

SUMMARY OF APPLIED PROCESS FOR CHANGEOUT
(1984~2014)

PROCESS	No. of Application		Total No. of Reactors		Total Cat. Volume (m ³)		Countermeasures on PSCC				
		oversea		oversea		oversea	(1)	(2)	(3)	(4)	Total
GO-HDS	1	1	1	1	83	83	0	1	0	0	1
LGO. DIST-HDS	12	8	15	9	1,305	430	0	7	1	4	12
LUB-HYDROFINER	26	1	28	1	1,598	40	0	1	21	4	26
HYDRO-CRACKER	33	18	59	30	9,256	2,830	0	17	2	14	33
VGO-HDS	24	12	25	13	4,562	2,682	5	6	1	12	24
AR-HDS	169	42	870 +	228	181,243 +	48,417	8	1	52	108	169
VR-HDS	105	31	534 +	228	96,573	35,723	0	1	29	75	105
DEEP-HDS	33	0	56	0	4,760	0	0	0	20	13	33
OTHERS	13	5	11	2	344	182	0	5	0	8	13
TOTAL	416	118	1599 +	512	299,723 +	90,387	13	39	126	238	416

NOTE : Countermeasures on PSCC Main (1) Soda Inundation, (2) Soda Spray, (3) Humidity Control, (4) No Action application

ALL CATALYST'S UNLOADING WORK IN THE REACTOR WAS CARRIED OUT UNDER AIR.

SUMMARY OF CATALYST CHANGEOUT

YEAR	No. of Applied Process				Total No. of Reactors				Total Catalyst Volume (m ³)				Countermeasures on PSCC				
	Total	AR,VR-HDS	HC&Other	oversea	Total	AR,VR-HDS	HC&Other	oversea	Total	AR,VR-HDS	HC&Other	oversea	(1)	(2)	(3)	(4)	Total
1984	1	0	1	0	1	0	1	0	150	0	150	0	1				1
1985	1	1	0	0	4	4	0	0	450	450	0	0	1				1
1986	2	1	1	0	5	4	1	0	600	450	150	0	2				2
1987	3	1	0	2	7	4	0	3	720	450	0	270	1	2			3
1988	3	2	1	0	11	10	1	0	1,430	1,280	150	0	2		1		3
1989	5	2	1	2	14	10	1	3	1,650	1,280	90	280	1	2	2		5
1990	5	3	2	0	20	18	2	0	3,180	2,980	200	0	2		3		5
1991	13	8	3	2	43	36	4	3	6,830	5,960	640	230	1	2	8	2	13
1992	17	8	2	7	45 +	32 +	2	11	6,660 +	5,500 +	200	960	2	6	8	1	17
1993	14	8	2	4	45 +	36 +	3	6	6,950 +	5,960 +	550	440		3	8	3	14
1994	18	8	2	8	50	36	2	12	8,090	6,680	240	1,170		7	6	5	18
1995	17	9	2	6	52	40	3	9	9,180	7,810	550	820		6	7	4	17
1996	13	8	2	3	38 +	36 +	2	0	7,190 +	7,030 +	160	0		3	5	5	13
1997	19	10	2	7	67 +	42 +	3	22	15,303	9,280	590	5,433		6	6	7	19
1998	16	8	5	3	56	34	5	17	12,101	7,910	290	3,901		1	4	11	16
1999	9	7	1	1	44	34	2	8	9,900	7,890	500	1,510			2	7	9
2000	8	7	1	0	33	32	1	0	7,600	7,510	90	0			3	5	8
2001	12	9	3	0	49	44	5	0	10,005	9,420	585	0			3	9	12
2002	13	8	2	3	66	38	2	26	12,157	8,590	175	3,392			3	10	13
2003	17	9	6	2	68	42	8	18	13,500	9,040	920	3,540			6	11	17
2004	16	8	5	3	61	38	7	16	11,809	8,590	557	2,662			4	12	16
2005	14	8	2	4	75	40	4	31	14,367	8,970	715	4,682			3	11	14
2006	12	8	1	3	56	40	2	14	11,488	8,970	245	2,273		1	3	8	12
2007	20	8	6	6	80 +	40 +	9	31	15,589 +	8,720 +	1,403	5,466			6	14	20
2008	21	10	3	8	85 +	54 +	4	27	16,217 +	10,506 +	342	5,369			5	16	21
2009	18	7	6	5	79	34	11	34	14,006	7,230	1,377	5,399			6	12	18
2010	14	7	2	5	61 +	34 +	3	24	11,461 +	7,230 +	279	3,952			3	11	14
2011	18	6	4	8	83	30	6	47	15,504	5,850	692	8,962			5	13	18
2012	19	7	6	6	83	39	6	38	15,437	7,525	365	7,547			4	15	19
2013	30	7	13	10	108	34	17	57	20,390	7,230	1,455	11,705			8	22	30
2014	28	8	10	10	1,372	41	1,276	55	19,809	7,886	1,499	10,424			4	24	28
TOTAL	416	201	97	118	2,861 +	956 +	1,393	512	299,723 +	194,177 +	15,159	90,387	13	39	126	238	416

NOTE : Countermeasures on PSCC

(1) Soda Inundation, (2) Soda Spray, (3) Humidity Control, (4) No Action