

Cause Analysis and Improvement of A Troubled Motor Operated Valve with Design Base Review method

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, 2002 6

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Abstract

This paper presents an example of cause analysis and improvement of a troubled Motor Operated Valve(MOV), which was performed through Design Base Review method developed for Safety-Related MOV operability evaluation. Based on this example, we ascertained that Design Base Review method will be a very effective means for analyzing the root cause of a troubled MOV and drawing up a quantitative improvement.

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(1997. 6. 13)

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(Buckling)

2.

2.1

()

“ ” “SFM”
”
(Flowmaster)

2.2

- (Fpack)
- (Fp)
- (Fdp)
- EPRI NP-7501
- (Tb)
- (Ts)
- (Tp)
- (Th)
- (Thyd)
- (Thub)

2.3

가

S&L

ELMS-AC

2.4

가

(Limitorque)

, pullout

가

가

가

2.5

가

(stress)

가

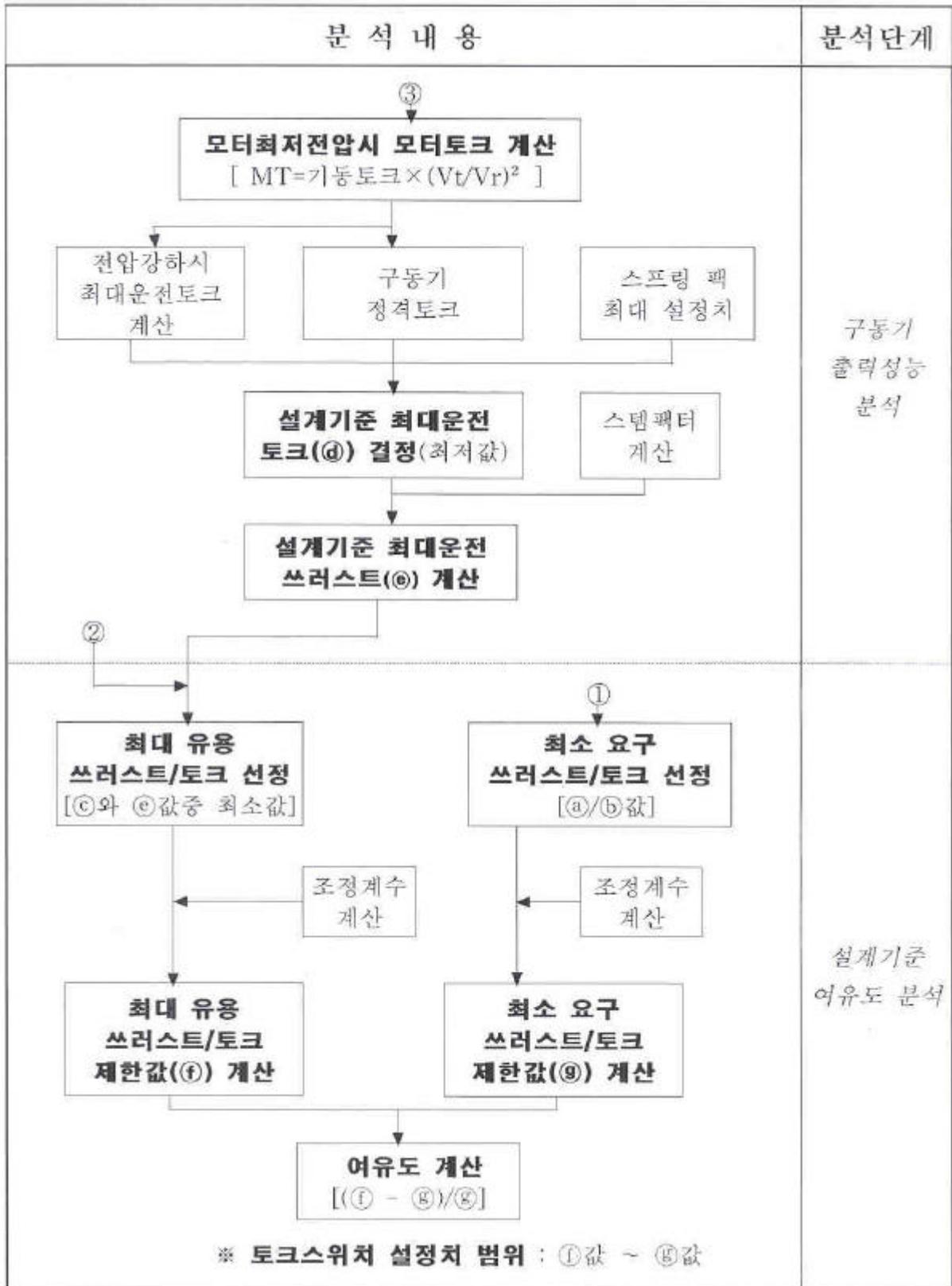
2.6

가

%

가

-
-
-
-
-



3.

3.1

- : 3 1
(4111-MV57)
- : 2002. 6. 16
- :
- 가
- : (Thread)가 “S”

3.2

- ()
- : SMB-3 (Nippon Gear Co. Ltd)
- : 12” , Flow Under Disc ()
-
- : 2.2835” (A479-410)
- : 27 cm (A216 WCB)
- : 12” (A216 WCB)
-
- : 460V, 60HZ, 3
- : 34.72 lb.ft
- : 86.796 lb.ft
- : 144.18
-
- (Do) : 10.236”
- (Ds) : 2.2835”

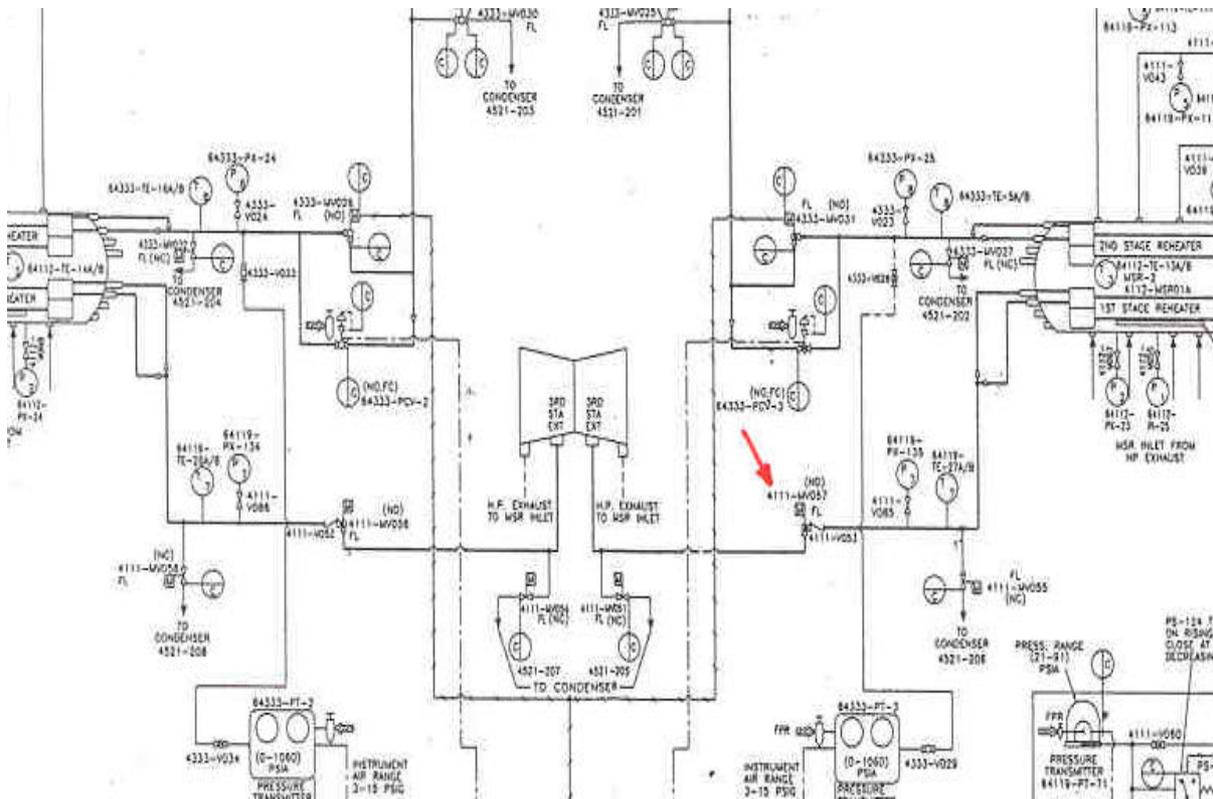
3.3

3.3.1

. < 1> 가

	-	가	-	(P _{up}) : 85.6 psi	
	1800rpm		-	(P _{down}) : 14.7 psi	(-001)
	(4111-MV56/57)		-	(P) : 70.9 psi	
	-	: 5 ~ 10%			
	-	1	-	(P _{up}) : 14.7 psi	
	(4111-MV56/57)		-	(P _{down}) : 82.5 psi	(-002)
	-	: 5 %		(P) : 67.8 psi	

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3.3.2

- [가 , (-03)] ,
- (Fpack) : 2250 lbf
 -
 - (Fp,) : 60.2 lbf
 - (Fp,) : 337.8 lbf
 -
 - F_{DP,} = 6418 lbf ()
 - F_{DP,} = 6137 lbf ()
 -
 - F_{R,} = F_{pack} - F_{p,} - F_{DP,} = - 4228 lbf
 - F_{R,} = F_{pack} + F_{p,} - F_{DP,} = 8724.8 lbf
- (-) 가
()

3.3.3

460V 95% 가 .

3.3.4

- [가 , (-07)]
- T_{qDV} = 3334.4 lb-ft
 - Stem factor SF₁₅ = 0.018229(μ = 0.15)
 - F_{dv} = T_{qDV} / SF₁₅ = 182,918 lbf(95%)

3.3.5

[가 , (-04)] 가 , 153,249.3 lbf .

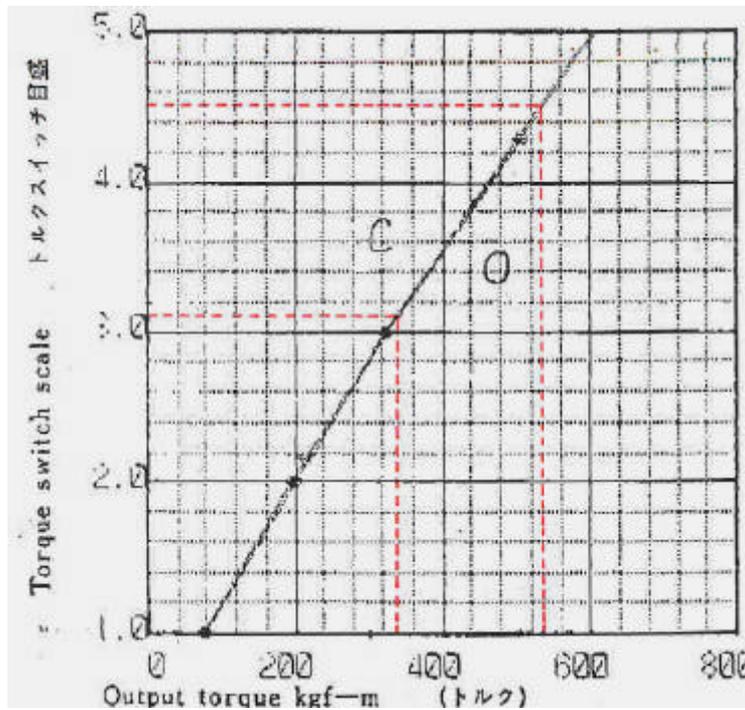
	(lbf)
(T _S)	222,171.2
(T _{CRT})	153,249.3
(T _N)	773,447.1

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3.4

(4.5)가 2.4 (2.5)

(3)



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4.5

540 kgf.m(3905.8 lb-ft) ,
Factor SF₁₅

214,262.9 lbf 가
(T_{CRT})

Stem

153,249.3 lbf

4.

4.1

(153,249.3 lbf) , (214,262.9 lbf) 가 가
 가 가 ,

4.2

가 *

		()
1 ~ 5	4.5	1 ~ 3.1

*

$$\begin{aligned}
 & \frac{11,183 \text{ lbf}}{(3)} \times SF_{15} = 203.85 \text{ lb-ft (28.2 kgf.m)} \times [1 + (0.362)] = 11,183 \text{ lbf} \\
 & \frac{137,814 \text{ lb-ft}}{3.1(3)} \times SF_{15} = 2,512.2 \text{ lb-ft (347 kgf.m)} / [1 + (0.112)] = 137,814 \text{ lb-ft}
 \end{aligned}$$

5.

1 , 3
 (8,724.8 lbf) (182,918 lbf)

6.

- (1) ,“ 가 (), ()” ,2001.7.24
- (2) ,“ 가 ”
- (3) ,“ 가” , , 2000.12
- (4) EPRI, “Application Guide for Motor Operated Valves in Nuclear Power Plants” ,1990. 9, NP-6660-D