uraniumone
Investing in our energy

September 4, 2013

Mr. Ron C. Linton, Project Manager
Decommissioning and Uranium Recovery Licensing Directorate
Division of Waste Management & Environmental Protection
Office of Federal & State Materials & Environmental Management Programs
11545 Rockville Pike
Rockville, MD. 20852-2738

RE: Uranium One USA, Inc. request for relief from the Confirmatory Action Letter (CAL) response of September 21, 2012 identifying a required residence time to at least 4.5 to 5.0 hours per drum of yellowcake

Dear Mr. Linton:

During an inspection of Uranium One's Willow Creek operation on July 31 – August 2, 2013, NRC inspectors reviewed Uranium One's June 2013 self identified violation regarding compliance with the 4.5 to 5.0 per hour dryer residence time commitment in the September 21, 2012 response to the CAL. The self identified violation was developed as a result of Uranium One using a direct correlation of yellowcake drum fill times to dryer residence time. After further evaluation, we realize that this correlation was not correct and have since developed a method to estimate true dryer residence time.

To clarify the relationship between drum fill time and dryer residence time, Uranium One retained Golder Associates, Inc. to establish a method of calculating yellowcake residence time in the dryer at the Irigaray facility. The attached evaluation explains how dryer residence time can be estimated and how a direct correlation between dryer residence time and drum filling time is inappropriate. In fact, the results indicate that the 4.5 to 5.0 hour residence time per drum commitment in the response to the CAL was never violated. Uranium One recognizes that while residence time is important to meet product specifications, the most effective procedure to avoid over-pressurized drums is to adequately cool and vent filled drums prior to sealing.

In light of the attached information, Uranium One USA, Inc. is requesting from the NRC relief from the September 12, 2012 CAL response letter (page 3, item number 2 - *Increase the required dryer residence (drying) time to at least 4.5 to 5.0 hours per drum of yellowcake*) as well as the CAL tie down identified in License Condition 9.3 (last bullet) of SUA 1341 dated March 7, 2013. We have also revised the Self-Identified Violation in question to address only a deviation in SOP-12 that requires adherence to both dryer residence time and drum filling time.

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If you have any questions or need additional clarification please contact me at jon.winter@uranium1.com or (307) 234-8235 ext. 331.

Sincerely,

Jon Winter
Director of Safety Health and Environment

Cc Blair Spitzberg, Linda Gersey, Robert Evans – NRC Region IV

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Evaluation of Irigaray Product Drying Residence Time vs Drum Fill Time

The Irigaray yellowcake dryer is a high temperature dryer designed to eliminate moisture from a damp or wet yellowcake (YC) and to produce a stable uranium oxide for packaging in 55-gal drum enclosures. In order to meet the desired product specifications of moisture and to insure that the final yellowcake product is produced in a stable form, the requirement for a minimal drying time was established for the response to the NRC Confirmatory Action Letter (CAL) (corrective action item 2, page 3 of the Uranium One response dated September 21, 2012). This drying time (also called dryer residence time) was established to be in the range of 4.5 to 5.0 hours. This is the length of time that the yellowcake must be in the dryer at the dryer temperature (1,000 degrees F) to insure that residual free moisture will be removed from the wet yellowcake feed to achieve a moisture level of 2.0% or less and will produce a stable yellowcake product that can be safely packaged and shipped to a uranium refinery.

At the time of the response to the CAL, the drum fill time was the only measure of the dryer operation available, thus it was used as an indicator of dryer residence time. Uranium One's June, 2013 Self-Identified Violation incorrectly correlated drum fill time directly with dryer residence time. However, as noted below, drum fill time is not a direct measurement of dryer residence time. The CAL addresses dryer residence time, not drum fill time.

More explanation of how to calculate dryer residence time, and whether compliance with commitments in the CAL were adhered to, is provided with the following analysis.

The Standard Operating Procedure (SOP) for the dryer is to maintain a minimum of 4.5 hours of drying time (residence time) in the dryer. The dryer residence time (RT) can be calculated from the formula:

$$RT_{Dryer} = V_d / F_{YC} \quad (1)$$

Where V_d = Volume of the yellowcake in the Dryer (ft^3)
and F_{YC} = Average yellowcake Feedrate (ft^3/hr)

Since the dryer internals do not completely fill with yellowcake during the drying operation, a calculation of the active yellowcake dryer hold-up must be determined in order to calculate the dryer residence time. The Willow Creek dryer is a direct fired multiple hearth dryer with an internal rake drive mechanism. The rake mechanism is the device internal to the dryer that moves the yellowcake from the top of the dryer through the multiple heated hearths to the dryer discharge and into the receiving drum. The dryer internals have the following specifications:

Number of Hearths = 3
Surface area of each Hearth = 13.50 ft^2
Area occupied by the Rake mechanism on each Hearth = 0.27 ft^2
Depth of yellowcake on each Hearth = 2.5 in. (0.208 ft)

The active yellowcake volume internal to the dryer is:

$$V_d = A_H * H_{YC} \quad (2)$$

where A_H = Area of Dryer Hearths
and H_{YC} = Height of yellowcake on the Hearths

For the Willow Creek dryer this calculates to be:

$$V_d\ (ft^3) = (13.50 - 0.27) * 3 * 0.208 \quad (3)$$

V_d= 8.27 ft^3 of yellowcake hold-up internal to the dryer

The calculation of the allowable feed rate of yellowcake in the dryer for any given residence time, can be determined from Equation (1) as follows:

$$F_{YC}\,(lb/hr) = V_d * d_{YC} / RT_{Dryer} \qquad (4)$$

where d_{YC} = density of the yellowcake in lb/ft^3 = $131 lb/ft^3$
(based on site measurement of 18.05 lb/gal for yellowcake feed)

To achieve a residence time of 4.5 hours in the dryer the yellowcake feed rate cannot exceed the following (assuming the variables such as density, drying temperature, and dryer rake speed remain constant):

$$F_{YC}\,(lb/hr) = (8.27\ ft^3 \times 131\ lb / ft^3) / 4.5\ hr = 240.7\ lb/hr \qquad (5)$$

The above calculation indicates that the maximum dryer feed rate to obtain a minimum 4.5 hour residence time is 240.7 lb/hr of yellowcake.

In a steady state operation where the feed to the dryer is constant, the fill rate of the drum is directly proportional to the feed rate. Therefore, in order to meet a residence time of 4.5 hours, a yellowcake drum weighing 800 lb should fill in no less than 3 hr and 19 minutes (ie. 800lb / 240.7lb/hr). Table 1, provided as Attachment 1 to this write-up, includes a list of all drums that were identified by Uranium One as having **drum fill** times of less than 4.5 hours. Additionally Table 1 provides dryer residence time for each drum based on the feed rate to the dryer and the fill time for each drum. As demonstrated from the calculations of dryer residence times presented in Table 1, none of the drums were below the minimum residence time of 4.5 hours. **Therefore, although the drum fill time of these particular drums was below 4.5 hours, the minimum dryer residence time of 4.5 hours was never violated.** The requirement of maintaining an adequate residence time in the dryer, not the drum fill time, is key to insuring that proper drying of the yellowcake has occurred and that the dried product will meet the product specifications.

Thus, as presented in the example above, as long as the dryer operators do not exceed the maximum dryer feed rate of 240.7 lb/hr to produce the minimum dryer residence time of 4.5 hrs, the yellowcake will receive the required drying time (dryer residence time) of 4.5 hours even though individual drum fill rates may slightly vary due to the variability of the % solids in the feed.

Conclusions

In conclusion, it has been shown that none of the drums had less than 4.5 hours of dryer residence time per drum, which is Uranium One's commitment made in response to the CAL. Therefore there was no violation of the CAL. The only potential violation that occurred involved a deviation from SOP-12, which - contains both the 4.5 to 5.0 hour dryer retention time requirement as well as a 4.5 to 5.0 hour drum filling time requirement. Having both requirements causes personnel to mistakenly correlate dryer residence time directly with drum filling time.

Residence time is one factor in determining product moisture content. However, the critical factor to reduce or eliminate gas build-up and drum pressurization is an adequate drum cooling and venting time. If residence time were the critical factor to the elimination of drum pressurization, NRC would require all licensees to have specific license conditions or language controlling dryer residence times. While residence time is a contributing factor that should be considered the most effective procedure to avoid over-pressurized drums is to adequately cool and vent filled drums prior to sealing. The procedure implemented at the Willow Creek site of allowing 24 hours of cooling and venting of each filled yellowcake drum prior to lidding, effectively eliminates the potential for build-up of gases and pressurization of drums.

Uranium One has demonstrated that none of the drums with fill times of less than 4.5 hours received less than 4.5 hours of dryer residence time per drum. Further, none of the drums packaged with a fill time less than 4.5 hours and allowed to vent for 24 hours exhibited pressurization.

Recommendations

Uranium One proposes that, based on the above evaluation of thedryer residence time, the first commitment of the CAL to establish a minimum of a 24 hour of cooling and venting time for each drum of yellowcake prior to shipping be considered the critical component to prevent future drum pressurization issues. Second, Uranium One is requesting that the dryer retention time of 4.5 to 5.0 hours be eliminated as a binding condition of the CAL.

Attachment 1

Table 1

YC Lot 17

Lot and Drum Number	Date/Time Packaged	Drumming Time	Net Drum Weight (lbs)	Dryer Residence Time
WC17-7	11/4/12 15:15	4:15	684	6:43
WC17-17	11/8/12 14:10	4:15	647	7:06
WC17-19	11/8/12 23:10	4:15	655	7:01
WC17-20	11/9/12 3:20	4:10	647	6:58
WC17-28	11/10/12 16:05	4:10	658	6:51
WC17-31	11/11/12 5:15	4:00	646	6:42
WC17-33	11/11/12 14:10	4:20	674	6:57
WC17-35	11/11/12 22:40	4:00	628	6:53
WC17-36	11/12/12 2:50	4:10	623	7:14
WC17-37	11/12/12 6:50	4:00	631	6:52
WC17-40	11/12/12 20:40	4:20	652	7:12
Total 11 drums				

YC Lot 20

Lot and Drum Number	Date/Time Packaged	Drumming Time	Net Drum Weight (lbs)	Dryer Residence Time
WC20-40	12/22/12 23:55	4:10	694	6:30
Total 1 drum				

YC Lot 21

Lot and Drum Number	Date/Time Packaged	Drumming Time	Net Drum Weight (lbs)	Dryer Residence Time
WC21-50	1/11/13 8:15	4:15	683	6:44
Total 1 drum				

Table 1

YC Lot 22

Lot and Drum Number	Date/Time Packaged	Drumming Time	Net Drum Weight (lbs)	Dryer Residence Time
WC22-23	1/16/13 8:10	4:25	771	6:12
WC22-24	1/16/13 12:30	4:20	772	6:04
WC22-25	1/16/13 16:50	4:20	773	6:04
WC22-26	1/16/13 21:15	4:25	784	6:06
WC22-27	1/17/13 1:40	4:25	764	6:15
WC22-28	1/17/13 6:00	4:20	768	6:06
WC22-29	1/17/13 10:15	4:15	761	6:03
WC22-30	1/17/13 14:30	4:15	764	6:01
WC22-31	1/17/13 18:50	4:20	760	6:10
WC22-32	1/17/13 23:05	4:15	764	6:01
WC22-33	1/18/13 3:30	4:25	762	6:16
WC22-34	1/18/13 7:40	4:10	756	5:58
WC22-35	1/18/13 12:00	4:20	764	6:08
WC22-36	1/18/13 16:20	4:20	752	6:14
WC22-39	1/19/13 5:55	4:25	784	6:06
WC22-41	1/19/13 14:35	4:10	750	6:01
WC22-42	1/19/13 19:00	4:25	780	6:08
WC22-48	1/20/13 21:55	4:10	733	6:09
WC22-52	1/21/13 16:10	4:25	795	6:01
Total 19 drums				

Table 1

YC Lot 23

Lot and Drum Number	Date/Time Packaged	Drumming Time	Net Drum Weight (lbs)	Dryer Residence Time
WC23-3	1/22/13 5:50	4:25	779	6:08
WC23-4	1/22/13 10:10	4:20	781	6:00
WC23-6	1/22/13 19:10	4:25	766	6:14
Total 3 drums				

YC Lot 24

Lot and Drum Number	Date/Time Packaged	Drumming Time	Net Drum Weight (lbs)	Dryer Residence Time
WC24-6	2/5/13 22:10	4:25	720	6:38
WC24-16	2/7/13 20:55	4:10	716	6:18
WC24-17	2/8/13 1:15	4:20	702	6:41
Total 3 drums				

YC Lot 25

Lot and Drum Number	Date/Time Packaged	Drumming Time	Net Drum Weight (lbs)	Dryer Residence Time
WC25-5	2/17/13 14:00	4:10	730	6:11
WC25-6	2/17/13 18:20	4:20	726	6:27
WC25-27	2/21/13 20:25	3:40	770	5:09
Total 3 drums				

Table 1

YC Lot 31

Orginal Lot and Drum Number	Lot and Drum Number	Date/Time Packaged	Drumming Time	Net Drum Weight (lbs)	Dryer Residence Time
WC29-37	WC31-1	4/28/13 0:15	4:25	775	6:10
WC29-38	WC31-2	4/28/13 4:40	4:25	784	6:06
WC29-39	WC31-3	4/28/13 9:05	4:25	783	6:06
WC29-40	WC31-4	4/28/13 13:30	4:25	813	5:53
WC29-41	WC31-5	4/28/13 17:50	4:20	767	6:07
WC29-42	WC31-6	4/28/13 22:10	4:20	794	5:54
WC29-43	WC31-7	4/29/13 2:20	4:10	785	5:45
WC29-44	WC31-8	4/29/13 6:35	4:15	791	5:49
WC29-45	WC31-9	4/29/13 10:50	4:15	800	5:45
WC29-46	WC31-10	4/29/13 15:05	4:15	778	5:55
WC29-47	WC31-11	4/29/13 19:30	4:25	809	5:54
WC29-30	WC31-12	4/26/13 16:25	4:25	736	6:30
WC33-45	WC31-13	5/31/13 2:10	3:15	769	4:34
WC34-49	WC31-14	6/25/13 12:50	3:50	706	5:52
WC34-50	WC31-15	6/25/13 17:05	4:15	753	6:06
WC35-11	WC31-16	6/28/13 18:40	3:50	636	6:31
WC36-10	WC31-17	7/10/13 10:55	4:20	839	5:35
WC36-48	WC31-18	7/24/13 11:55	4:15	831	5:32
WC36-49	WC31-19	7/26/13 9:10	4:15	874	5:16
Total 19 drums					

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Ron Linton-Project Manager
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