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To: J. R. Novak — Industrial Hygiene & Safety

From: G. T. Lonergan, C. S. McKee — Industrial Hygiene & Safety

Subject: Extrusion of Billets, Precision Extrusion Company, May 24, 1958

C.S. McKee and G. T. Lonergan, both of IHS, monitored the extrusion of the final portion of fuel plates for the Argonaut Reactor which is to be exhibited in Geneva, Switzerland. The extrusion was accomplished at the Precision Extrusion Company in Bensenville, Illinois on May 24, 1958. The following listed ANL personnel were present in addition to those already listed: L. C. Hymes and J. H. Sanecki, both of Metallurgy end T. M. Kennedy, Special Materials. Four members of the Precision Extrusion Company's operating force also assisted in this operation.

The billets were transported to the Precision Extrusion Company accompanied by two AEC couriers, and placed in the furnaces there on asbestos lined trays furnished by ANL.

A preliminary survey of the entire area (see attached special survey sheet #1) was made by Radiation Safety personnel upon arrival at the Bensenville plant.

The floor areas, which were to be traveled by persons handling the hot billets were covered with asbestos sheeting 3' wide 1/16" thick. All other areas which were vulnerable to contamination were covered with polyethylene sheeting. The pusher block catching laddle, laddle table and block runway were lined and/or covered with 1/16"thick asbestos prior to the initial extrusion. The run out table and other areas exposed to high temperature end possible contamination were also covered with 1/16"asbestos.

The air sample collected during the operation failed to reveal any long lived, airborne activity when counted 44 hours later. (See attached air sample data sheet.)

All materials, clean, contaminated and/or suspect were returned to ANL the same day. No contamination of facilities of the Precision Extrusion Company was detected on the final survey.

Each extruded billet was monitored by Radiation Safety personnel immediately after extrusion. The results of those surveys are recorded on the attached sheet labeled s-yard smear data. It was noted at the time of extrusion that there was noticeably less fixed contamination on the extrusions made after a short aluminum container cleanout was pushed through the die (then it was manually cleaned) than on the extrusions made after only a manual cleaning of the die. This data was obtained in a cursory survey immediately following extrusion, therefore data could only be considered as close approximation.

Since there is the possibility of a similar extrusion operation of this nature being performed in the future, it was decided that a more concise investigation of the difference in the levels of fixed contamination between the extrusions made after manual cleaning of the die and those made after a small aluminum cleanout is extruded as well as being manually cleaned.

Upon return of the extrusions to Argonne they were cut into small fuel plate sections prior to assembly into fuel elements. At this time surveys of each fuel plate section was made with an alpha pac and a zeus by Radiation Safety personnel. The results of this survey are recorded on the attached sheet "Argonaut Fuel Plate survey Results". This data has been plotted on the attached charts.

The average fixed contamination for each fuel plate is listed below. The figures indicate an average taken of readings indicated on attached Argonaut fuel plate s-y results.

Plates from Billet #	Average Fixed Contamination in "M"*	Overall Average of Fixed Contamination of Groups in "M"
15	24.91	27.57
16	30.23	
5	22.51	21.51
9	21.17	
10	20.85	
11	14.33	14.45
12	14.57	
13	13.51	16.78
14	20.05	

* "M" = 1000 dpm/100 cm^2

The average fixed contamination on the plates from billets #15 and 16 can not be considered since the die was not cleaned between the extrusion of these billets. However, to polntoutthe effect of only manual cleaning of the die, it can be noticed that the fixed contamination on plates from billet #16 was approximately 5.3M greater than the fixed contamination on plates from billet #15. After billet #16 was extruded the die was cleaned manually which in turn lowered the fixed contamination detected on plates from billet #5 which was the next billet extruded by 5.3M. Between the extrusion of billets numbered 5, 9 and 10 the die was cleaned manually only. However, after this group of three billets a small aluminum clean out block was extruded for the purpose of cleaning the die and container. The overall average of fixed contamination detected on the plates of group (2) (billets #5,9,10) was 21.51M, where as the overall average fixed contamination detected on plates from group (3) (billets #11-12) was significantly lower than that detected on plates of group (2) by 7M. Another aluminum clean out was pushed and the die was manually cleaned, after billet #12. It is to be noted that the levels encountered on billet #13 were lower than those recorded for billet #12. The die was only manually cleaned between the extrusion of billets #13 and 14 and therefore the possible reason for the significant increase of fixed contamination on plates fmm billet #14. Considering the overall average of fixed contamination on group (4) (billets #13 and 14) to be 16.5~ this is still significantly less than the average fixed contamination for-groups #1 and 2.

It appears upon comparison of the overall averages of fixed contamination of all groups, that the levels are lower for those groups after which an aluminum clean out was pushed in conjunction with a manual cleaning of the die. This conclusion is also indicated graphically on the attached sheet entitled Average Reading per Billet.'

The collection of additional and/or similar data, and further consideration of this as a possible means of reducing fixed contamination of fuel plates extruded. in this manner, is suggested, such as similar data on fixed contamination levels encountered where an aluminum clean out is pushed after every billet extrusion.

These conclusions and data are offered only from the consideration of die and container as possible sources of contamination, although the contamination may be the result of or contributed to by metallurgical properties and/or preparations. These possibilities are not treated in this report.

G. T. Lonergan

C. S. McKee

nrw
cc: J. F. Ege, Jr., w/o encl., L. C. Hymes, w/encl.
H. J. Moe, w/o encl., R. A. Noland,w/o encl.
Reading File, w/o encl., File, w/2 encl., CF,w/o encl.

SPECIAL SURVEY REPORT

Location	Requestor	Surveyor	Request	Results
5-24-58	L. C. Hymes	C. S. McKee G. T. Lonergan	Preliminary Survey Covered the following items: 1. Press Die Holder 2. Press Controls 3. Press Die Tab&e 4. Press Pusher Blocks 5. Pusher Block Laddle 6. Floor in front of furnace 7. Floor at Extrusion Point 8. Run out table 9. Cooling tables 10. Stretch Straightener 11. Floor Stretch straightener	No activity was detected in preliminary surveys.
see Surv	and smear	ta Chart	tached) for results of surveys	de during operation.
			Final Survey	
			Asbestos cover on run out tabl	No contsmination detected*
			Catwalk by run out table above end below	No contsmination detected
			Large copper trays upon which billets were heated in furnace	No contamination detected*
			Asbestos lining of trays	Large tray - no contamination detected* Small tray - 1M*
			Graphite guide tube	Exterior only - no contamination detected*
			Guide tube blocks	No contamination detected
			Main Orifice of press	No contsmination detected - smear, No contamination detected, survey
			Flashing on front of container	
			block of the press	No contsmination detected
			Floor area after asbestos rolled	No contsmination detected
			Press floor area	No contsmination detected
			Press controls and surrounding area	No contsmination detected
			Smear Inside press	No contamination detected*
			Smears Inside ovens	No contsmination detected*
			Pusher block table	
			a) On asbestos	1-14M* Asbestos removed
			b) Area under asbestos	No contsmination detected
			Die cleaning area	No contamination detected

*Returned to ANL

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SPECIAL SURVEY REPORT

Location	Requestor	Surveyor	Request	Results
			Stretch - Straightener	
			a) Tape on jaws	1-10M*
			b) Jaws tape removed	No activity detected* (Tape discarded as DAW)
			c) Controls	No activity detected
			d) Floor in this area	No activity detected
			Runout table	
			a) Asbestos cover	No activity detected*
			b) Asbestos removed	No activity detected*
			c) Floor in this area	No activity detected
			d) Duckboard walkway	No activity detected
			Wrapping Table	
			a) Poly Cover	No activity detected*
			b) Poly Removed	No activity detected
			c) Floor in this Area	No activity detected
			Boxes containing plates wrapped	Alpha - No activity detected Beta-Gamma 1-5/1" H&S
			Hand tools belonging to Precision Extrusion Company	No activity detected
			Survey of all personnel, ANL and Precision Extrusion Company	
			Lab Coats	No activity detected*
			Work Clothing	No activity detected*
			Hands and feet	No activity detected
			Four (4) pair of high temp asbestos gloves	3 pair - no contamination detected. 1 pair - 1-2M
			Five (5) pair cotton gloves	4 pair - no contamination detected 1 pair - .5M (All gloves returned to ANL)

* Returned to ANL

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SURVEY AND SMEAR DATA COLLECTED AT PRECISION EXTRUSION COMPANY IN BENSONVILLE, ILLINOIS ON MAY 24, 1958

Billet #	Time Extruded	Tape - Random Smear of Extruded Plate Surface	Portable Instrument Survey Beta-Gamma	Alpha	Remarks	Tape Smear of Die Cleaning Area
2-5 alum	0855	NAD	NAD	NAD	Test as billet	NAD
15	0905	NAD	9/1" H&S	SM	Activity appeared fixed Good plate	
16	0916	NAD	12/1" H&S	At approx. 33 f 30-35M	Activity appeared fixed Informed L. Hymes of alpha survey	(Die Taken To Bussels Office by Precision personnel to remove all butt.
Die Cleaned					Vice read 1M, Cleaned to NAD. Die cleaning tool read 4M. Discarded as DAW. Floor & Bench - NAD.	
5	0949	NAD	13/1" H&S	3-40M	Activity appeared fixed Good plate	
9	0954	NAD	14/1" H&S	5-21M	"	
10	1001	NAD	14/1" H&S	12 -> 40M	Activity appeared fixed however last 15 ft. scored	NAD
Pushed a container clean out		NAD	To hot thermally To survey		NAD	NAD
11	1014	NAD	14/1" H&S	5-30M	Activity appeared fixed Good	NAD
12	1027	NAD	10/1" H&S	10-20M	"	NAD
Pushed a clean out	1029	NAD	To hot thermally To survey			
13	1041	NAD	12/1" H&S	2-25M at end	Activity appeared fixed - good	NAD
14	1050	NAD	14/1" H&S	11-30M	" NAD	
Pushed two 25 clean outs - No activity detected						

ARGONAUT FUEL PLATE SURVEY RESULTS
(Results recorded in "M" = 1000 dpm/100 cm^2 α)
Plates Listed in order of Extrusion

Plate #	PAC Reading in "M"	Zeus Reading in "M"	Plate #	PAC Reading in "M"	Zeus Reading in "M"	Plate #	PAC Reading in "M"	Zeus Reading in "M"
15-1	5		16-1	3		16-31	>40	
15-2	2		16-2	3		5-1	0	
15-3	3		16-3	2		5-2	0	
15-4	1.5		16-4	3		5-3	0	
15-5	8		16-5	7		5-4	0	
15-6	8		16-6	5		5-5	2	
15-7	6		16-7	4		5-6	0	
15-8	3		16-8	2		5-7	1.2	
15-9	5		16-9	5		5-8	0.	
15-10	7		16-10	2		5-9	1.5	
15-11	3		16-11	4		5-10	2.0	
15-12	9		16-12	4		5-11	5	
15-13	10		16-13	10		5-12	4	
15-14	8		16-14	12		5-13	5	
15-15	15		16-15	28		5-14	5	
15-16	15		16-16	12		5-15	5	
15-17	30		16-17	18		5-16	14	
15-18	>40	55	16-18	38		5-17	22	
15-19	>40	39	16-19	>40	39	5-18	38	
15-20	>40	47	16-20	>40	46	5-19	>40	47
15-21	>40	51	16-21	>40	47	5-20	>40	50
15-22	>40	63	16-22	>40	47	5-21	>40	54
15-23	>40	66	16-23	>40	48	5-22	>40	54
15-24	>40	63	16-24	>40	48	5-23	>40	54
15-25	>40	63	16-25	>40	54	5-24	>40	55
15-26	>40	47	16-26	>40	55	5-25	>40	59
15-27	>40	43	16-27	>40	63	5-26	>40	61
15-28	22		16-28	>40	130	5-27	>40	63
			16-29	>40	125	5-28	>40	49
			16-30	>40	43	5-29	>40	48
						5-30	>40	39
						5-31	35	

Plate #	PAC Reading in "M"	Zeus Reading in "M"	Plate #	PAC Reading in "M"	Zeus Reading in "M"	Plate #	PAC Reading in "M"	Zeus Reading in "M"
9-1	0		10-1	10		11-1	0	
9-2	0		10-2	12		11-2	0	
9-3	0		10-3	9		11-3	0	
9-4	0		10-4	8		11-4	0	
9-5	0		10-5	9		11-5	0	
9-6	0		10-6	7		11-6	0	
9-7	0		10-7	10		11-7	0	
9-8	0		10-8	8		11-8	0	
9-9	0		10-9	11		11-9	1	
9-10	0		10-10	9		11-10	1	
9-11	1		10-11	2		11-11	1	
9-12	2		10-12	4		11-12	1	
9-13	3		10-13	12		11-13	1.4	
9-14	4.5		10-14	20		11-14	1.8	
9-15	5		10-15	35		11-15	2.2	
9-16	10		10-16	>40	40	11-16	6	
9-17	14		10-17	>40	46	11-17	7	
9-18	16		10-18	>40	47	11-18	15	
9-19	23		10-19	>40	46	11-19	20	
9-20	26		10-20	>40	43	11-20	20	
9-21	29		10-21	>40	40	11-21	34	
9-22	32		10-22	>40	39	11-22	40	
9-23	38		10-23	>40	39	11-23	>40	55
9-24	40		10-24	>40	39	11-24	32	
9-25	37		10-25	>40	39	11-25	30	
9-26	37		10-26	>40	46	11-26	30	
9-27	34		10-27	>40	46	11-27	22	
9-28	35		10-28	>40	46	11-28	27	
9-29	37		10-29	>40	39	11-29	31	
9-30	37		10-30	28		11-30	40	
9-31	2		10-31	22		11-31	26	
			10-32	18				
			10-33	20				

Plate #	PAC Reading in "M"	Zeus Reading in "M"	Plate #	PAC Reading in "M"	Zeus Reading in "M"	Plate #	PAC Reading in "M"	Zeus Reading in "M"
12-1	0		13-1	0		14-1	0	
12-2	0		13-2	0		14-2	0	
12-3	0		13-3	0		14-3	1.2	
12-4	0		13-4	0		14-4	1.2	
12-5	1.5		13-5	0		14-5	1.2	
12-6	1.5		13-6	0		14-6	1.4	
12-7	1.3		13-7	0		14-7	1.8	
12-8	1.5		13-8	0		14-8	1.5	
12-9	1.75		13-9	1		14-9	1.5	
12-10	1.5		13-10	2.5		14-10	1.8	
12-11	1.5		13-11	2.3		14-11	1.9	
12-12	1.8		13-12	2.0		14-12	2	
12-13	2		13-13	3.5		14-13	5	
12-14	1.5		13-14	4		14-14	12	
12-15	2		13-15	7		14-15	9	
12-16	5		13-16	5		14-16	10	
12-17	10		13-17	9		14-17	15	
12-18	11		13-18	8		14-18	30	
12-19	16		13-19	9		14-19	40	
12-20	20		13-20	15		14-20	>40	43
12-21	26		13-21	20		14-21	>40	39
12-22	32		13-22	31		14-22	>40	41
12-23	34		13-23	>40	41	14-23	>40	47
12-24	32		13-24	28		14-24	>40	47
12-25	34		13-25	40		14-25	>40	47
12-26	40		13-26	30		14-26	>40	48
12-27	40		13-27	36		14-27	>40	47
12-28	>40	47	13-28	>40	40	14-28	35	
12-29	>40	42	13-29	>40	39	14-29	33	
12-30	26		13-30	>40	32	14-30	>40	38
12-31	19							