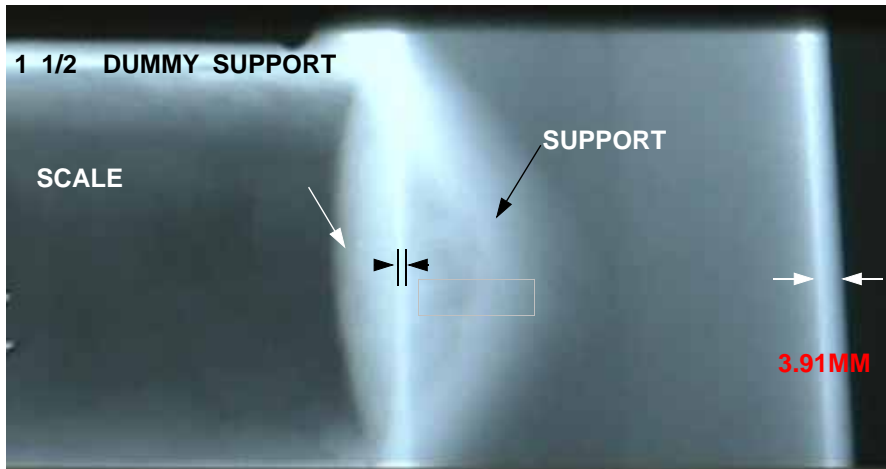
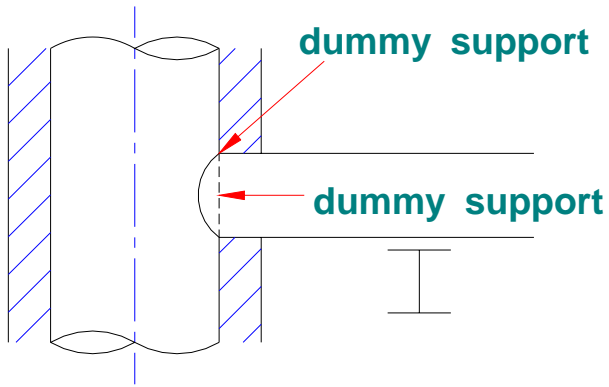


Technology & Services for U



(On-Stream Inspection)



(On-Stream Inspection)

(Infrared Thermography)

Panel , 154 KV

Service

Heater, Boiler Reformer Tube Hot Spot

(Saving)

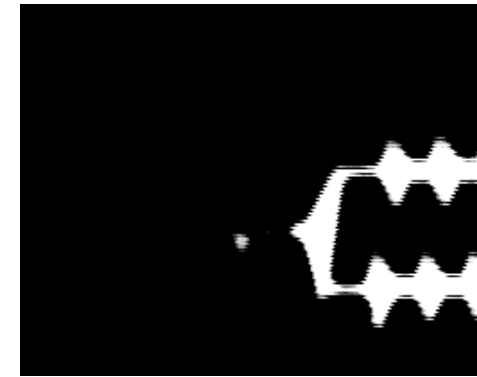
(On-Stream Inspection)



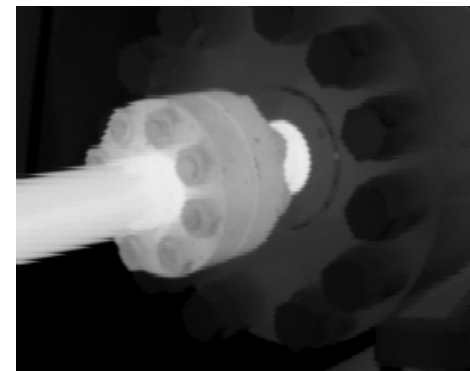
Panel内
MC



Fired Heater



Reactor



Compressor

(Shut-Down Inspection)

(Turn Around Inspection)

Service

(Turn Around)

(Column, Vessel, Heat Exchanger, Tank, Heater)

(Replication & NDT)

, Trouble Shooting

(Failure Analysis)

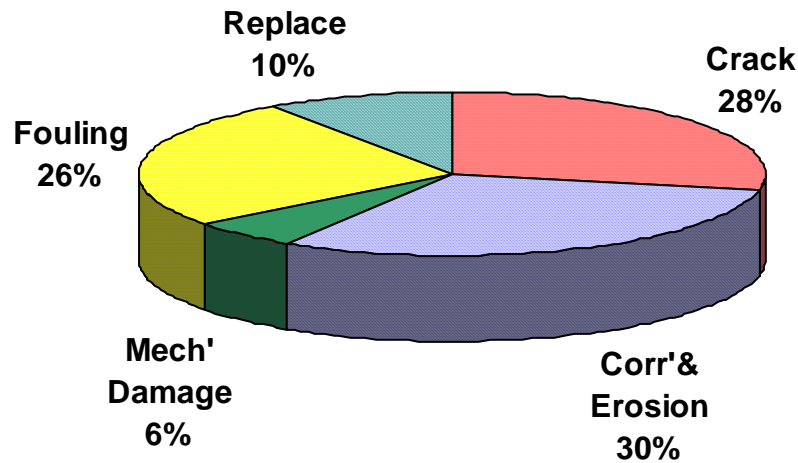
(SEM),

(Shut-Down Inspection)

()

: item

	Tower	Vessel	H/EX.	Heater Boiler	Tank	Total	
1993	71	261	322	17	8	679	
1995	62	286	372	19	23	762	
1997	74	288	322	24	13	721	
1999	24	71	151	13	1	260	PX
2000	76	245	343	22	20	706	
2002	24	69	134	13	0	240	PX
2003	77	335	453	23	9	897	
	408	1,555	2,097	131	74	4,265	



	Crack	Corr' & Erosion	Mech' Damage	Fouling	Replace	Total
1993	34	46	26	36	0	142
1995	60	54	9	19	3	145
1997	69	82	7	35	10	203
1999	39	17	4	45	2	107
2000	83	80	6	76	22	267
2002	26	59	10	79	21	195
2003	89	107	17	79	81	373
Total	400	445	79	369	139	1432

(Shut-Down Inspection)

	Cracking Heater/Reformer
--	--------------------------

, , Creep, Bowing

Service

Radiant Coil (, Bulging, bowing, Creep)

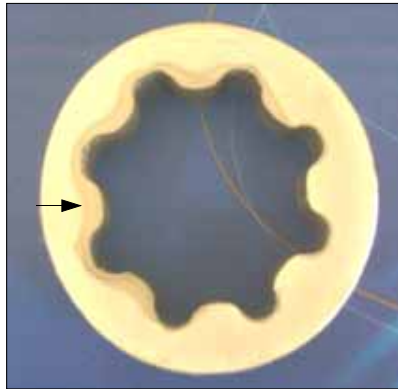
Radiant Coil (Coil)

Radiant Coil WPS

COT Thermowell Boss Erosion

Convection Tube Fouling

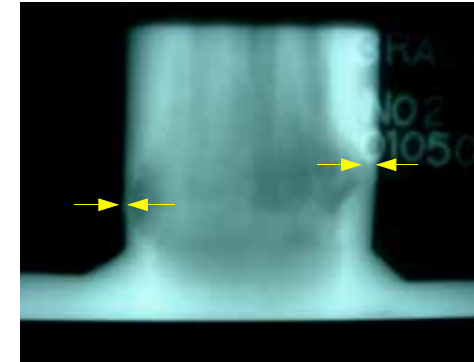
(Shut-Down Inspection)



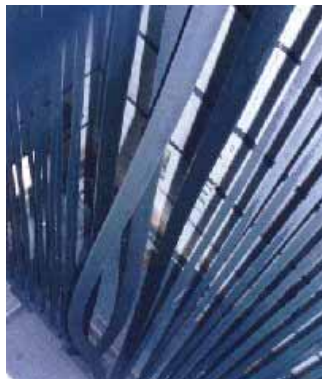
Carburization
: 2.5MM



Radiant Coil
Hot Spot Damage



Radiant Coil
Melting



Radiant Coil
Bowling



Radiant Bottom
Manifold Erosion



Thermowell Boss
Erosion

(Shut-Down Inspection)

Heat Exchanger Tube

1,800 rpm

(45°)

가

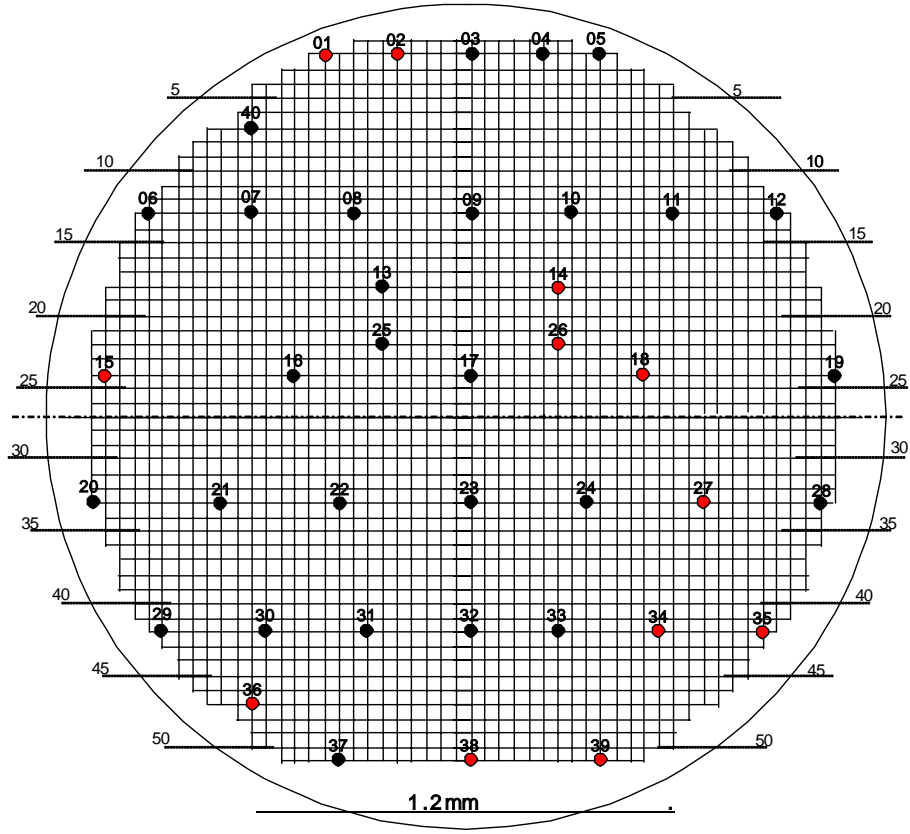
B-scan

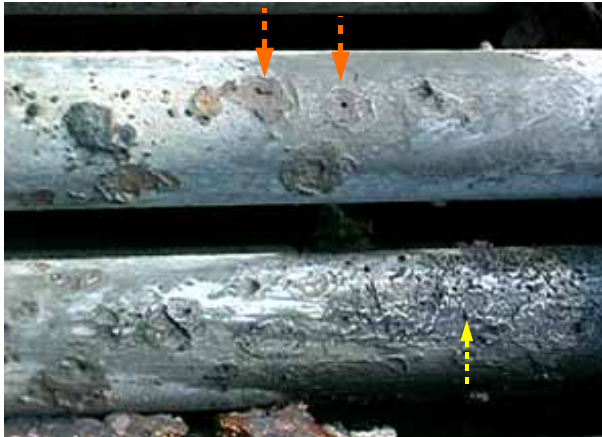
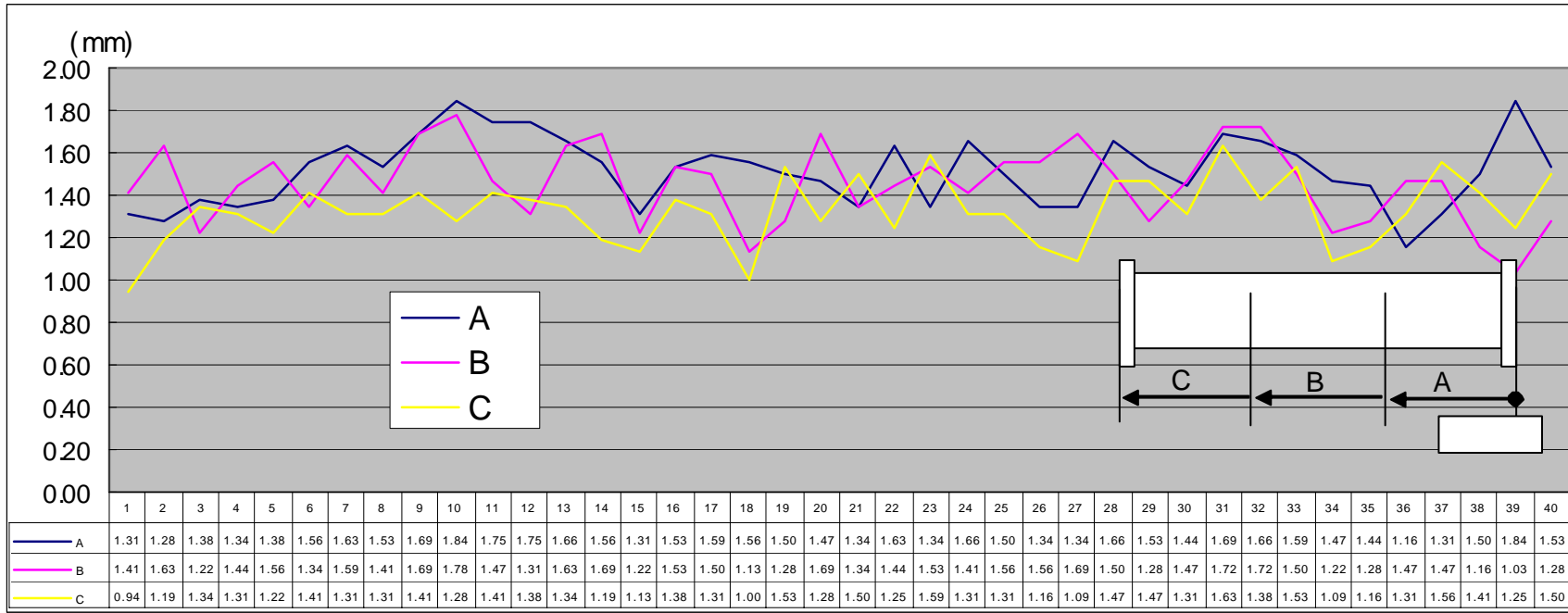
- : 30 (12.2 mm ID ~ 63.5 mm OD)
- : 2.54 m/min
- : Hydro Blasting(900 x 1000 Bar, 150 /min)



()	IRIS 9000		I-03-05-18	
	TUBE		()	
	C1-EA113		2ND EXTRACTOR CONDENSER	
	H-AES	A179	2.1 mm	
	3/4"	19.1 mm	6000 mm	
	Straight	TB PASS	1 PASS	FIN
	2200	40		
	TUBE:	C4 H.C	SHELL:	
	TUBE:		TUBE:	kg/cm ²
	SHELL:		SHELL:	kg/cm ²
	(MWT)	0.94 mm	N/A Years	
		1.16 mm	2.06 mm	
		N/A mm	N/A Years	
	(MPY)	N/A mm/Year		
【RECOMMENDATION】				
1. TUBE , MIN. WALL TH'K() .				
2.				
1) Tube :Pitting Corrosion .				
	1.2mm	Tube No.		
	01	0.94mm	27	1.09mm
	02	1.19mm	34	1.09mm
	14	1.19mm	35	1.16mm
	15	1.13mm	36	1.16mm
	18	1.00mm	38	1.16mm
	26	1.16mm	39	1.03mm
2) Tube :				
	IRIS 9000		15MHz	
	5930	m/s	1800rpm	40psi
	2.0 ± 1	m/min	TUBE	TUBE
	20 ± 10		WATER JET CLEANING	
	31-May-00		J.Y.LEE	

C4-EA113 TUBESHEET





Tube Deposit Tubercle Mud Fouling
 Pitting Corrosion ()
 General Corrosion ()



Tubel Fouling Deposit Tubercle Mud
 Pitting CORROSION

(Inspection Period)

	40~80			6 10 14 16
	40~80 & 40~-30			8 14 18
	-30			10 16 20
SR	Al-Killed (41kg/cm ² , 25mm)	(MT) (MT) (MT) (UT)		6 6 6 6

(Inspection Period)

Creep Temper	(350)	(MT) (Replication)	(HAZ)	6
	()	(UT)		10
	&	(MT) (PT)	(HAZ)	10
(SCC)	Stainless Steel(CI-,S)	(PT)		6
	(NaOH, Amine)	(MT)		6
	Austenitic Stainless Steel & Aluminium	(PT)		6
-	Austenitic Stainless Steel(500)	(PT) (Replication)		8
		(Replication)		12

(Project Supervising)

Complex

Maintenance

Plant



Service

(Shop Inspection)

Boiler, Heater

Cracking Heater

Maintenance Supervising

Inspection & Diagnosis Services

Process

Service

Trouble Shooting



Inspector

	()				
1	(18)		() Complex : 1986.6~1989.6 : 1989.6~1991.7 : 1991.7~	(UT) (RT) RI	
2	(14)	가	Complex : 1990.2~1991.7 : 1991.7~2000.9 : 2000.10~2002.4	(KWE)	
3	(10)		PTA : 1994.12~1996.7 : 1996.8~1997.3 : 1991.7 ~ 2002.6	(KWE)	PTA PLANT
4	(22)		() : 1982.2~1990.5 Complex : 1990.6~1991.7 : 1991.7~	(RT) (MT) RI	SM/EOEG PLANT
5	(21)	C/HEATER REFORMER	() : 1983.8~1990.2 Complex : 1990.3~1991.7 : 1991.7~		NCC/C4/BTX PX PLANT

Inspector

	()				
6	(14)	PIPING	Complex : 1990.4~1991.7 : 1991.7~2002.3 : 2002.4~		POLYMER PLANT
7	(10)		()	가 : 1996.1~2003.7 : 2003.10~	/
8	(14)	(UT) (/)	Complex : 1990.4~1991.7 : 1991.7~1993.10 : 2002.4~	(UT)	POLYMER PLANT
9	(14)	/	Complex : 1990.5~1991.7 : 1991.7~2001.6 : 2001.7~	UT Level	UT/OS PLANT
10	(14)	/	Complex : 1990.7~1991.7 : 1991.7~2002.3 : 2002.4~		NCC/C4/BTX PLANT
11	(8)	()	: 1996.7~	()	SM/EOEG PLANT

Inspector

	()				
12	(8)	HEATER REFORMER (UT)	: 1996.2~	(RT)	NCC/C4/BTX PX PLANT
13	(14)	/	Complex : 1990.10~1991.7 : 1991.7~2002.6 : 2002.7~	MT/PT Level	SM/EOEG PLANT
14	(9)	/	: 1995.9~2002.6 : 2002.7~	MT/PT Level	NCC/C4/BTX PLANT
15	(14)	IRIS	Complex : 1990.5~1991.7 : 1991.7~2002.6 : 2002.7~		IRIS
16	(29)	IRIS	: 1988.4~1995.12 : 1996.1~1998.4 IRIS : 1998.4~2002.12 () IRIS : 2003.1~		IRIS

1993.07.15		()	5	16	
1993.11.03				24	
1994.01.31				44	
1994.05.24				32	
1994.06.27	가	가	1	24	
1994.08.24				32	
1994.09.01				24	
1994.11.23	가		1	360	
1994.12.05				24	
1995.02.06				44	
1995.05.11	()			1	
1995.05.31	Fitness For Service		9	14	SHELL
1995.08.16	(KWE)		1	480	
1995.09.28	가	가		8	
1995.10.16				440	ASNT UT
1995.12.06		가		6	
1996.02.06	HAZOP			28	
1996.03.04	UT LEVEL			88	
1996.03.28	AE	CO.	6	6	
1996.06.01	()			1	

1996.07.01			8	44	
1996.08.19	가		8	44	
1996.09.05	가	가	1	8	
1996.12.09	가	CMS		40	
1997.07.07	MT/PT LEVEL			44	
1997.07.21				20	
1997.10.10	PLANT	PLANT()		8	
1997.10.17				8	
1997.10.19				88	
1997.11.11	PLANT			4	
1997.11.25				32	
1997.12.12			11	4	
1998.04.22				16	
1998.05.14	BOILER	()	2	4	,
1998.05.08				8	
1998.06.08	UT LEVEL			88	
1998.07.24	C/HEATER TUBE			4	
1998.08.16	AE	PAC()		7	
1998.11.23	가		1	24	
1998.12.08	MACHINERY DIAGNOSTICS			28	

1999.09.08			8	16	
1999.10.24	Process Plant Reliability	Hydrocarbon Processing		32	
2000.01.20	TOWER	Koch-Glitch	5	8	
2000.01.24		()		16	
2000.06.22	가(FFS)			12	
2000.08.21				16	
2000.08.25	UT			12	
2000.08.28	ECT			80	
2000.08.28		가	1	40	
2000.09.06				8	
2000.09.08	Bearing	NSK		8	
2000.11.09				16	
2000.12.19			8	8	
2001.09.17	AE	()SK	2	40	,
2002.08.19				16	
2002.11.18	RT Level		1	24	
2002.11.25	UT			24	
2003.03.08	UT Level			40	

2004.02.02				160	
2004.05.17	MT/PT LEVEL II		,	32	
2004.06.28				24	
2004.08.23				16	
2004.08.10	가	KTM		16	
2004.08.23				16	
2004.09.06	RT LEVEL			72	
2004.11.22	가	S&V	,	16	

No	Equipment Name	Maker	Model	Qt'y	Remarks
1	Ultrasonic Flaw Detector	Panametrics Krautkramer	EPOCH 2 USM-25	1 1	
2	Magnetic Flaw Detector		MP-A3 MP-200	1 1	
3	Video Image Scope	Olympus Welch Allyn	IV6C5-110 VC-101	1 1	
4	Fiber Scope	Olympus	IF8D4-30	1	
5	Bore Scope	Olympus	F100-065	2	Tube
6	Acoustic Emission Leak Detector	Physical Acoustic Corp.	SAM 4610	1	
7	Ultrasonic Leak Detector	UE System	UP-2000 UP-9000	2 1	Check
8	Infrared Radiometer	Inframetrics Flir	740 PM 695	1 1	
9	Alloy Analyzer	Texas NUclear Niton	9266 XLT-898	1 1	
10	Metascope	Clandon Sientific	MFR CLANDON	1	
11	Ultrasonic Thickness Gage	Panametrics Kraut Kramer Stresstel	26DL 26 DMS T-MIKE E	4 1 1 3	
12	Ultrasonic Hardness Tester	Kraut Kramer	MIC 2	1	
13	Micro Vickers Hardness Tester	Mitutoyo	MVK-E3	1	
14	EPR Tester	石川島検査	S-61	1	
15	Ferritemeter	Elcometer	A159	1	SUS Fe
16	Paint Thickness Gage	Elcometer	A300F-P2 456	1 2	
17	Pinhole Detector	Elcometer	D105	1	PE Coating
18	Carburization Tester	Kubota	KCD-100X	1	
19	Vibration Analyzer	Rion IRD Predictdli	VA-10 Data Pac1500 DCX-233	1 1 1	(4-Channel)
20	Transit	Sokkisha	C30 DT6	1 1	
21	Metalugical Microscope	Olympus	PME3 313UN	1	
22	Polishing Machine	Struers	ROTOPOL-V	1	
23	Sump Tester	Struers	TRANSPOL-2	1	
24	Pipe & Cable Locator	Subsite Electronics	70R/T	1	
25	Bolt Tension Tester	Hitachi	DT500B	1	
26	Halogen Leak Detector	Toshiba	HAL-8F		
27	Vibration On-line Monitoring System	SKF		1	On-Line (UT/SM/LD)
28	Corrosometer	Rohback-cosasco		20	
29	Oil Analyzer	CSI	Oil View 5100	1	
30	IRIS	IRIS	IRIS9000	1	Tube
31	Surface Roughness Gage	Automate Diavite	Diavite DH-6	1	()

No.				
1	()	2002	Inspection	2002.10.08~2002.10.25
2	()	No. 1&2 Plant	Inspection	2002.10.10~2002.10.24
3	CJ()	CJ 2	PD-DTDC	2003.01.27~2003.01.29
4	()	Flake #3,4	H/EX. Tube IRIS	2003.03.04~2003.03.14
5	()	Reactor Area Inspection		2003.03.11~2003.04.17
6	()	S1-EA229R Shop		2003.01.20~2003.04.19
7	()KP Chemical	1	PX#2 Inspection	2003.04.10~2003.04.25
8	CJ()	CJ 2	Boiler	2003.04.26~2003.04.27
9	()			2003.04.29~2003.04.30
10	()	2003		2003.05.01~2003.05.30
11	()	2003	H/EX. IRIS	2003.05.15~2003.05.28
12	()KP Chemical	1	PX#1 Heater Inspection	2003.06.02~2003.06.04
13	()		Inspection	2003.06.09~2003.06.16
14	()	ECH	Inspection	2003.06.20~2003.07.10

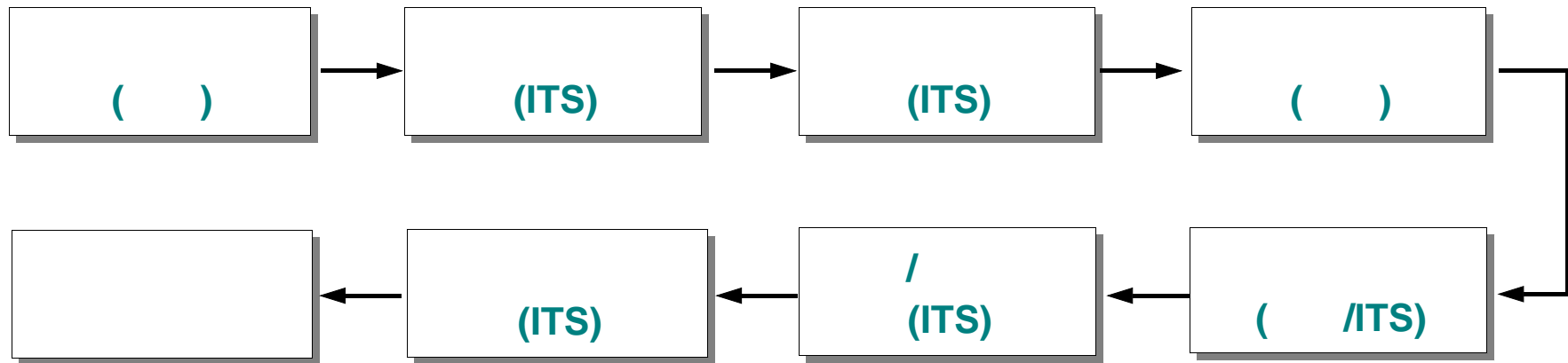
No.				
15	()			2003.08.12~2003.08.20
16	()KP Chemical	1	PX#1 Inspection	2003.10.14~2003.11.02
17	()	PTA 2	Shut Down	2003.10.12~2003.10.23
18	()	PTA		2003.11.30~2003.12.05
19	()		Shut Down	2004.01.01~2004.01.15
20	CJ()		PD-DTDC Shop	2003.12.13~2004.01.18
21	()		Condenser Leak Test	2004.02.09~2004.02.11
22	()	ANP	Shut Down	2004.03.21~2004.03.27
23	()			2004.04.08~2004.04.09
24	()	PTA	Shut Down	2004.04.19~2004.04.24
25	()			2004.04.10~2004.04.10
26	()		IRIS	2004.04.13~2004.04.17
27	LG ()		IRIS	2004.04.26~2004.04.29
28	()KP Chemical	PTA 1	Shut Down	2004.05.16~2004.05.22
29	()			2004.05.31~2004.06.15

No.				
30	()	S/B AP Cooler		2004.07.21~2004.08.18
31	()	Tube (IRIS)		2004.08.23~2004.09.17
32	()	PX #2 Plant T/A		2004.08.23~2004.09.17
33	()KP Chemical	PTA No.3	Inspection	2004.09.06~2004.09.26
34	()KP Chemical	PX No.1	Inspection	2004.09.10~2004.09.30
35	LG ()	LG	IRIS	2004.09.08~2004.09.08
36	() BG	MVR		2004.09.16~2004.09.21
37	()			2004.09.21~2004.09.22
38	LG ()	LG		2004.09.22~2004.09.22
39	()	Tube	IRIS	2004.10.04~2004.10.04
40	()KP Chemical	PX#1/MEX	Inspection	2004.10.08~2004.11.07
41	()KP Chemical	PTA No.1	Inspection	2004.10.15~2004.10.30
42	()	PTA No.2	()	2004.10.17~2004.10.25
43	()KP Chemical	PTA No.2	Inspection	2004.11.22~2004.12.10

Pressure Vessel, Heat Exchanger, Storage Tank, Heater & Boiler,
Cracking Heater, Reformer, Piping

(Full Time)
(Part Time)

/ Inspection
, 가
, , 가 Report
()



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