

'2000

UBS

Operational experience of UBS for spent fuel verification and optimum application

150

IAEA EURATOM THORP
, 1994 UBS

THORP
80%

CANDU UBS 가

Abstract

IAEA and EURATOM have applied UBS for the verification of spent fuels which have been stored in spent fuel pond of THORP since 1994. Application and development of this special sealing system, UBS could establish dual containment and surveillance system for spent fuel which have been stored long-term for reprocessing in the future. It is expected to reduce the verification time of the spent fuel which have been stored long-term under safeguards and also increase verification effectiveness. Compared with NDA using gamma detector, this save to maximum 80% of verification time in THORP. On the basis of this experience it is reviewed the possibility of UBS application to the CANDU spent fuel pond which produce and store a lot of spent fuel at present.

1.

1985 EURATOM JRC-Ispra

UBS(Ultrasonic Bolt Seal)
IAEA(International Atomic Energy Agency;)

가 가 BWR

1986 BNFL(British Nuclear Fuels plc) THORP(Thermal Oxide Reprocessing Plant)
MEB(Multiple-Element Bottles)
UBS , MEB
IAEA EURATOM 1986 (Field Test)가

2.

IAEA 13가
THORP “ (storage facility)” ,
1 (PIV; Physical
Inventory Verification) 3 4

가. (PIV)

PIV 1 가 , PIV PIV 14

- :
가 , .

- : 가 ,

- : 가 ,

- : ,

가 가

- 가

가

- 가
- 가

1 SQ(Significant Quantity)

- 가 : 가
- 가가 , 가가
- : 가
- : 가
- :

3. THORP

UBS

- 가.
- THORP
- B560 . B560 2500
- 가 140m, 25m 8m 가
- MEB , MEB
- THORP
-
- MEB
-
- MEB 3m
- 가
- 가

MEB 20 가 . MEB
5-17 , 1 1 가 .
MEB 가 MEB , 가 .
가 . MEB 4
MEB
,
MEB가 , MEB
MEB MEB .

3m MEB

. UBS
UBS 4가 .
- : MEB .
가 .
(unique random signature) ,
가 .

- : MEB

- : 가 .
, , 1

- : ,
가 .
가 .
1 MEB ,
2 .

. UBS
THORP MEB
NaI . MEB
가 MEB , ,
MPH(Main Pond Handler) 1 MEB 30
가 . 가 UBS

- UBS : MEB가 , MPH 2
 MEB 가 MEB
 , 가
 MEB ,

- UBS : 가
 가
 1 8 25
 가 가
 , 1 8 50

4. CANDU

UBS 가
 UBS THORP
 1994 가 가
 MEB 1000 , MEB 20%
 MEB 50% MEB가
 4 (50 , 1000 20%),
 15 (15 , 1000 50%) MEB
 CANDU 600MW 4 가
 2-3 16-24 1
 90 stack 4 가 가
 IAEA 1 PIV 4 가
 가
 , 40PDIs(Person-Day Inspections)
 가 IAEA PIV , 가
 stack UBS 3
 CANDU
 UBS UBS
 (Feasibility Study)가 1999 UBS
 , UBS 가 가
 가 가

5.

THORP

MEB

UBS

가

UBS

가

가

UBS

1

2, 3, 4

가

가

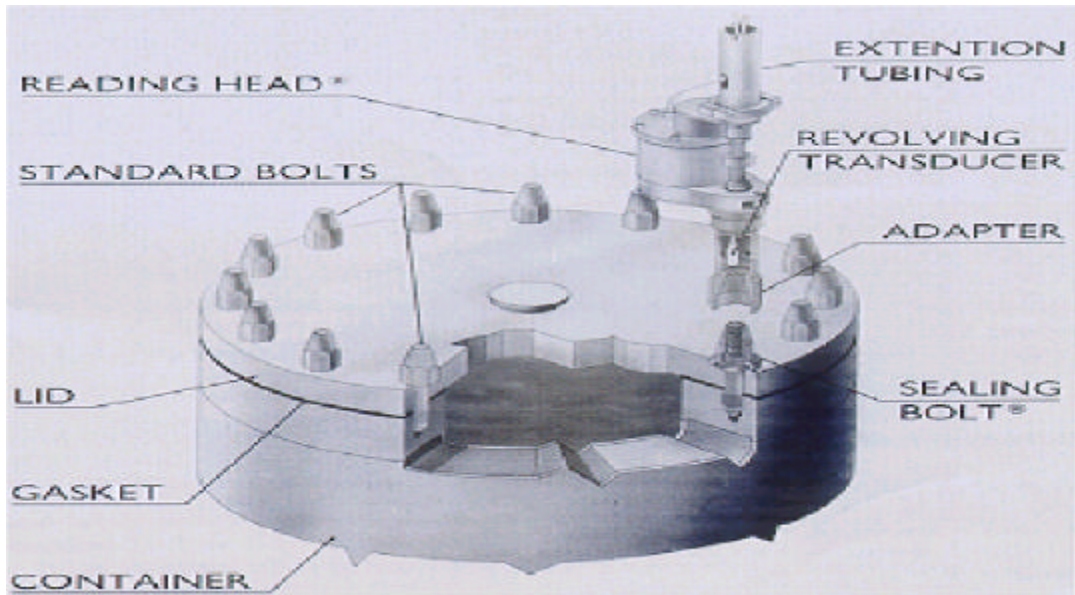
stack

UBS

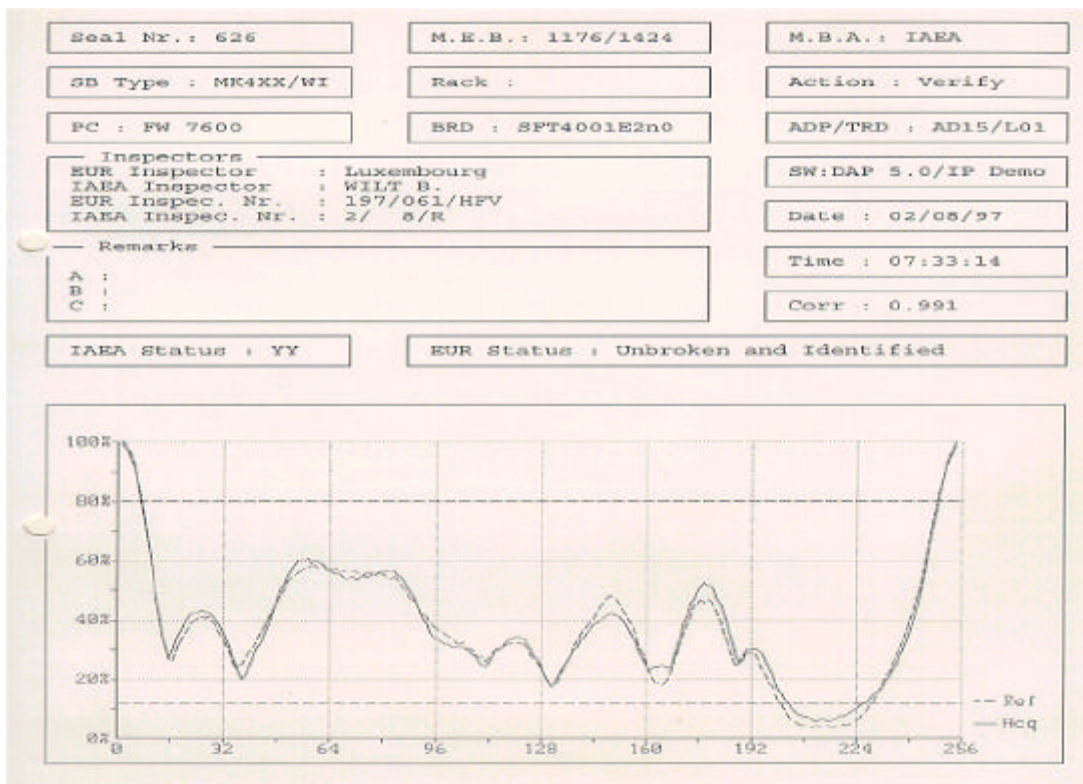
UBS

가

1. *J.M. McKenzie* "A New Approach to Comparing Ultrasonic Seal Signatures", INMM, May 1991.
2. *Bertrand C.d'Agraves* " Ultrasonic Sealing Techniques: A Possible Solution for Safeguarding the Containment or Storage of Spent Fuel in an Underwater or Dry Environment", INMM, May 1993.
3. *C D Hatt and A F Reynolds* " Operation Experience of Ultrasonic Sealing Bolts for Safeguards Containment of Multi-Element Bottles in British Nuclear Fuel's THORP Spent Fuel Storage Ponds", INMN, May 1995.



1, MEB



2. UBS

가



3. UBS가

stack