



LA NATURALEZA Y LA INDUSTRIA PUEDEN COEXISTIR

**INGENIERIA ESPECIALIZADA EN BIOTECNOLOGIA PARA
TRATAMIENTO DE DESECHOS LIQUIDOS & SOLIDOS INDUSTRIALES,
BIOREMEDIACION, DISEÑO Y REDISEÑO DE SISTEMAS DE
TRATAMIENTO**

TRATAMIENTO DE VINAZAS EN DESTILERIAS DE ALCOHOL



DESTILERIAS DE ALCOHOL & TEQUILA

CARACTERISTICAS DE LAS DESCARGAS

- **GRANDES VOLUMENES DE :**
- **VINAZAS (MOSTO)**
- **MATERIA ORGANICA E INORGANICA**
- **ALTAS TEMP. > 95°C**
- **MALOS OLORES**
- **ALTO NIVEL DE COLOR**
- **ALTO NIVEL DBO.**
- **ALTO NIVEL DQO.**



CONDICIONES DE OPERACIÓN CONVENCIONALES





AERONICS INCORPORATED

ENVIRONMENTAL LABORATORY DIVISION

Suite 315 Herald Bldg., 81 Muralia St.
Intramuros, Manila

Tel. No. 527-4334/E.C. No. 141-136
Telefax No. (632) 527-4

Client : CENTRAL FERMENTATION INDS. CORP.
Address : San Vicente, Apalit, Pampanga

Date : 02 Aug. '96
Ref. No. : 960746

TECHNICAL ANALYSIS REPORT

Sample Description : Fr. Sludge Fermenter
Method of Sampling : Composite

PARAMETERS	CONCENTRATION
	=====
COD , mg/l	149,985
pH , mg/l	3.66
Nitrogen , mg/l	1,665
Phosphate , mg/l	12,098
Conductivity, umhos/cm	49,995

	<u>BOD5, mg/l</u>
Grab Influent fr. Digester	46,384
— Grab Effluent fr. Digester	24,088
— Influent fr. Sludge Digester	37,496
Effluent fr. Sludge Digester	18,690
Sludge from Fermenter	90,000

Reported by

Mark Aileen A. Campomanes
MARK AIREEN A. CAMPOMANES
Analyst

INGENIERIA, DISEÑO & DESARROLLO

A- INGENIERIA

-  * Ingeniería Conceptual
- * * Ingeniería Basica
- * Ingeniería en detalle
- * Memorias
- * Desarrollo de Teccnologías
- * Diseño & Construcción



B - Desarrollo y Dirección de Proyectos :

- ✓ - Plantas de Tratamiento de Aguas Residuales Industriales, Municipales & Domésticas.
- Sistemas de Bio gas & Co Generación
- Administracion de construccion
- ü - Administracion de proyectos
- Puesta en Marcha



ü

C - Construcción :

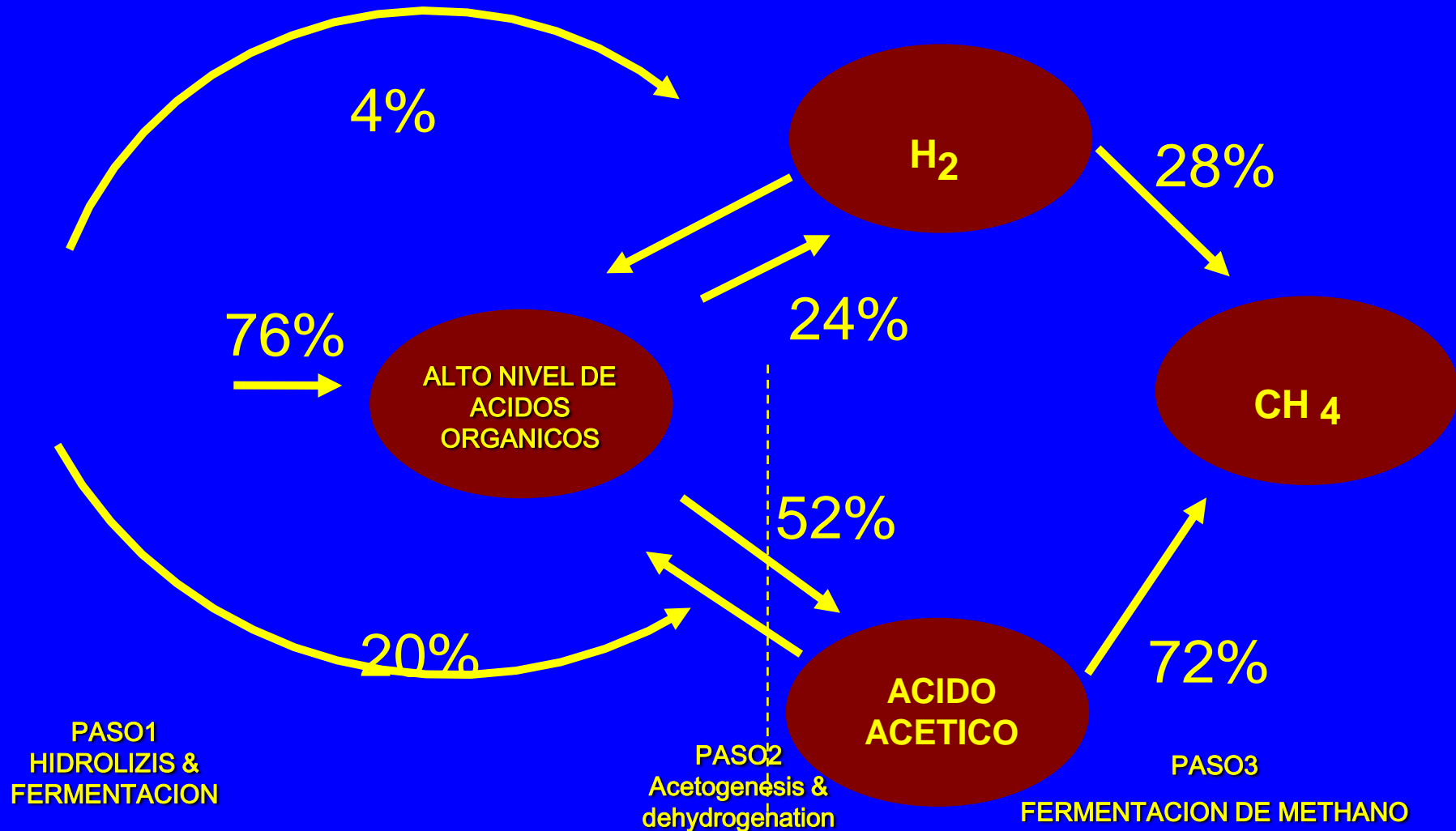
- Obra Civil
- ü - Movimiento de tierras
- ü - Cimentaciones
- ü - Estructuras metalicas
- Tanquería en acero .
- Tuberías



PROCESO TRAT. VINAZAS



PROCESO DE DIGESTION ANAEROBICO & FLUJO DE ENERGIA



DIGESTOR ANAEROBICO



TRATAMIENTO BIOLÓGICO SISTECO

ENTRADA AL DIGESTOR



SALIDA DEL DIGESTOR



RELACION VINAZA / M3. Vs PRODUCCION BIO GAS / Ft 3

1 Lt. Alcohol = 12 - 15 Lts Vinaza

1 Lt. Vinaza > 150.000 Mg. / Lt. DQO = 1.5 Ft 3 Bio Gas

1.000 Lts. Alcohol= 15.000 Lts. Vinaza = 22.500 Ft3. Bio Gas

Ref. Bio Gas Ft 3 Vs. Vapor saturado 150 PSIG.

16 Lbs. Vapor = 1 Lt. Alcohol

2.5 Ft 3 Bio Gas = 1 Lb. Vapor

40 Ft 3 Bio Gas = 1 Lt. Alcohol

40.000 Ft 3 Bio Gas = 16.000 Lbs. Vapor = 1.000 Lts. Alcohol

APORTE BIO GAS 7.080 LBS. VAPOR = 44.2 % - \$ 0.00

REF. COMBUSTOLEO Vs. VAPOR SATURADO 150 PSIG

1 Lt. Combustoleo = 33 Lbs. Vapor.

0.5 Lt. Combustoleo = 16 Lbs. Vapor = 1 Lt. Alcohol

16.000 Lbs. Vapor = 485 Lts. Combustoleo = 1.000 Lts. Alcohol.

Precio Combustoleo \$ 2.40 / Lt.

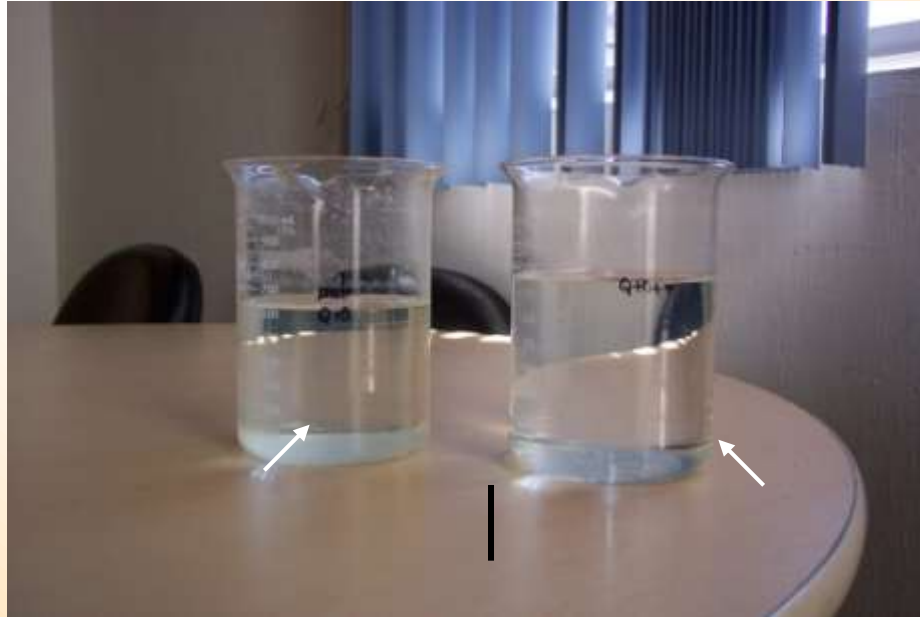
Costo producción vapor / cada 1.000 Lts. Alcohol. \$ 1.164.00

Costo ton. Vapor. **\$ 165.00/ Aprox.**

TRATAMIENTO QUIMICO SISTECO



PRODUCTO FINAL



ESCALA REMOCION DQO / PPM

DESC. DIGESTOR

57.000 PPM



TRAT. QUIMICO

1.500 PPM



POST
OXIDACION
400 PPM



FILTRACION
< 100 PPM



PHILLIPENES ALCOHOL DISTILLERY



AERONICS INCORPORATED

ENVIRONMENTAL LABORATORY DIVISION

Suite 215 Herald Bldg., 81 Marikina St.
Marikina, Manila

Tel. No. 527-4334 (C. No. 541)
Telex No. (633) 527

Client : CENTRAL FERMENTATION INDS. CORP.
Address : San Vicente, Apalit, Pampanga

Date : 02 Aug. '98
Ref. No. : 960746

TECHNICAL ANALYSIS REPORT

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BOD5, mg/l

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Grab Effluent fr. Digester	24,088
Influent fr. Sludge Digester	37,496
Effluent fr. Sludge Digester	18,690
Sludge from Fermenter	90,000

Reported by

Mary Aileen A. Campomanes
MARY AIREEN A. CAMPOMANES
Analyst



AERONICS INCORPORATED

ENVIRONMENTAL LABORATORY DIVISION

Suite 215 Herald Bldg., 81 Marikina St.
Marikina, Manila
Tel. No. 527-4334
TA No. 927-4291 (C. No. 141 12018)

CLIENT : CENTRAL FERMENTATION INDS., INC

DATE : 11 Oct. '98

ADDRESS : San Vicente, Apalit,
Pampanga

REF. NO. : 961014

TECHNICAL ANALYSIS REPORT

SAMPLE DESCRIPTION : Treated Wastewater

PARAMETERS	SAMPLE #1	DENR STD.
DOO, mg/l	40	-
COO, mg/l	93	-
TSS, mg/l	42	80
TDS, mg/l	750	1000
N, mg/l	7.3	-
P, mg/l	2.3	-
S, mg/l	108	-
Color, PCU	239	200 *
pH	7.18	6.5 - 8.0

REMARKS :

The parameters for TDS, TSS and pH passed the DENR Standard for Effluent Wastewater.

The results for BOD and Coliforme (Total & Fecal) to follow upon completion of analysis.

Report of technical analysis refers only to the sample submitted last 10 October 1998.

REPORTED BY:
Mary Aileen A. Campomanes
MARY AIREEN A. CAMPOMANES

ANALYST

Department of Environmental and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
DENR Compound, Fuzar Ave., Diliman, Quezon City
Tel. No. 929-6626 to 11 Oct. 2127, 2129

RESULTS OF PHYSICAL AND CHEMICAL ANALYSIS

SOURCE : Central Fermentation Industrial Corporation
ADDRESS : Apalit, Pampanga (via Region 3 DENR-EMPAS)
SAMPLED BY : CENRO Rolando Santos
DATE SAMPLED : Jan. 3, 1997
DATE RECEIVED : Jan. 3, 1997
DATE ANALYZED : Jan. 3, 1997
DATE REPORTED : Jan. 15, 1997

Laboratory Sample No.	Station Number	Type of Collection	Station Identification
97-002	1		Final Stage of Treatment

CHARACTERISTIC	STATION NUMBERS		
	1		
BOD ₅ , mg/L	195		
COO, mg/L			
Color Utrix (Apparent Color)	1250*		
pH	7.30		
Total Suspended Solids, mg/L	40		

REMARKS * yellowish

ANALYSTS:

TERESITA A. PERALTA

ARCELIE C. VIERNES

VICTORIA B. MALIHAN

CHECKED BY:

NEMTA L. TINOKO

Chief, Laboratory Services Section

NOTED BY:

EILA S. DEOCADIZ

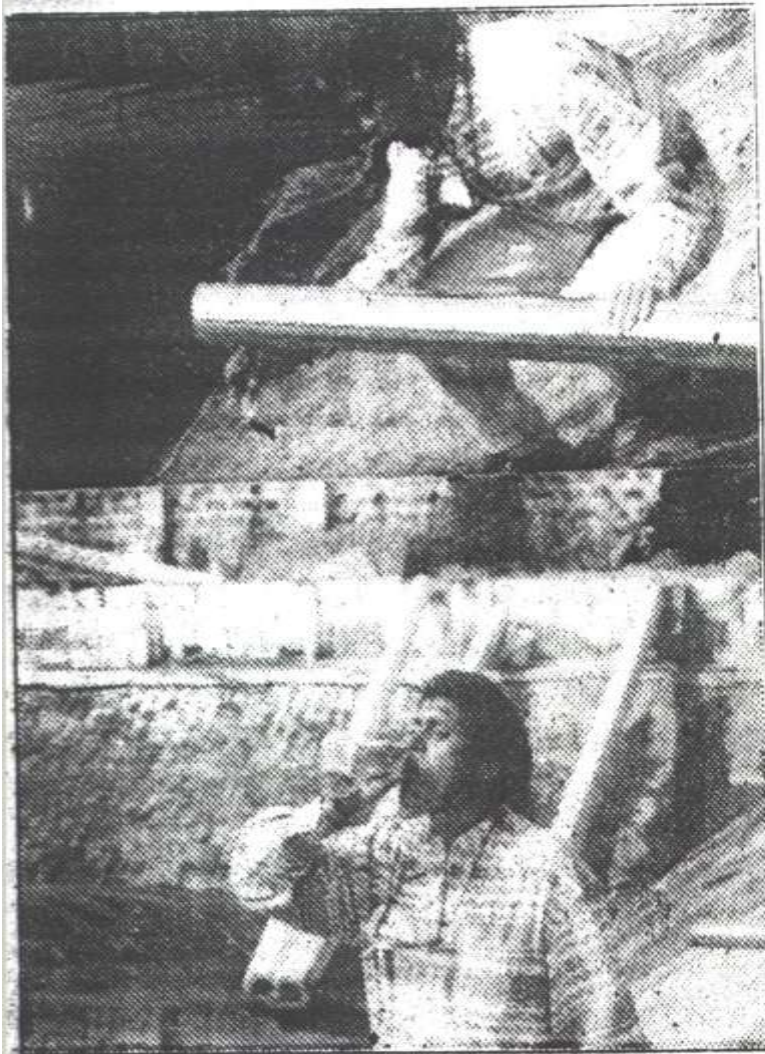
Chief, Research and Development Division

LEONITA D. BARTUNG
Head, Physical-Chemical Laboratory

LABORATORY CERTIFIED TRUE COPY

LAURE P. TADEO

CFIC inaugurates water treatment facility



THE CENTRAL Fermentation Industrial Corp. (CFIC), one of those alcohol makers accused of polluting the Pampanga River, has cleaned up its act with the inauguration recently of a modern P50-million waste water treatment facility in its factory in Apalit, Pampanga. Sistemas Ecologicos S.A. (Sistecos), a specialist "biotechnology" company based in Puerto Rico undertook the installation of the treatment plant. In a dramatic demonstration of the efficacy of the new system and to prove that the treated effluent that will be discharged from the CFIC compound is totally clean and safe, Juan Luis Rios (in photo),

the Sistecos chemical engineer who supervised the installation of the facility, takes a drink of water taken directly from the discharge outlet.

AROUND THE NATION

Waste treatment plant up

APALIT, Pampanga — The Central Fermentation Industrial Corp. (CFIC), one of the several alcohol making plants often accused by the environmentalists and fisher folks as major polluters of the Pampanga River, has made good its promise to protect the sensitive ecosystem of the river by inaugurating yesterday the P50 million waste water treatment facility in its factory here.

CFIC contracted the services of Sistemas Ecológicos S. A. (Sistecos), a specialist technology company based in Costa Rica, Mexico, and the United States. The firm replaced its old treatment with a modern waste water treatment facility using the latest technology to ensure that only clean treated water is dumped into the river.

In a dramatic demonstration of the efficacy of the new system and to prove that the treated effluent that will be discharged from the CFIC compound is totally safe and clean, Davy Lee, CFIC President Luis Rios of Sistecos and an environmental journalist took turns in drinking treated water taken from the discharged outlet as other journalists watched.

According to Lee, the Department of Environment and Natural Resources has ordered the company to put in place within 90 days an efficient process and facility to cure its waste water before it discharge into the Pampanga River which is the source of livelihood of many families living along its bank.

"It was a tough job to finish the whole treatment facility in just three months. We had shifts people working round the clock to meet the DENR deadline and we are glad we did it," said Rios, Sisteco chemical engineer who supervised the work at the factory.

Lee said the inauguration marked a positive, environmental turn-around in the company's existence. He assured the fishing and farming communities, the DENR, and the media that CFIC will be a true friend of the environment and an active partner in protecting, preserving and reviving the Pampanga River.

CFIC is one of the biggest fermentation firms in the country which manufactures alcohol yeast, vinegar and liquid coming from molasses, a by product of sugar making. The company counts several giant manufacturing corporations, like Del Monte, Nestle, San Miguel, Pepsi, Coke and CMC as clients. (Madelynn Dominguez)

Jul. 17 1997 02:18PM



DEPARTMENT OF
ENVIRONMENT AND
NATURAL RESOURCES



ENG. JUAN LUIS RIOS
Director, Research & Development
Sisteco S.A.
W.A. Mozart 5224 Col. La Estancia
Zapopan, Jalisco, Mexico C.P. 45030
FAX # (52-3) 629-4849

Dear Engineer Rios:

This is to acknowledge receipt of your letter dated 1 July 1997. The Department of Environment and Natural Resources (DENR) would like to thank you for your concern on the persisting problem with CFIC.

We are glad to know that you are willing to help us with this problem. We would greatly appreciate whatever proof you may have on CFIC's intentions to deceive the DENR on their efforts to abate the company's pollution problems. It is assuring to note that your company is sincere in its efforts to minimize pollution and uphold professionalism in your field of expertise.

I have assigned my assistant, Ms. Diane D. Eustaquio to coordinate with you on the matter mentioned above. Looking forward to your assistance for a more vigorous sense of environmental vigilance.

Very truly yours,


VICTOR O. RAMOS
Secretary

GUATEMA ALCOHOL DISTILLERY



DARSA LABORATORIO DE AGUAS RESIDUALES

Km. 00.0 Camino a Fagua, Sta. Lucía Cotz., Escuintla
Tel.: 802014, 802022, 802026 Fax: 802048
e-mail: chad@darson.com.g

REPORTE DE ANALISIS No. 042.02 PAGINA 1 DE 1

Empresa: Destiladora de Alcoholes y Ronas, S. A.
Responsable: Ing. Erick Aragón
Fecha: 03/06/2002

TRATAMIENTO BACTERIAS SISTECO S.A.

Tipo de muestra	Código	Fecha de muestreo	Fecha de Análisis
Columna Dest.	135300502	30/05/2002	30/05/2002

PARAMETRO	135300502	DIMENSIONALES
Temperatura	61	°C
pH	4.17	Unidades de pH
DOO	151150	mg O ₂ /L
DBO	73569	mg O ₂ /L
Nitrógeno total	660	mg N/L
Fósforo total	420	mg PO ₄ /L
Sulfatos	7100	mg SO ₄ /L
Sulfitos	520	mg SO ₃ /L
Cloruros	3530	mg Cl/L
Oxígeno Disuelto	0.23	mg O ₂ /L
Sólidos Totales	87800	mg/L
Sólidos Suspendedos Totales	3844	mg/L
Sólidos Sedimentables	0.3	ml/L
Potasio	8800	mg K/L
Calcio	1000	mg Ca/L

*Metodología utilizada: Standard Methods for the Examination of Water and Wastewater: APHA, MWWA, WEF. 19th edición: 1995.
Los resultados corresponden a las muestras tal y como fueron recibidas en el laboratorio.



DARSA LABORATORIO DE AGUAS RESIDUALES

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Responsable: Ing. Erick Aragón
Fecha: 03/06/2002

TRATAMIENTO BACTERIAS SISTECO S.A.

Tipo de muestra	Código	Fecha de muestreo	Fecha de Análisis
Chem. Digestor Anoxidante	134300602	30/05/2002	30/05/2002

PARAMETRO	134300602	DIMENSIONALES
Temperatura	30	°C
pH	6.92	Unidades de pH
DOO	9300	mg O ₂ /L
DBO	4150	mg O ₂ /L
Nitrógeno total	375	mg N/L
Fósforo total	710	mg PO ₄ /L
Sulfatos	6050	mg SO ₄ /L
Sulfitos	380	mg SO ₃ /L
Cloruros	1000	mg Cl/L
Oxígeno Disuelto	0.11	mg O ₂ /L
Sólidos Totales	15000	mg/L
Sólidos Suspendedos Totales	3072	mg/L
Sólidos Sedimentables	0.2	ml/L
Potasio	2250	mg K/L
Calcio	400	mg Ca/L

*Metodología utilizada: Standard Methods for the Examination of Water and Wastewater: APHA, MWWA, WEF. 19th edición: 1995.
Los resultados corresponden a las muestras tal y como fueron recibidas en el laboratorio.

Lidia Darlena Chea de Arévalo
Jefe de Aseguramiento de Calidad



DARSA LABORATORIO DE AGUAS RESIDUALES

Km. 00.0 Camino a Fagua, Sta. Lucía Cotz., Escuintla
Tel.: 802014, 802022, 802026 Fax: 802048
e-mail: chad@darson.com.g

REPORTE DE ANALISIS No. 041.02 PA

Empresa: Destiladora de Alcoholes y Ronas, S. A.
Responsable: Ing. Erick Aragón
Fecha: 03/06/2002

TRATAMIENTO QUÍMICO / TECNOLOGÍA SISTECO S.A.

Tipo de muestra	Código	Fecha de muestreo
Efluente de Reactor Anox. # 1	133300502	30/05/2002
Muestra Tratada con polimeros & Ozono (Filtrada)		
Efluente de Reactor # 1	134300602	30/05/2002
Muestra Tratada con polimeros & Ozono (Sin Filtrar)		

PARAMETROS

	133300502	134300602	DIMENSIONALES
Temperatura	25	25	°C
pH	8.40	8.37	Unidades de pH
DOO	45	4896	mg O ₂ /L
DBO			mg O ₂ /L
Nitrógeno total	5.9	8.5	mg N/L
Fósforo total	1.04	0	mg PO ₄ /L
Sulfatos	182	50	mg SO ₄ /L
Sulfitos	---	---	mg SO ₃ /L
Cloruros	73	172	mg Cl/L
Oxígeno Disuelto	17.35	66.0	mg O ₂ /L
Sólidos Totales	800	400	mg/L
Sólidos Suspendedos Totales	92	146	mg/L
Sólidos Sedimentables	0.0	0	ml/L
Potasio	15.8	158	mg K/L
Calcio	0	0	mg Ca/L
Silicio	32	0	mg Si/L

(*) El agua no puede contener el valor por ser más bajo.
Metodología utilizada: Standard Methods for the Examination of Water and Wastewater: APHA, MWWA, WEF. 19th edición: 1995.
La presencia de cromo en la muestra No. 134300602 puede ocasionar un procesamiento de algunos métodos.

Lidia Darlena Chea de Arévalo
Jefe de Aseguramiento de Calidad

DOMINICAN REPUBLIC ALCOHOL DISTILLERY



26 de noviembre, 2002

Señor,

Ing. Juan Luis Ríos / SISTECO S.A.

Después de saludarle, le remitimos los resultados del DQO, montado a las muestras de vinaza de la descarga del DIGESTOR ANAERÓBICO, usando las bacterias de SISTECO.

DQO DE ENTRADA 135.000 Mg / Lt.

5 (seis días posterior a la siembra) = SALIDA 17,700 mg/lt

8 (ocho días posterior) = 15,700 mg/lt

10 (diez días posterior) = 9,900 mg/lt

Esperamos, que tan pronto reciba, nos confirme, y estamos a la orden.

Atentamente,

Ing. Miledys Maldonado
Gerente Control de Calidad

BRUGAL & CO., C. POR A.
AV. JOHN F. KENNEDY 57
SANTO DOMINGO,
REPÚBLICA DOMINICANA.
TEL. (809) 585-5481
FAX: (809) 585-5344

BRUGAL & CO., C. POR A.
AUTOPISTA CUARTE KM. 119
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FAX: (809) 581-8282

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DESTILERÍA, S.P.A.
PROV. JOSÉ RÓDRIQUEZ NO. 1
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FAX: (809) 526-8848



Reporte de análisis de laboratorio.

Prueba de Tratabilidad descarga del Digestor.
" TECNOLOGIA SISTECO S.A."

Resultado análisis DQO - OCTUBRE 22, 2002

MUESTRA	1 ^{RA} CORRIDA	2 ^{DA} CORRIDA
Digestor (Descarga)	17,700 mg/l	17,000 mg/l
Trat. Químico y Físico	1,800 mg/l	1,000 mg/l
Ozonación	350 mg/l	278 mg/l
Filtración	100 mg/l	85 mg/l

Resultado análisis Microbiología a la filtración

MUESTRA	1 ^{RA} CORRIDA	2 ^{DA} CORRIDA
Coliformes	No crecimientos	No crecimientos
Lactobacilos	No crecimientos	No crecimientos
Strep / Staph	No crecimientos	No crecimientos

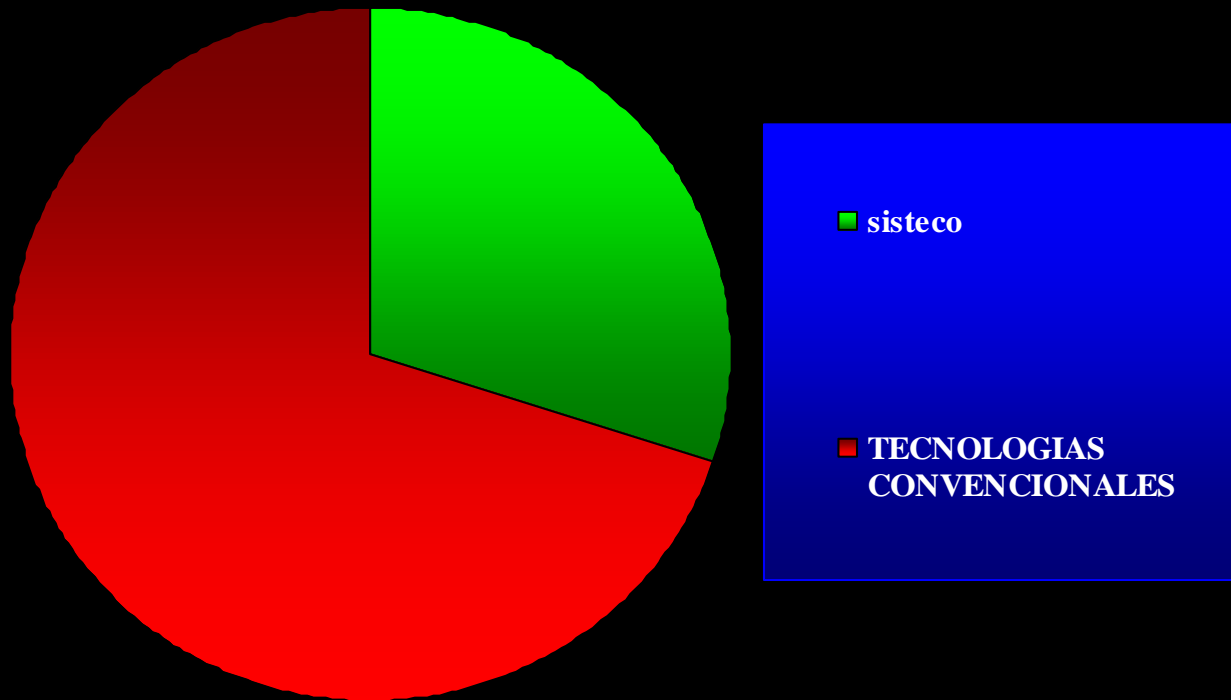
Resultado análisis al filtrado (agua)

ANALISIS	1 ^{RA} CORRIDA	2 ^{DA} CORRIDA	AGUA FERM
Ph	8.15	8.36	7.89
Dureza mg/Lt.	450	347	140
Conduct. us/cm	1,220	1,420	1,330
Cloruros mg/lt.	1,120	1,040	1,294
Alcalinidad P mg/lt.	0	0	0
Alcalinidad M mg/lt.	248	208	220

DESARROLLO CONSTRUC. & PUESTA EN MARCHA

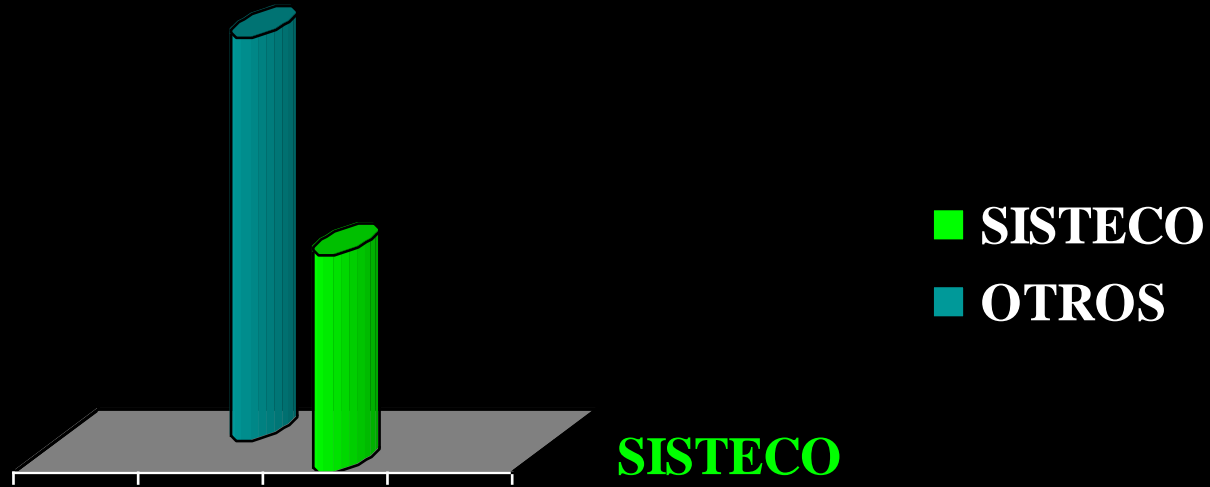


AREA REQUERIDA TECNOLOGIA SISTECO .



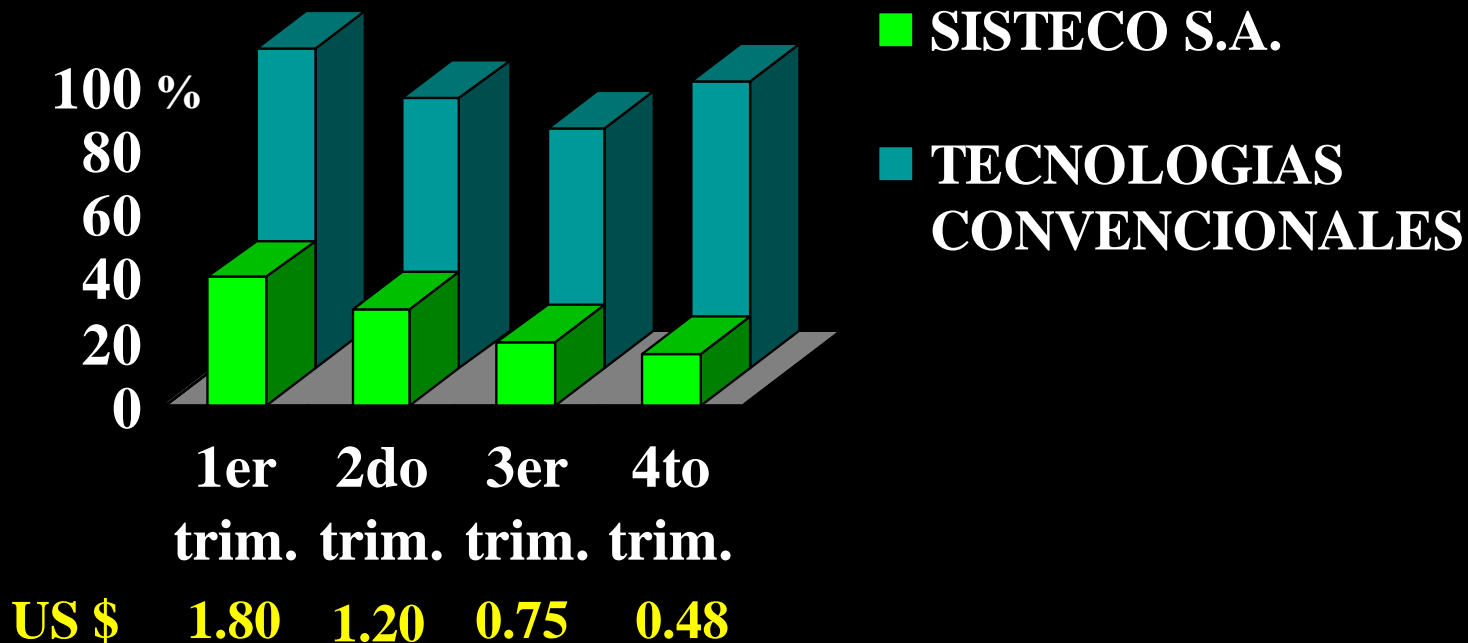
REF. COSTOS DE INVERSION

TECNOLOGIAS CONVENCIONALES



REFERENCIA DE COSTOS DE OPERACIÓN POR M3 / AGUA RESIDUAL TRATADA

REF:
US \$4 .00/ M3

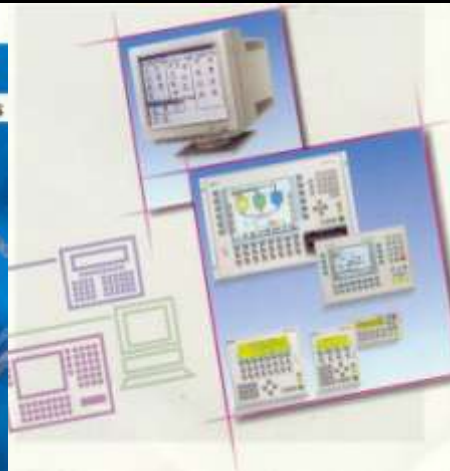


PANEL ELECTRICO MODULAR



AUTOMATIZACION PLC & SOFTWARE

Process and machine automation



ANTES



DESPUES



**APLICACIÓN EN
FERTIRRIEGO**



TECNOLOGIA SISTECO

BENEFICIOS:

- .- RECUPERACION Y REUTILIZACION DE LA AGUAS PARA .- UTILIZARSE EN CALDERAS, SISTEMAS DE ENFRIAMIENTO, RIEGO, LIMPIEZA, ETC.
- .- PRODUCCION DE GAS METHANO; A UTILIZARSE COMO COMBUSTIBLE ALTERNO EN CASA DE FUERZA.
- .- CONTROL TOTAL DE MALOS OLORES.
- .- REMOCION DE COLOR 99.5% .
- .- GENERAR ABONO ORGANICO; BASADO EN LOS DESECHOS SOLIDOS .
- .- AREA REQUERIDA < AL 50% CON RESPECTO A TECNOLOGIAS CONVENCIONALES.
- .- REDUCCION DE COSTOS POR CONSUMO DE ENERGETICO SOBRE UN 50 % .
- COSTO DE INVERSION < 50 % OTRAS TECNOLOGIAS.