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Bulk Shielding Facility Quarterly Report October, November, and December of 1975

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OAK RIDGE NATIONAL LABORATORY
OPERATED BY UNION CARBIDE CORPORATION FOR THE ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION

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OPERATIONS DIVISION

BULK SHIELDING FACILITY QUARTERLY REPORT

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UNION CARBIDE CORPORATION
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SUMMARY

The BSR operated at an average power level of 1,996 kw for 31.93% of the time during October, November and December. Water-quality control in both the reactor primary and secondary cooling systems was satisfactory. There was one unscheduled shutdown during the quarter.

The reactor was shut down on October 31, 1975, because of water loss from the pool at a rate of 1.6 gpm, apparently due to several small leaks. The reactor fuel was transferred to the OGR Canal Storage and the pool water level lowered to the pool floor. Defective places in the concrete pool walls and floor are being chipped, grouted and sealed in preparation for applying fiberglass and repainting. Pool repairs accounted for 98% of the downtime this quarter.

The PCA was not used during this report period and remains in a secured condition.

BULK SHIELDING REACTOR

Operations

During the quarter the reactor operated 31.93% of the time primarily for the irradiation of research samples. Basic operating data for this period are given in Table 1.

Table 1. Basic Operating Data
(October, November, and December of 1975)

	This Quarter	Last Quarter	Year To Date
Total energy, kw	58,652	65,654	299,380
Average power, kw/operating hr	1,996	1,878	1,884
Time operating, %	31.93	38.00	43.50
Reactor availability, %	32.13	96.30	75.36
Reactor water radioactivity, counts min^{-1} ml^{-1} (av)	1,558	2,459	2,195
Reactor water resistivity, ohm-cm (av)	870,000	967,000	950,000
Standard fuel elements depleted	0	1	6
Control fuel elements depleted	0	0	2
Research samples	21	31	97

Core loading 29 (Figure 1) was in service until the reactor was shut down for repairs to the pool on October 31, 1975. The core has been unloaded and will be replaced with core loading 30 after pool repairs are complete.

Shutdowns

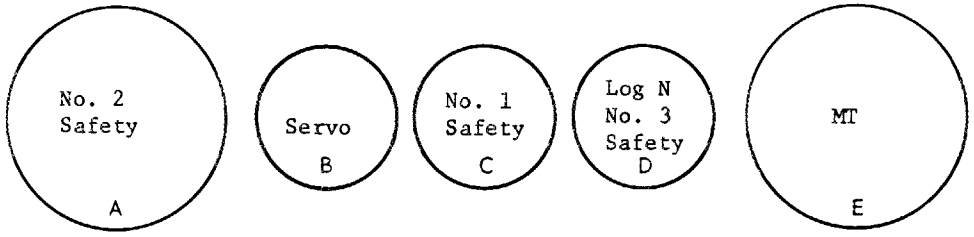
There was one unscheduled shutdown during the quarter when No. 2 rod dropped. Table 2 gives an analysis of both scheduled and unscheduled shutdowns.

Table 2. Analysis of Shutdowns

Description of Shutdown	Number	Downtime (hrs)
Scheduled		
Experimenters:		
No request to operate	2	30.150
Experiment insertion or removal	11	4.218
Reactor Operations:		
BSR pool repair	1	1469.150
Subtotal	14	1503.518
Unscheduled		
Experimenters	0	0.000
Reactor Operations	1	0.150
Subtotal	1	0.150
Total	15	1503.668

Maintenance and Changes

Maintenance or changes on the instrumentation and mechanical components in the complex are listed in Tables 3, 4, and 5. Table 6 presents the status of the ionization and fission chambers.



F.C. 81	82	83	84	85	86	87	88	89
71	72	73	74	75	76	77	78	79
FZC 003T 195 61	BSF-S-9 70 62	BSF-36 146 63	BSF-S-10 70 64	FZC 003U 195 65	66	67	68	69
FZC 003N 187 51	M-194-D 163 52	M-193-D 140 53	M-195-D 163 54	FZC 003P 186 55	56	West 57	58	59
BSF-34 114 41	BSF-S-13 96 42	M-192-D 136 43	BSF-S-14 95 44	BSF-35 143 45	46	D_2O 47	48	49
BSF-39 158 31	FZC 003R 191 32	BSF-38 139 33	FZC 003S 190 34	BSF-40 156 35	36	Tank 37	38	39
M-196-D 177 21	BSF-S-11 71 22	BSF-37 143 23	BSF-S-12 71 24	M-323-A 179 25	26	27	28	29
Exp. 11	FZC 003W 200 12	FZC 003Q 189 13	FZC 003V 203 14	Exp. 15	16	17	18	19

N

East

D_2O Tank

BSR CORE

29

LOADING NO.

8-7-75

DATE

Excess Reactivity 5.25%

CRITICAL MASS

4196

OPERATING MASS

ROD POSITIONS AT CRITICAL
(With Operating Mass)

ROD NO.	IN. WITHDRAWN	
1	10.15	11.40
2	10.15	11.40
3	10.15	11.40
4	10.15	11.40
5	23.00	11.40
6	23.00	11.40

REMARKS:

Figure 1. Core Loading 29-BSR

Table 3. Maintenance and Changes, Instrumentation and Controls

Date	Component	Trouble or Change	Reason or Maintenance
10-3-75	Facility radiation and contamination monitoring system	Routine	Bimonthly checkout.
10-13-75	Monitron S. W.	Inoperative	The instrument was retubed and returned to service.
10-21-75	TV camera	Faulty focus control	A new focus drive motor was installed.
12-15-75	Facility radiation and contamination monitoring system	Routine	Bimonthly checkout.

Table 4. Maintenance and Changes, Mechanical System

Date	Component	Trouble or Change	Reason or Maintenance
12-1-75 through 12-4-75	Shim-rod drive assemblies Nos. 1 through 6	Routine inspection	The shim-rod drive assemblies were removed to the shop for preventive maintenance. Rust was cleaned from the magnet faces, clutch switches were cleaned, electrical wiring was replaced as needed. Push rods and spring tension on the clutch switches were checked and adjusted as necessary.

Table 5. Maintenance and Changes, Process System

Date	Component	Trouble or Change	Reason or Maintenance
10-7-75	Secondary pH system	Insensitive	The pH probes were replaced.
10-15-75	Secondary pH system	Erratic readout	The pH measuring probe was replaced.

Table 6. Status of Ionization Chambers

Chamber Serial No.	Location	Date Present Service Started	Previous Service	Remarks
		Chambers in Service		
CTC-3 (J-118)	Position A, No. 2 safety	10-8-69	LITR	The chamber was modified for underwater service in 1969.
PCP-III-106, SN-72-1	Position B, servo	5-12-75	None	This new chamber was installed in the BSR in May, 1975.
CTC-4 (C-771)	Position C, No. 1 safety	12-1-69	LITR	The chamber was modified for underwater service in 1969.
PCP-III-106A, SN-72-2	Position D, log-N and No. 3 safety	11-13-73	None	This new dual chamber was installed in the BSR in November, 1973.
C-1045	CP-81, fission chamber	10-1-69	PCA	This fission chamber assembly was transferred to the BSR from the PCA in October, 1969.
		Chambers Not in Service		
PCP (old type, no serial number)	Warehouse storage		BSR	This chamber is of the old type and will be repaired if needed.
CIC (No. 62)	BSR storage		BSR	This chamber is reserved for the PCA but can be used in an emergency for the BSR.

Table 6 (continued)

Chamber Serial No.	Location	Date Present Service Started	Previous Service	Remarks
CIC (No. 63)	BSR storage		BSR	This chamber is reserved for the PCA but can be used in an emergency for the BSR.
PCP (Q975), No. 2)	BSR storage		BSR	This chamber is reserved for the PCA but can be used in an emergency for the BSR.
PCP-III-106, SN-66-1	BSR storage		BSR	The uncompensated section of this dual chamber failed on June 16, 1969, while in service as the No. 2 safety and servo. While in service as servo the noise to signal ratio increased to an unsatisfactory level and in May, 1975, the chamber was removed for repairs.
PCP-III-106, SN-66-3	ORR beam tube storage		BSR and ORR	This dual chamber was installed in the BSR in December, 1967. In March, 1969, the chamber was removed for repairs due to failure of the uncompensated section. In November, 1969, the chamber was installed in the BSR. In April, 1970, the uncompensated section failed.

Table 6 (continued)

Chamber Serial No.	Location	Date Present Service Started	Previous Service	Remarks
				The chamber was removed for repairs. In May, 1971, the chamber was installed in the ORR. In November, 1971, the chamber was removed for repairs. In October, 1972, the chamber was installed in the BSR as a spare chamber. In January, 1973, the chamber was transferred from Position E (spare chamber location) to Position D. In November, 1973, the chamber was removed for repairs due to failure of the uncompensated section.
PCP-III-106, SN-66-1	BSR storage		BSR	This dual chamber was installed in the BSR in June, 1968. In May, 1969, the uncompensated section failed. The chamber was removed for repairs. In August, 1970, the chamber was reinstalled in the BSR. In January, 1973, the chamber was removed from Position D for maintenance. The uncompensated section had an abnormal condition of not being fully saturated on saturation characteristic checks.

Fuel

There were no changes in the number of components in the fuel inventory; however, the fuel inventory is listed in Table 7.

Table 7. Fuel and Shim Rod Status

	This Quarter	Last Quarter	Year To Date
Fuel elements depleted	0	1	6
Control-rod fuel elements depleted	0	0	2
New fuel elements placed in service	0	1	6
New control-rod fuel elements placed in service	0	0	2
New fuel elements available for use	11	11	11
New control-rod fuel elements available for use	6	6	6
Partially depleted fuel elements available for use	0	0	0
New shim rods placed in service	0	0	0
Boron stainless steel shim rods in use	6	6	6
Boron stainless steel shim rods available for use	2	2	2

Experiment Facilities Assignment

Facility assignments are listed in Table 8. The tubes of the east D_2O tank are not permanently assigned; they are used by various Laboratory personnel for short-term sample irradiations.

Table 8. Facilities Assignment

Facility	Location	Division or Sponsor
Liquid helium cryostat	Southwest corner of pool using west D_2O tank	Solid State
Liquid nitrogen cyrostat	On instrument bridge	Solid State
Ambient temperature facility	North face of core	Solid State
Front-face tube	North face of core	Solid State
Fast-neutron tube	Core position 15	Solid State
Water-cooled tube	Core position 11	Solid State
Dry thermal-neutron tubes* (N-4 and S-3)	East D_2O tank	Operations
Dry thermal-neutron tubes* (east, center, southwest, and northwest)	East D_2O tank	Operations

*These facility tubes are for sample irradiations and are used by personnel of several divisions, primarily Analytical Chemistry and Solid State Divisions.

Demineralizer Performance

Table 9 gives detailed information on the condition of the primary water system for the preceding year and pertinent data on the performance of the bypass demineralizer.

Table 9. Demineralizer Performance Data

Run No.	Initiation Date	Termination Date	Throughput (gal)	(Counts min^{-1} ml^{-1}		pH		Specific Resistance (ohm-cm)	
				In	Out	In	Out	In	Out
33	1-4-73	3-5-73	1,614,000	1,280	115	5.7	5.8	1,008,000	1,430,000
34	3-6-73	4-30-73	1,393,200	1,848	181	5.7	5.7	873,000	1,363,000
35	5-2-73	7-2-73	2,060,000	2,072	120	5.8	5.8	896,000	1,209,000
36	7-3-73	9-4-73	1,900,000	1,672	116	5.8	5.8	792,000	1,270,000
37	9-4-73	11-12-73	1,300,000	2,021	107	5.9	6.0	682,000	1,144,000
38	11-14-73	1-7-74	1,692,000	1,353	98	5.7	5.7	738,000	1,102,000
39	1-9-74	3-13-74	1,320,000	1,931	101	6.2	6.0	666,000	908,000
*40	3-15-74	7-30-74	1,400,000	9	0	6.2	6.0	364,000	1,132,000
41	8-16-74	12-4-74	1,500,000	2,316	385	5.8	5.8	630,000	895,000
**42	12-17-74	4-15-75	3,850,000	2,116	119	5.8	6.0	1,018,000	1,611,000
43	4-16-75	7-7-75	2,550,000	2,712	174	5.7	5.8	937,000	1,823,000
44	7-10-75	11-5-75	2,750,000	2,528	144	5.7	5.9	968,000	1,428,000
*45	11-5-75	In Service	200,000	28	0	5.7	5.8	870,000	1,558,000

* The reactor was shut down during the entire run.

** New resin in the demineralizer columns.

Special Tests

Efficiency Tests

Tests were performed by Inspection Engineering on the cell ventilation filters. Details are given in Table 10.

Table 10. Efficiency Tests Results, Filters

Date	Unit	Type Test	Efficiency (%)
10-16-75	Center Bank	Elemental Iodine	99.996
10-22-75	North Bank	Methyl Iodide	44.33
10-22-75	Center Bank	Methyl Iodide	96.94
10-22-75	South Bank	Methyl Iodide	37.79
12-3-75	North Bank	DOP	99.995
12-3-75	Center Bank	DOP	99.997
12-3-75	South Bank	DOP	99.994

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