciales y de ventas.

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2.7 La EMPRESA permitirá que El Programa EP3 le de publicidad a los resultados de las innovaciones recomendadas por el Programa EP3, y permitirá que otras industrias con procesos similares se beneficien de las experiencias de nuestra EMPRESA, siempre y cuando esto no involucre procesos de propiedad de la EMPRESA, y que se puedan transferir a otras industrias del sector. Los resultados no serán divulgados a ninguna entidad Publica o Privada sin previa aprobación por escrito por parte de la EMPRESA. Esta divulgación de resultados se podrá hacer durante los dos (2) primeros años siguientes a la puesta en marcha e iniciación operativa de las modificaciones o aplicaciones, de forma que otras empresas puedan observar las tecnologías en operación. Estas visitas serán aprobadas por el Gerente de Proyecto de la EMPRESA, y se programarán de forma tal de minimizar perturbaciones en las operaciones de la EMPRESA.

2.8 La EMPRESA obtendrá también las licencias, permisos y otros documentos oficiales que puedan requerirse. La EMPRESA se encargará del pago de cargos locales. La EMPRESA será responsable del almacenamiento y de la seguridad de todos los instrumentos y/o equipos de los técnicos del Programa EP3 desde su llegada a ésta.

2.9 La EMPRESA se compromete a pagar los costos de implementación de la recomendaciones del Programa EP3 que sean aceptadas por la EMPRESA.

2.10 La EMPRESA accede a proporcionar personal operativo y de mantenimiento que esté capacitado para recibir entrenamiento para la Operación y Mantenimiento de los equipos, instrumentos o recomendaciones operacionales según lo soliciten El Programa EP3 y EP3-HBI o el consultor/contratista local que contrate El Programa EP3 para el Programa EP3. La EMPRESA tambien se compromete a promocionar una ética de Prevención de Contaminación que adoptará e implementará la siguiente politica ambiental formalizada, que incluirá a todo su personal:

> "Para la EMPRESA, la protección del medio ambiente tendrá máxima prioridad. Nuestro compromiso será eliminar o reducir la utilización de sustancias tóxicas y reducir al mínimo el uso de la energía y la generación de todo tipo de desechos, siempre que sea posible. Preferimos prevenir la contaminación en la fuente que controlarla y/o tratarla al final del proceso industrial. En los casos que no se puede evitar que haya desechos, trataremos de reciclar, de tratar o eliminar desechos por medios que reduzcan al mínimo los efectos nocivos para la atmósfera, las aguas y la tierra."

2.12 La EMPRESA proporcionará personal con capacidades técnicas suficientes para ejecutar las funciones de verificación o implementación que identifique El Programa **EP3**. Se le proporcionará toda la información disponible a Programa **EP3** que sea necesaria para formular sus recomendaciones.

2.13 Luego de la ejecución del presente Contrato, el personal técnico de la EMPRESA y del Programa **EP3** realizarán conjuntamente el seguimiento de los resultados. Se registrarán toda medida y parámetros necesarios, como ser las emisiones y los efluentes, para verificar la reducción de los efluentes y de las emisiones.

2.14 La EMPRESA designa al Señor Carlos Kanterovitz como su Gerente de Proyecto, quien asumirá las responsabilidades de revisión técnica de la EMPRESA en relación a la implementación del Programa **EP3**. El Gerente de Proyecto actuará también como enlace entre la EMPRESA y El Programa **EP3**/EP3-HBI y/o con los consultores/contratistas extranjeros o Chileno, que contrate El Programa **EP3** para este Proyecto.

2.15 La EMPRESA le proporcionará espacio de trabajo a los representantes del Programa **EP3** cuando éstos se hallen en la EMPRESA durante las fases de medición, implementación de las recomendaciones, y puesta en marcha de operaciones, y también durante el seguimiento de las implementaciones de las recomendaciones y las evaluaciones y/o mediciones de los resultados.

2.16 La EMPRESA conviene en participar, con otras firmas y con El Programa **EP3**, en la promoción de la "aplicación de tecnologías de prevencion de contaminación", asistiendo a seminarios y talleres.

2.17 La EMPRESA declara que ni El Programa **EP3** ni USAID ni EP3-HBI ni sus respectivos contratistas y sub-contratistas, serán responsables por ningún daño directo o indirecto, especial o consecuencial; incluyendo, sin que esta enumeración sea limitante, pérdida de energía, costo de reponer energía, imposibilidad de uso o pérdida de ganancias que pudiesen resultar de la implementación de recomendaciones emanadas de los Estudios Diagnósticos de Prevención de Contaminación o de cualesquier otros servicios prestados por El Programa **EP3**, por USAID o por EP3-HBI o por sus respectivos contratistas y sub-contratistas en virtud de este Contrato.

2.18 La EMPRESA declara que ni El Programa EP3 ni USAID ni EP3-HBI ni sus respectivos contratistas y sub-contratistas, serán responsable por daños personales, pérdidas o daños a la propiedad que pudiesen resultar de la Aplicaciones Técnicas descritas en este documento. La EMPRESA se compromete a indemnizar, a defender y a mantener libre de perjuicio al Programa EP3, a USAID y a EP3-HBI y a sus respectivos contratistas y sub-contratista por y ante cualesquier demandas, juicios o procedimientos provocadas por o relacionadas con cualquier acto o emisión en relación con la ejecución de los servicios objeto del presente Contrato.

2.19 Queda convenido que la EMPRESA procurará sus propios seguros como única medida paliativa ante daños personales, pérdidas o daños a la propiedad o ante cualquier otra pérdida o daño resultantes de o relacionados con la prestación de los servicios ejecutados por El Programa EP3, por USAID y por EP3-HBI y por sus respectivos contratistas y sub-contratistas en el cumplimiento del presente Contrato. La EMPRESA acepta liberar, por el presente instrumento, al Programa EP3, a USAID y a EP3-HBI y a sus respectivos contratistas y sub-contratistas, de responsabilidad por cualesquier pérdidas o daños que pudiese sufrir la EMPRESA por razones de cualquier clase que sean, en este respecto.

2.20 Se espera que la EMPRESA proporcione indemnización o cobertura a su propio sub-contratista, si lo hubiese, sobre cualquier equipo o instalación de instrumentos en el transcurso de sus prácticas normales de contratación, y que tales medidas puedan incluir cualesquier fuerzas mayores, retrasos, daños liquidados o garantías de cumplimiento que la EMPRESA pueda desear, pero se entiende también que tales medidas no involucrarán en forma alguna los resultados de cualesquier actos u omisiones del Programa EP3 ni de EP3-HBI ni de ninguno de sus contratistas y sub-contratistas.

3.0 <u>OBLIGACIONES FINANCIERAS DE AMBAS PARTES</u>

3.1 El Programa EP3/EP3-HBI o el consultor/contratistas extranjeros o Chilenos contratados por El Programa EP3 para este Proyecto, no tienen obligación financiera alguna para con la EMPRESA. En igual forma, la EMPRESA no tiene obligación financiera alguna para con el Programa EP3/EP3-HBI o el consultor/contratistas extranjeros o Chilenos contratados por El Programa EP3 para este Proyecto.

4.0 DURACION DE ESTE CONTRATO

4.1 Este contrato tendrá una duracion suficiente para efectuar los estudios diagnósticos descritos anteriormente, y para implementar las recomendaciones del Programa EP3, pero en ningún caso será mayor de un (1) año a partir de la fecha de la firma de este contrato. El período de duracion solamente podrá ser modificado por medio de un acuerdo formal por escrito, entre las dos partes.

5.0 DISPOSICIONES GENERALES

5.1 Honorarios Eventuales

A) La EMPRESA garantiza que no ha empleado ni le ha pagado a ninguna persona ni agente de ventas para que solicite u obtenga este Contrato en base a un contrato de entendimiento por comisión, porcentaje, corretaje u honorarios anticipados; a excepción de empleados de buena fe o de agencias comerciales o de venta establecidas que la EMPRESA mantenga para efectos de procurar negocios.

B) En caso de infringimiento o violación del presente Contrato, El Programa EP3 tendrá el derecho de detener todas las actividades sin contraer responsabilidad por ello.

5.2 Efecto Legal de la Aprobación y Decisión de USAID

Las Partes suscritas manifiestan entender que el presente Contrato reserva ciertos derechos para USAID, tales como (pero no limitándose a): el derecho de aprobar las condiciones del presente Contrato, y también la EMPRESA y cualesquier otras industrias, los informes, las especificaciones, los sub-contratos, los documentos de licitación, los planos u otros documentos relacionados con el presente Contrato, como también el Proyecto del que este Contrato forma parte. Las partes suscritas declaran también entender y aceptar que USAID, al reservarse cualesquiera o todos los derechos de aprobación mencionados, actúa únicamente como una entidad financiera para asegurar el uso adecuado de los fondos del gobierno de los Estados Unidos, y que cualquier decisión que USAID tome de ejercer o de abstenerse de ejercer tales derechos de aprobación, será en cuanto parte financiante en el curso del financiamiento de este Proyecto, no significando que USAID entre a ser una parte del presente Contrato.

Las Partes suscritas declaran entender y aceptar que USAID puede, de vez en cuando, ejercer los derechos de aprobación mencionados, o bien discutir materias relacionadas con tales derechos y con el Proyecto, ya sea con las partes en conjunto o separadamente, sin que por ello incurra en responsabilidad alguna ante las partes, ni en conjunto ni en forma separada. Cualquier aprobación (u omisión de aprobar) por parte de USAID no privará al Programa EP3 ni a EP3-HBI ni a USAID de ejercer sus derechos, ni liberará a la EMPRESA de ninguna responsabilidad que ésta pudiese tener, de no haber mediado tal ejercicio, ante El Programa EP3, ante EP3-HBI o ante USAID.

5.3 Inspección

La EMPRESA consiente en permitir acceso a los representantes autorizados del Programa EP3 y de USAID, en cualquier momento razonable, para que inspeccionen las instalaciones, las actividades y el trabajo relacionado con este Contrato, y también para que adopten medidas de trabajo y realicen pruebas durante la vigencia del presente Contrato.

5.4 Notificaciones

Cualquier notificación que entregue al Programa EP3/EP3-HBI tendrá validez y efectividad solamente si se emite por escrito y se entrega al coordinador del Programa EP3 o a la EMPRESA en las direcciones consignadas en este Contrato. Las notificaciones entrarán en vigencia al momento de su entrega o a la fecha consignada como efectiva, lo que ocurra primero.

5.5 Ley que Regirá

El presente Contrato se interpretará de acuerdo con las leyes de la República de Chile, y en caso de litigio, este se tramitará en la ciudad de Santiago.

6.0 COPIAS DE ESTE CONTRATO

6.1 Este documento se hará en cuatro originales, uno para el Programa EP3, uno para la EMPRESA, uno para AMCHAM y uno para EP3-HBI.

Se declara que las partes, por medio de sus representantes debidamente autorizados, están de acuerdo con las cláusulas de este contrato.

Por la EMPRESA	Por el Programa EP3
Nombre: FUAD GARIB AGUAD	Nombre: Eduardo S. Maal
Cargo: GERENTE GENERAL	Cargo: DEPUTY DIRECTOR
Firma:	Firma:
Fecha: 07.08.94	Fecha: 3/19/94