

Assessment for a Systematic Approach in Adoption of New Technology

By: Ong, David Emmanuel S.
Professor: Shayan, Ebrahim

Outline

- I. Briefing of Aims
- II. The Company
- III. Customers
- IV. Manufacturing Process
- V. Data Collected
- VI. Accomplishments



Briefing of Aims

- Understand & describe the System
- Quantify collected data
 - Required integration with courses
- Interview the staff
- CO₂ Quality - 33 parameters

• 0.03% Atmosphere

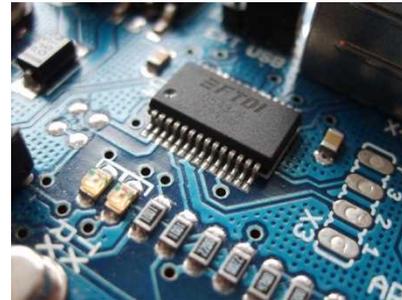


PCC Philippines

- Established: **1962** ≈ 52yrs
- Manufacturing and Retail CO₂
- ISO 9001:2008 QMS
- FSSC 22000 PAS 220 Certified
- Food and Beverage Industry



Customers

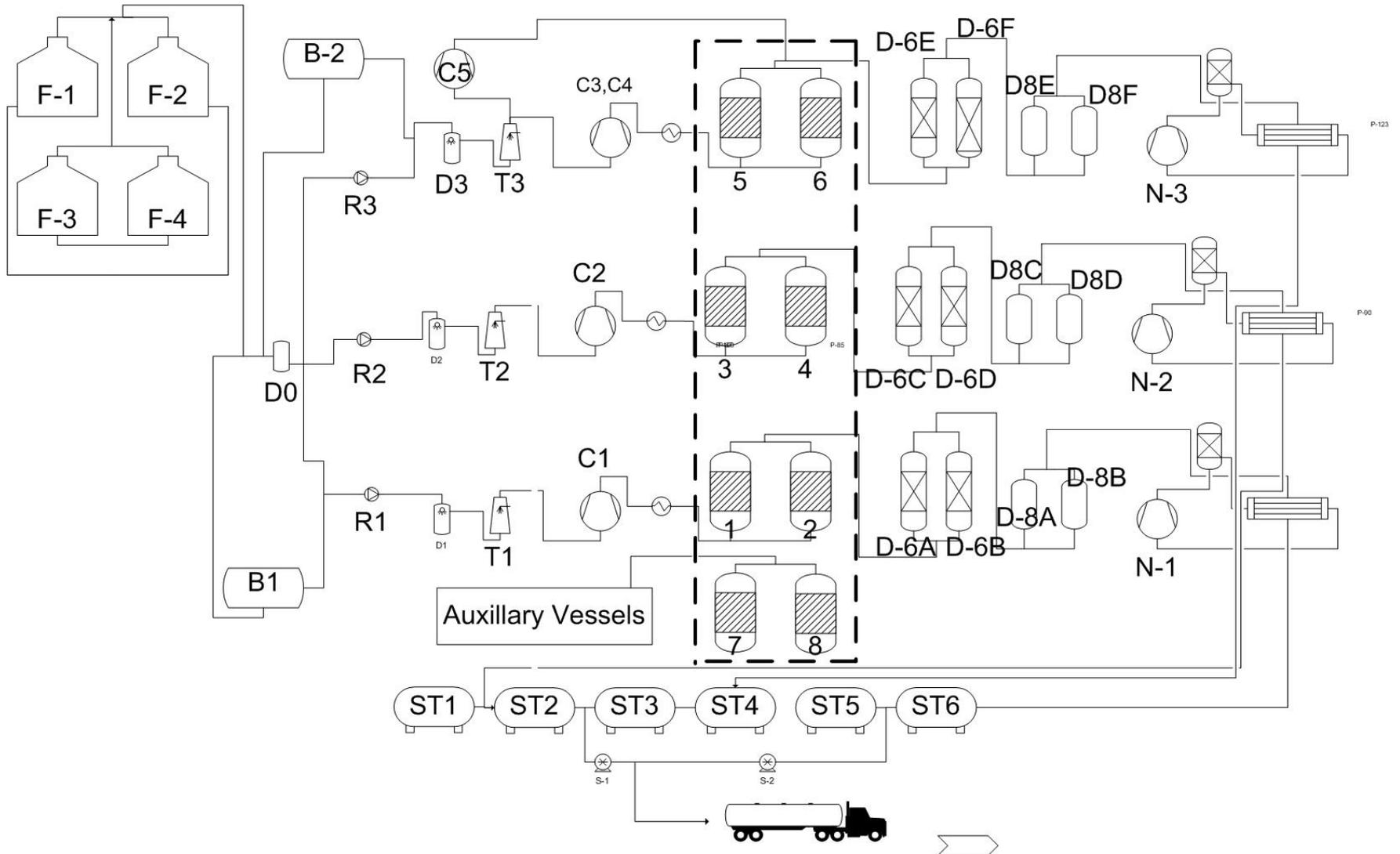


Manufacturing CO2

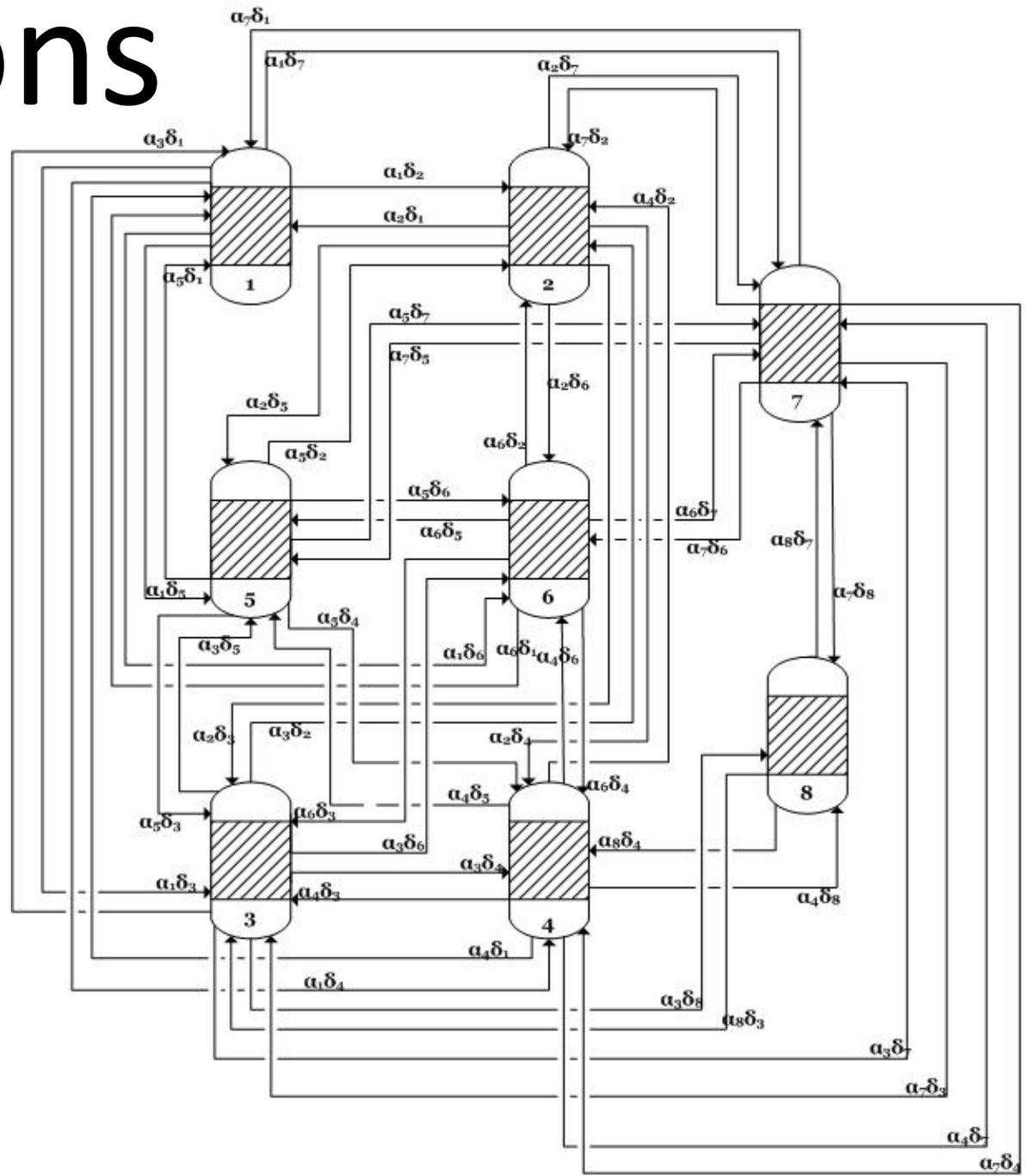
- Operation time: **24hours, 365 days**
- Plant: 14 Personnel
- 3 Lines
- Raw material:



Process



Relations



States

D-5 ON-LINE VESSEL SERVICE HOUR

Line 3

2011

Date	Vessel ID	Date		Service Hours	Reg'n Hours				Prod's (Tons)
		Start	End		Steaming	Hot Air	Cooling	Total	
1/2/2011	A	11941.07	11961.82	20.75	10.00	17.50	8.20	36.10	7.00
1/4/2011	B	11961.82	11996.85	35.03	10.00	16.42	6.00	32.42	12.00
1/6/2011	A	11996.85	12058.23	61.38	10.00	18.10	8.30	36.40	28.00
1/9/2011	B	12058.23	12103.58	45.35	10.00	18.25	6.00	34.25	17.00
1/11/2011	A	12103.58	12145.57	41.99	10.00	21.30	13.00	44.30	14.00
1/12/2011	A	39415.09	39420.31	5.22					3.50
1/13/2011	B	12145.57	12190.85	45.28	10.00	15.50	8.45	34.35	18.00
1/16/2011	A	12190.85	12246.60	55.75	10.03	17.02	11.00	38.05	20.00
1/20/2011	B	12246.60	12293.64	47.04	10.00	15.45	4.19	30.04	19.00
	B	13656.14	13660.79	4.65					2.00
1/24/2011	B	12293.69	12327.35	33.66	10.00	11.35	0.00	21.35	16.00
1/25/2011	A	12327.35	12383.05	55.70	10.00	13.50	8.00	31.50	20.00
1/28/2011	B	12383.05	12421.09	38.04	10.00	8.00	5.00	23.00	17.50
1/29/2011	A	12421.09	12482.65	61.56	9.20	18.10	8.05	35.35	28.50
2/2/2011	B	12482.65	12514.52	31.87	10.00	16.50	5.37	32.27	15.00
2/3/2011	A	12514.52	12567.47	52.95	10.00	17.20	6.00	33.20	20.00
2/5/2011	B	12567.47	12603.06	35.59	13.55	17.00	9.00	39.55	16.50
2/7/2011	A	12603.06	12654.18	51.12	9.55	17.10	8.00	35.05	19.50
2/9/2011	B	12654.18	12700.55	46.37	10.00	15.15	9.00	34.15	18.00
2/11/2011	A	12700.55	12753.09	52.54	11.00	16.10	8.10	35.20	21.00

Idle

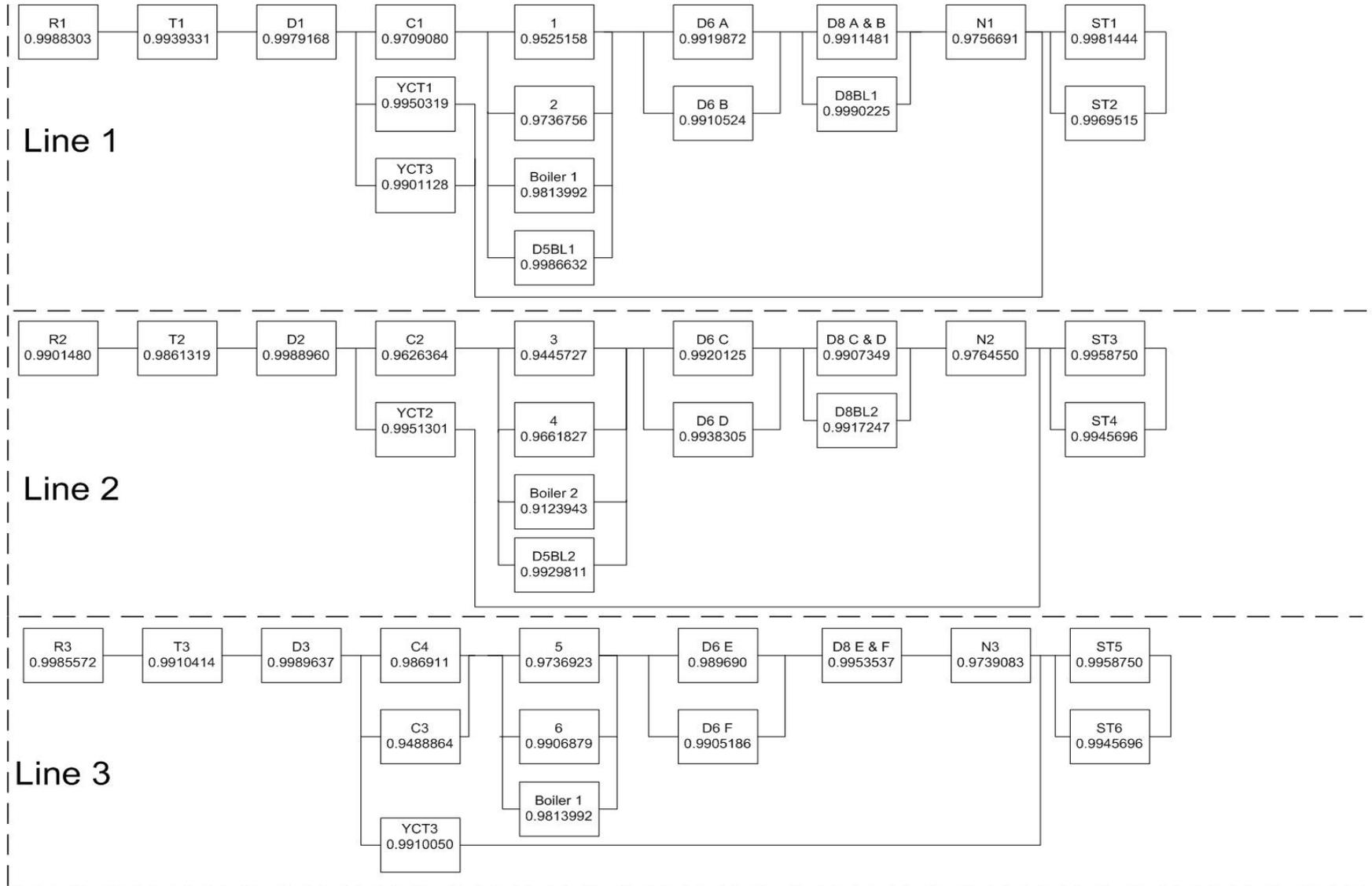
Idle

Date	Hours	Status
1/21/2012	174.25	opn-idle;low raw gas maintenance work
1/28/2012	21.83333	opn-idle;LRG
1/29/2012	21.75	opn-idle;unusual heat on raw gas blower
1/31/2012	7.75	opn-idle;power interruption
2/13/2012	4.833333	opn-idle;checked the suct/disch valves of C2
2/20/2012	125.8333	opn-idle;LRG maintenance work
3/6/2012	5.25	opn-idle;high temp C2 1st stage/replaced elbow on C2 heat exchanger
3/13/2012	110.9167	opn-idle;LRG maintenance work on L2
3/18/2012	4.5	opn-idle;replaced valve seat (disch) 1st stage
3/21/2012	21.66667	opn-idle;low raw gas
3/22/2012	33	opn-idle;LRG
3/31/2012	2.5	opn-idle;LRG
4/4/2012	0.5	opn-idle;LRG
4/10/2012	4.583333	opn-idle;LRG
4/12/2012	25.83333	opn-idle;LRG

Repair of Modules

AMMONIA COMPRESSOR						CO2 COMPRESSOR C2						WATER SCRUBBER					
Line 2						Line 2						Line 2					
Date Start	Time	Date Finishe	Time	Total	WORK DONE	Date Start	Time	Date Finishe	Time	Total	WORK DONE	Date Start	Time	Date Finishe	Time	Total	WORK
2/6/2011	0900H	2/6/2011	1000H	1	Cleaning of condensers, oil purging	1/16/2011	0800H	1/16/2011	1700H	9	Cleaning of heat exchanger, motor greazing, checking v-belts	1/16/2011	1600H	1/17/2011	0600H	14	Cleaning of internal shell
3/8/2011	0900H	3/8/2011	1900H	10	cleaning of condensers, oil purging, E3/oil separator	3/8/2011	0900H	3/8/2011	1400H	5	Changed oil, cleaning of oil cuno filter, suction/disch. Valves	#####	1600H	3/19/2011	0500H	13	Cleaning of internal shell
4/20/2011	0800H	4/22/2011	1600H	56	Replaced needle bearing of piston #3 and 6	3/8/2011	0900H	3/8/2011	1600H	7	Cleaned internal section of crank case, clean oil filter, replaced gasket	#####	0900H	4/22/2011	0800H	23	Chemical circulating, cleaning
5/30/2011	0900H	5/30/2011	1600H	6	Cleaning of condensers	3/8/2011	0800H	3/19/2011	2200H	36	replaced piston ring (1st & 2nd stage), guide ring (1st & 2nd stage)	#####	0900H	7/28/2011	1600H	31	Cleaning of internal shell
7/7/2011	0900H	7/7/11	1600H	6	Cleaning of condensers, oil purging of E3	3/27/2011	0900H	3/27/2011	1500H	6	Replaced set screw aluminum cover 2nd stage	#####	1500H	9/25/2011	0600H	15	Chlorine recirculation, clean
10/1/2011	1400H	10/1/2011	1500H	1	Replaced v-belts (c-168)	4/22/2011	0900H	4/22/2011	1600H	7	Cleaning of heat exchanger, suction filter	11/4/2011	0030H	11/4/2011	1400H	13.5	Cleaning of internal shell
12/10/2011	0800H	12/12/2011	1600H	32	replaced the condenser (small) oil purging c3, cleaning condense	5/18/2011	1000H	5/18/2011	1700H	7	Replaced garlock gasket, oil ring	#####	1600H	1/26/2011	0800H	16	Cleaning of internal shell
1/26/2012	1600H	1/29/2012	1400H	70	replaced valves, cleaning of condensers, oil cuno filter, suction fill	5/19/2011	0900H	5/19/2011	1900H	16	Replaced valve plates, piston ring, guide ring	#####	1930H	3/23/2012	0730H	12	Cleaning of internal shell
1/26/2012	0900H	1/26/2012	1700H	8	Cleaning of condensers, oil purging c3	5/19/2011	0900H	5/19/2011	1300H	4	Cleaning of oil cuno filter, motor bearing greazing, checked v-belts	#####	1600H	4/13/2012	0000H	8	Cleaning of internal shell
2/13/2012	1550H	2/13/2012	1710H	1.2	malfunction of 3V #1,2,3. Replaced 10 amp. Protection fuse 2 pc	7/27/2011	1000H	7/27/2011	1600H	5	Changed oil, replaced v-belts	#####	0900H	7/26/2012	2100H	12	Cleaning of internal shell
4/24/2012	0900H	4/24/2012	1600H	6	Cleaning of condensers, oil purging	8/2/2011	0900H	8/2/2011	2200H	13	Replaced piston ring 3 pcs, gasket	#####	0200H	10/17/2012	1400H	12	Cleaning of internal shell
7/7/2012	0800H	7/10/2012	1900H	83	Replaced micro-switch of low level float, c3 colanoid valve coil	8/3/2011	1800H	9/1/2011	0100H	7	Cleaning of intercooler/heat exchanger	#####	0200H	11/5/2011	1100H	9	Cleaning of internal shell
					solenoid valve of sub-cooler, replaced wiring	9/2/2011	1400H	9/2/2011	1530H	1.3	Replaced valve spring, valve seat	#####	1000H	2/26/2011	0600H	20	Cleaning of internal shell
10/17/2012	0800H	10/19/2012	1800H	58	Replaced needle bearing, oil ring, piston ring	11/3/2011	2100H	11/4/2011	1700H	20	Replaced guide ring, piston ring						
11/20/2012	0930H	11/20/2012	1045H	1.15	Replaced v-belt (c-168)	12/14/2011	0800H	12/15/2011	1700H	32	replaced piston ring, guide ring piston rod carbon packing 2nd stage						
12/31/2012	1300h	12/31/2012	1400H	1	Replaced v-belts (c-168)	12/1/2012	1100H	12/1/2012	0000H	13	Cleaning of H2O head jacket, H.E., checked v-belts	failure rate	9E-04	13			
4/30/2013	0900H	4/30/2013	1600H	6	Replaced double collar oil ring	2/13/2012	1000H	2/13/2012	1400H	4	Replaced 1 pc. Valve plate of disch. Valve	mean time	1086				
5/13/2013	1000H	5/13/2013	1700H	7	Cleaning of Condensers	2/14/2012	1900H	2/15/2012	1600H	21	Replaced guide ring, piston ring, oil ring	mean time	15.27				
						2/21/2012	0900H	2/21/2012	1600H	7	Replaced valve cover o-ring, checked/cleaned suction, disch. Valve	Service Av	0.986				
	2010	7130.22				3/6/2012	1100H	3/6/2012	1600H	5	Replaced o-ring, checked 1st stage suction & disch. Valves						
	2011	7613.64				3/13/2012	1000H	3/20/2012	1400H	172	Replaced 1 pc. Guide ring, 2pcs. Piston ring, changed oil	2010	7130				
	2012	6501.32				5/4/2012	1100H	5/5/2012	0200H	15	Cleaning of H.E., motor bearing greazing, checking v-belts	2011	7614				
failure rate	0.001	15.00				5/15/2012	1300H	5/15/2012	1800H	5	Replaced gasket	2012	6501				
mean time before failure	341					5/24/2012	0900H	5/24/2012	1200H	3	Changed oil						
mean time to repair	22.63					5/29/2012	0055H	5/29/2012	0700H	6.05	Replaced 2nd stage suction valve plate						
Service Availability	0.976					6/14/2012	1000H	6/14/2012	1600H	6	Checked/cleaned suction, disch. Valves						
						7/13/2012	0900H	7/13/2012	1200H	3	Changed oil						
						8/16/2012	0800H	8/17/2012	1700H	32	replaced piston ring, guide ring, moisture trap, cylinder head gasket						
						9/7/2012	0900H	9/7/2012	1400H	5	Cleaned intercooler						
						9/7/2012	1000H	9/7/2012	1600H	6	Replaced circuit breaker 300 amp.						
						#####	2000H	10/19/2012	1700H	32	Change 3 pcs. Piston ring (2nd stage), changed piston rod packing						
						#####	0800H	10/23/2012	1700H	9	Replaced guide ring 1st stage, replaced piston ring						
						11/12/2012	0900H	11/12/2012	1600H	7	cleaning of intercooler 1st stage						
						11/15/2012	0900H	11/15/2012	1600H	7	checked v-belts, cleaning of tubes						
						11/18/2012	0900H	11/18/2012	1400H	5	Replaced 1 pc valve plate 2nd stage						

Accomplishments



Inventory

	Equipment Part	C_o	D	C_c	Q_{opt}	O_c	TC	d	R
Deodorizer	pellets	360	2400	0.75	1518	231	1138	2	441
<p>C_o = per order cost, (US\$) D = demand per year of the unit, (kg) C_c = carrying cost, (US\$/kg) Q_{opt} = optimum quantity to be ordered, (kg) O_c = order cycle time, (days) T_c = total cost, (US\$) d = number of orders per year, R = reorder level, (kg)</p>									

Simul8

