

2002

2001

An Analysis of HANARO Operating Performance of the Year 2001

150

2001
3770MWD 가
3.56 2.49
2001
1 2

Abstract

For the evaluation of operating performance of the HANARO, operation data of the year 2001 were analyzed. Power output, delay times for full-power arrival and shutdown were considered as the representative measures of operating performance. The analysis results show that the total thermal power output is 3770MWD, which is the best record since the startup of the HANARO. The mean values of the delay time for full-power arrival and shutdown are calculated as 3.56hours and 2.49hours, respectively. The major causes for the delay of full-power arrival and shutdown are found to be the retardation of the fuel inspection, and unscheduled work for maintenance and experiment. In order to enhance the operating performance, based on the analysis results, biweekly-prearranged plan for working and experiment will be prepared in advance. The starting time of the reactor has been moved up by 1 hour for reaching the full power before the scheduled time. In addition, we will make effort so as to reduce the number of fuels that have to be inspected.

1.

1995 2 (first criticality) 7

24MW , 2~3 , 3~4

가 , 가
가

2001

가

2.

1 3 2001 (,)⁽¹⁻⁷⁾

, 2001 3770MWD 가

1

	(MWD)		(-)		(MWD)		(-)
9-1-1	72	72.18	0.18	11-2-3	96	97.45	1.45
9-1-2	72	72.14	0.14	11-2-4	72	73.73	1.73
9-1-3	96	95.25	-0.75	12-1-1	96	97.54	1.54
9-1-4	65	67.13	2.13	12-1-2	96	91.92	-4.08
9-2-1	72	73.61	1.61	12-1-3	72	72.31	0.31
9-2-2	96	97.57	1.57	12-1-4	72	73.5	1.5
9-2-3	72	72.58	0.58	12-2-1	96	99.03	3.03
9-2-4	96	97.76	1.76	12-2-2	72	74.89	2.89
10-1-1	72	74.22	2.22	12-2-3	72	73.49	1.49
10-1-2	72	74.21	2.21	13-1-1	96	59.98	-36.02
10-1-3	72	72.87	0.87		0	1.18	1.18
10-1-4	96	97.51	1.51	13-1-2	264	265.68	1.68
10-2-1	72	72.44	0.44	13-1-3	72	60.98	-11.02
10-2-2	96	89.56	-6.44	13-2-1	89	87.73	-1.27
10-2-3	96	98.45	2.45	13-2-2	76	75.4	-0.6
10-2-4	72	0	-72	13-2-3	72	73.03	1.03
	0	72.04	72.04	13-2-4	72	72.54	0.54
11-1-1	72	74.35	2.35	14-1-1	96	97.64	1.64
11-1-2	96	96.07	0.07	14-1-2	96	98.61	2.61
11-1-3	72	74.08	2.08	14-2-1	96	69.51	-26.49
11-1-4	96	97.05	1.05	14-2-2	96	92.59	-3.41
11-2-1	96	98.81	2.81	14-2-3	48	49.17	1.17
11-2-2	72	96.52	24.52	14-2-4	72	75.93	3.93
					3782	3770.23	-11.77

2

				(hour)	
9-1-1	01.03 22:00	01.04 00:00		2	
9-1-2	01.10 22:00	01.11 01:21		3.35	RRS Trip
9-1-3	01.16 22:00	01.16 23:39		1.65	N/T
9-1-4	01.25 22:00	01.25 20:20		-1.67	
9-2-1	01.31 22:00	01.31 21:31		-0.48	
9-2-2	02.07 14:00	01.07 14:30		0.5	
9-2-3	02.14 22:00	02.14 23:34		1.57	1
9-2-4	02.20 22:00	02.20 21:22		-0.63	
10-1-1	02.28 22:00	02.28 21:04		-0.93	
10-1-2	03.07 22:00	03.07 20:34		-1.43	
10-1-3	03.14 22:00	03.14 23:04		1.07	가
10-1-4	03.21 14:00	03.21 15:18		1.3	N/T
10-2-1	03.28 22:00	03.29 21:23		23.38	
10-2-2	04.03 22:00	04.04 05:21		7.35	2 #1 , (N/T)
10-2-3	04.11 14:00	04.11 14:04		0.07	
10-2-4	04.18 22:00	-		-	
	04.25 22:00	04.25 23:32		1.53	RRS A A9
11-1-1	05.02 22:00	05.02 22:59		0.98	
11-1-2	05.08 22:00	05.08 22:18		0.3	
11-1-3	05.16 22:00	05.16 21:04		-0.93	
11-1-4	05.23 14:00	05.23 14:51		0.85	
11-2-1	05.30 14:00	05.30 13:19		-0.68	
11-2-2	06.06 22:00	06.05 22:12		-23.8	NTD
11-2-3	06.13 14:00	06.13 15:33		1.55	
11-2-4	06.20 22:00	06.20 20:55		-1.08	
12-1-1	06.26 22:00	06.26 21:43		-0.28	
12-1-2	07.04 14:00	07.04 20:47		6.78	
12-1-3	07.11 22:00	07.12 16:28		18.47	
12-1-4	07.18 22:00	07.18 20:30		-1.5	
12-2-1	07.24 22:00	07.24 19:47		-2.22	
12-2-2	08.08 22:00	08.09 04:59		6.98	#4
12-2-3	08.15 22:00	08.15 21:28		-0.53	
13-1-1	08.21 22:00	08.22 05:25		7.42	Sipping
	08.29 13:13	08.29 13:13		0	1
13-1-2	08.28 22:00	08.30 22:30		48.5	Sipping
13-1-3	09.12 22:00	09.13 19:04		21.07	Sipping
13-2-1	09.18 22:00	09.19 00:12		2.2	#4
13-2-2	09.24 23:00	09.25 00:35		1.58	
13-2-3	10.04 14:00	10.04 13:40		-0.33	
13-2-4	10.10 22:00	10.10 22:12		0.2	
14-1-1	10.17 14:00	10.17 14:13		0.22	
14-1-2	10.24 14:00	10.24 18:03		4.05	BNCT PTS
14-2-1	12.04 22:00	12.06 02:08		28.13	
14-2-2	12.11 22:00	12.12 00:50		2.83	
14-2-3	12.21 15:00	12.21 18:24		3.4	N/T
14-2-4	12.26 22:00	12.26 19:29		-2.52	

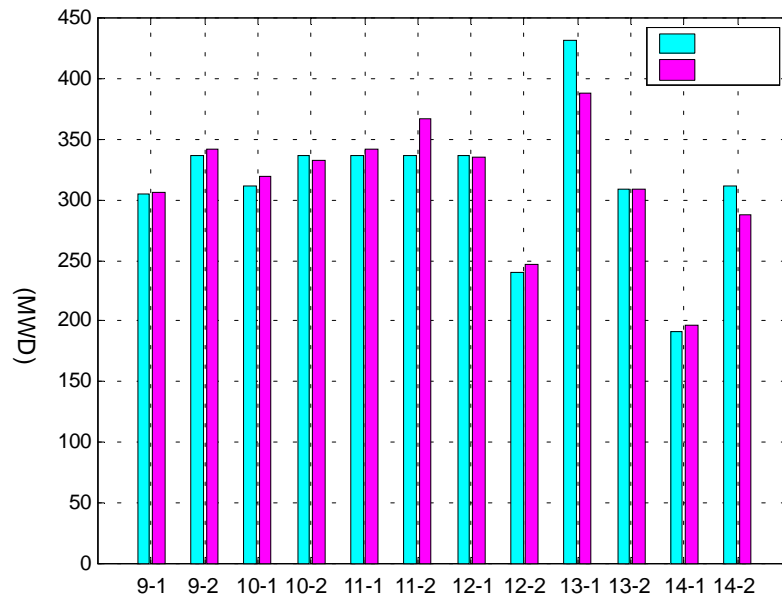
					(hour)	
9-1-1	01.06	22:00	01.06	22:52	0.87	
9-1-2	01.13	22:00	01.14	00:00	2.0	
9-1-3	01.20	22:00	01.20	22:10	0.17	
9-1-4	01.28	15:00	01.28	15:30	0.5	30
9-2-1	02.03	22:00	02.03	22:00	0	
9-2-2	02.11	14:00	02.11	15:00	1	
9-2-3	02.17	22:00	02.17	23:10	1.17	
9-2-4	02.24	22:00	02.24	22:15	0.25	
10-1-1	03.03	22:00	03.03	22:30	0.5	30
10-1-2	03.10	22:00	03.10	22:00	0	
10-1-3	03.17	22:00	03.17	23:00	1	
10-1-4	03.25	14:00	03.25	18:31	4.52	
10-2-1	03.31	22:00	04.01	22:00	24	
10-2-2	04.07	22:00	04.07	22:15	0.25	
10-2-3	04.15	14:00	04.15	15:33	1.55	
10-2-4	04.21	22:00	-	-	-	
	04.28	22:00	04.28	22:40	0.67	
11-1-1	05.05	22:00	05.06	00:30	2.5	#4 ()
11-1-2	05.12	22:00	05.12	22:41	0.68	#4 ()
11-1-3	05.19	22:00	05.19	22:30	0.5	
11-1-4	05.27	14:00	05.27	15:00	1	
11-2-1	06.03	14:00	06.03	13:07	-0.88	
11-2-2	06.09	22:00	06.09	22:00	0	
11-2-3	06.17	14:00	06.17	16:00	2.0	
11-2-4	06.23	22:00	06.23	22:00	0	
12-1-1	06.30	22:00	06.30	22:00	0	
12-1-2	07.08	14:00	07.08	15:30	1.5	
12-1-3	07.14	22:00	07.15	16:00	18	
12-1-4	07.21	22:00	07.22	01:10	3.17	
12-2-1	07.28	22:00	07.28	22:00	0	
12-2-2	08.11	22:00	08.12	07:00	9	
12-2-3	08.18	22:00	08.18	22:05	0.08	
13-1-1	08.25	22:00	08.24	16:40	-29.33	
	08.29	13:50	08.29	15:50	0	
13-1-2	09.08	22:00	09.10	22:00	48	
13-1-3	09.15	22:00	09.16	07:00	9	
13-2-1	09.22	15:00	09.22	15:00	0	
13-2-2	09.28	03:00	09.28	03:00	0	
13-2-3	10.07	14:00	10.07	14:00	0	
13-2-4	10.13	22:00	10.13	22:00	0	
14-1-1	10.21	14:00	10.21	14:42	0.7	BNCT
14-1-2	10.28	14:00	10.28	19:36	5.6	BNCT Flux
14-2-1	12.08	22:00	12.08	22:00	0	
14-2-2	12.15	22:00	12.15	22:00	0	
14-2-3	12.23	15:00	12.23	17:00	2	
14-2-4	12.29	22:00	12.29	22:00	0	

3.

(dispersion) , 가 (bias) ,

3.1

1 (9-1 ~14-2) 3,782MWD 3,770.2MWD 99.7%



1

2

가 ±2MWD

2

26

46

-0.26MWD 17.17MWD

가

10-2-4

가

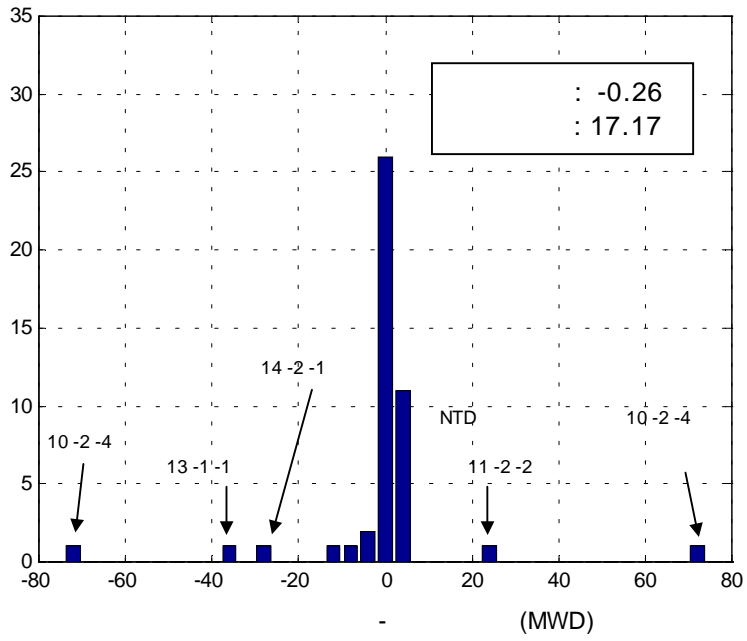
(13-1-1) ,

(14-2-1) , NTD

(11-2-2)

5

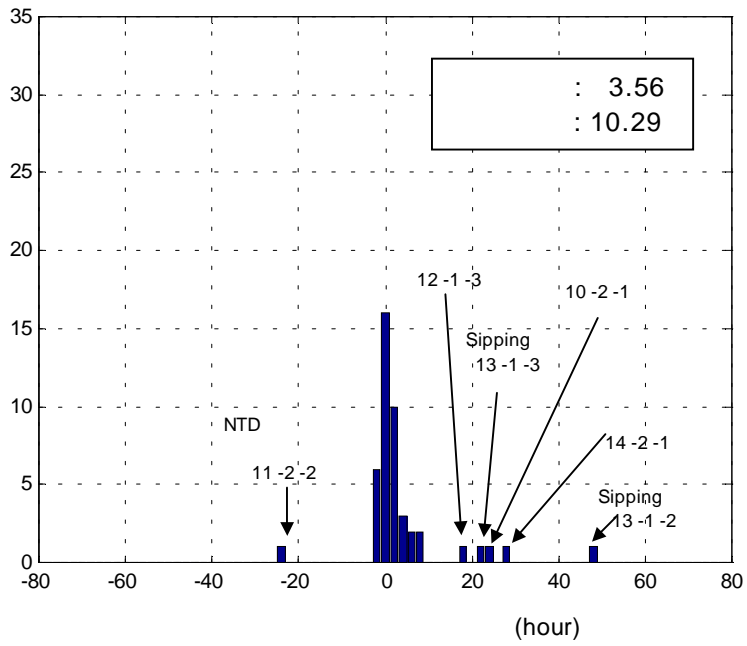
0.64MWD 2.69MWD



2 (x : 4MWD)

3.2

3 . 10-2-4
 45 1
 , 22 .
 23



3 (x : 2)

3. 가 3 sipping (13-1-2, 13-1-3), (10-2-1), (12-1-3) NTD 11-2-2

2 sipping 가

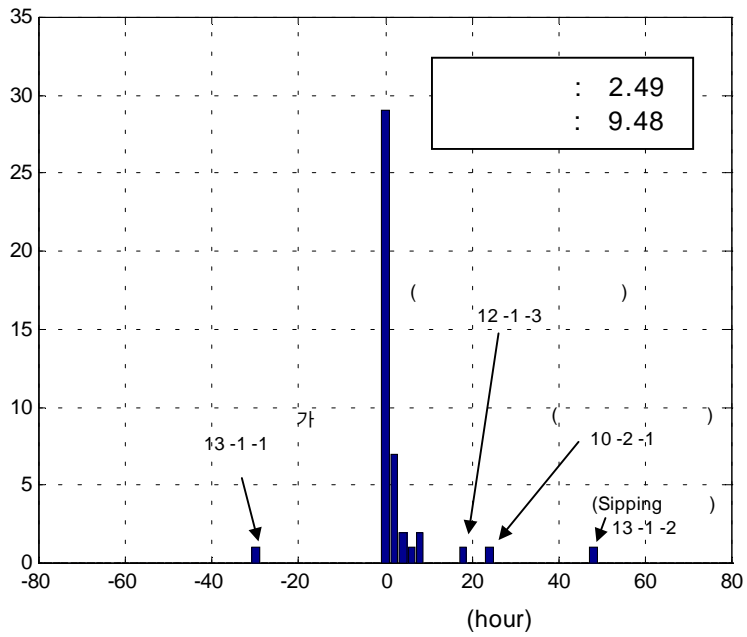
가 (23) -0.39hour 1.07hour 가

23 가 (3.56hour 10.29hour) 64

가 가

3.3

4 10-2-4 45 4 1 29



4 (x : 2)

4 1 가 15
 , 11 , 4
 1 , 1
 가 (13-1-1) .
 2.49hour 9.48hour ,
 가 (22) 0.13hour
 0.38hour
 가 가 45

4.

4 sipping , 2, 3 4 가
 가
 가
 가
 2
 1

4 2001

(MWD)		46	41 (10-2-4 , 11-2-2 , 13-1-1 , 14-2-1)
		-0.26	0.64
		17.17	2.69
(hour)		45	23 (가)
		3.56	-0.39
		10.29	1.07
(hour)		45	22 (가)
		2.49	0.13
		9.48	0.38

5.

2001

1) 2001 3,782MWD , 3,770.2MWD

99.7%

-0.26MWD 17.17MWD . 46

가

0.64MWD 2.69MWD .

2) 45 3.56hour

10.29hour

가

-0.39hour, 1.07hour .

3) 45 1

29 ,

2.49hour 9.48hour

가

0.13hour 0.38hour .

4) 가 ,

가

2

1

1. , “2001 ,” , KAERI/MR-379/2001, 2002. 1.

2. , “2001 1/4 ,” , 2001. 1.

3. , “2001 2/4 ,” , 2001. 3.

4. , “2001 2/4 (1),” , 2001. 4.

5. , “2001 3/4 ,” , 2001. 6.

6. , “13 2 ,” , 2001. 9.

7. , “2001 4/4 ,” , 2001.10.