

INTERNATIONAL TRANSPORT OF URANIUM CONCENTRATES

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ABSTRACT

There has been discussion within industry for a number of years regarding standards for shipping uranium concentrates from producers (mine/mill operations) to uranium conversion facilities. Although the standard way of transporting ore concentrates is in drums (nominally 200-210 litre size), the specific packing and securing methods for sea transport vary considerably. A major initiative was recently launched within WNTI with the setting up of a Task Force to examine the aspects of the transport of uranium concentrates that include a marine component. These aspects were grouped into three areas of interest as follows: the drums used for packaging, the sea (ISO) containers themselves and the restraint of the drums in the ISO containers. The objective of the Task force is to explore the concept of standard good industry practices for uranium concentrates packaging and shipping in ISO containers.

Based on the findings of the Task Force, this paper will share the lessons learned. It will discuss good industry practices, which can be used as a basis to establish common methodology for the transport uranium concentrates. It will consider the value of adopting a common approach and in this regard, the paper will highlight the current variations in drum design and the range of difficulties this can pose. In addition, the paper will describe drum restraint systems within the container, explaining the way in which securing methods have had to change due to restrictions on the use of wood dunnage. The importance of using containers satisfying ISO 1496 standard and the Convention for Safe Containers will be discussed. Based on industry experience, important operational procedures to ensure well packaged secure loads will also be discussed.

INTRODUCTION

A task force was formed in late 2005, through the World Nuclear Transport Institute (WNTI), to discuss the common transportation related interests of the commercial producers and converters of natural uranium concentrates. Naturally, additional participants included transporters. The

focus of the UCTF was to discuss common means of meeting converter tooling requirements, complying with the international transport regulations and guidelines [1, 2, 3, 4, 5, 6, 7] and making improvements in safety and efficiency through pooling joint industry experience. The group also reviewed related published information [8, 9, 10]. Although drummed uranium concentrates have been transported internationally for over forty years, recent developments have created a renewed interest (particularly amongst producers and converters) in sharing industry experience and good practices. In fact the interest of the producers and converters is to share this information beyond the consignors and consignees of the material to the other stakeholders in the transportation logistic chain.

The very few commercial natural uranium conversion service providers worldwide are supplied by a larger number of international producers that are spread across the globe. The growing interest in nuclear energy and the current healthy price for uranium is generating new and increased uranium ore concentrate production worldwide. In the interest of continued safe handling of drummed uranium concentrates, this seemed an opportune time to launch an initiative to share information about industry good practices.

It is understandable that since this is both a narrow field of interest and one that is at the very beginning of the fuel cycle, that many of the other participants in the nuclear fuel cycle would have given little thought to this transport logistic. In the past this logistic has been carried out quietly, economically and with little fanfare or incident. For this reason when the notion to create a task force was raised a number of years ago, the producers and converters themselves questioned the idea. In addition, various stakeholders such as standards organization representatives, competent authorities and transporters also questioned the concept. Although the idea was raised a number of years ago, it was the discussions that took place in 2004 and 2005 that prompted the converters and some of the principle producers to launch work on the subject through a WNTI task force, the Uranium Concentrate Shipping Task Force (UCTF).

Three key topic areas were identified and preliminary papers were prepared to explore them. An initial meeting was held by the UCTF in December 2005 and the papers and plans for how to proceed were discussed. This meeting was followed by four workshops, held over the 2006 to 2007 period. The workshop discussions resulted in the preparation of a draft information paper that is now in the final phase of review by the UCTF before publication by WNTI.

SCOPE OF THE IP

The scope of the IP is limited to drummed natural uranium concentrates that are transported from producers using a marine logistic component combined with ground transport by road and/or rail.

The commercial converters are located in North America and Europe and they currently have a number of common requirements for drum characteristics that are related to facility tooling. Significant volumes of drummed uranium concentrates are received by all of the converters from off shore producers, and once again there are common requirements for the sea (ISO) containers that are related to facility tooling.

Natural uranium concentrate, typically originating from combined mine-mill facilities, is treated a commodity material. The natural uranium used for fresh fuel is generally purchased by power utilities, who then purchase conversion services. The power utility directs the mine-mill facility to deliver the material to the conversion facility that they have selected. In this sense, it is

generally not the producer of the concentrate that decides to which converter it is to be delivered. As a first step, the natural uranium concentrates are packaged into drums that can be handled by any of the converters. When shipment by sea is required, they are also loaded into ISO containers in a manner that is “universal” and can be handled by any of the recipient conversion facilities.

More specifically, the uranium concentrates are packaged in open head steel drums and they are packed into twenty (20) foot ISO containers. The containers travel by ground via road and/or rail to port, by sea and then finally from the destination port by ground again to the consignee. The ISO containers are almost always leased from shipping lines or container services and then free released back to container pools once they are unloaded. The ISO containers are rarely consignor or consignee owned due to the poor economy in having them back hauled empty.

REASON FOR THE IP

There are two key reasons for the initiative to produce an industry good practices IP at this time.

One reason is that industry was recently requested to provide information about their handling practices for uranium concentrates in particular by a principle shipping line that provides the ISO containers for this application. In this sense, providing information to confirm that the containers are being properly and consistently handled by the uranium concentrate industry in this logistic contributes to the industry’s ability to readily access ISO containers via their transporters from the ISO container lessors. In other words, this is a matter of sustaining shipments (i.e. avoiding denial and delay of shipments). This is currently a very topical matter for class 7 (radioactive materials) businesses.

The other reason is that there was a change of regulatory requirements that have been phased in over the last several years. This change is related to new phytosanitary requirements that apply to the securing materials used for these shipments. The changes are driven by adoption by member states of an international convention for plant protection [7]. ISO containers can be readily secured with conventional timber blocking and bracing. Without certified treatment and certification for phytosanitary compliance, this conventional lumber is no longer acceptable for use. Although there are very good alternative securing materials that are phytosanitary compliant, they are not as straightforward to use in such a way that they provide the equivalent restraint. The hope in sharing industry good practices is to reduce the likelihood of problems or noncompliance in these transports.

Apart from these current concerns, some of the transporters involved with this logistic have expressed a longer standing interest in having this information. In their case although they deal with obtaining the ISO containers and they handle the movement of the packed ISO containers from the consignor to the consignee, they are not involved directly with their loading and packing. With more information about how the ISO containers are handled, they can better provide their own services as well as to provide information to the ISO container lessors. In many cases the transporter is the commercial link to the ISO container lessors.

PARTICIPATION IN IP DEVELOPMENT

All three (3) of the North American and European commercial converters and many of the principle uranium concentrate producers have participated to date in drafting the IP. The producers represented are from facilities located in Africa, Australia, Asia and North America.

STAKEHOLDERS AND USE OF THE IP

The principle stakeholders in the transportation of uranium concentrates are the producers (consignors) and converters (consignees) of uranium concentrates. Other key stakeholders include marine transporters, ISO container lessors, ground transporters (road and rail), regulators and modal organizations.

In the interest of sharing the industry good practices information, WNTI plans to publish the final IP in the next 3-4 months. It will be available at no charge to both WNTI members and non-members.

The good practices described in the IP are divided into four areas of interest. The first three were components of the original scope of the paper and the last one was added during the work of the UCTF.

- (i) the drums used for packaging
- (ii) the ISO containers themselves
- (iii) restraint of the drums in the ISO containers
- (iv) release of the empty ISO containers for return

The IP includes an extensive section on terminology. This section acts as a glossary for stakeholders who may be familiar with their portion of the logistic, but who might need assistance with the terminology related to uranium concentrate itself or the mixture of regulations that require compliance for transport.

The drums used for packaging are described and unacceptable features are listed in the IP, such as clip rings and welded ring bolts. Illustrations are provided in the IP for the styles of drums that are currently in use by industry (nesting and non-nesting) as well as illustrations of components such as regular and centre load lids.

The conversion facilities all commonly accept 20 foot size ISO containers and this is discussed in the IP. Good practices related to handling the containers for uranium concentrates are described and references are provided for more detailed information [2-10]. Receipt inspection of the ISO containers is recommended for both mechanical and physical features, such as good general condition and presence of a current CSC plate. In addition the IP recommends that the containers be checked for radioactive contamination on receipt. This is done to ensure that prior exposure to normally occurring radioactive material (NORM), which is unrelated to the planned uranium concentrate shipment, is not present at levels that would render the container unacceptable for free release by the consignee (converter). The key reference related to the

physical and mechanical aspects of the ISO containers is ISO 1496-1 [3]. The IP does not attempt to duplicate the reference, but rather to harmonize with it.

The IP provides good practices information for the loading of the ISO containers and also references applicable regulatory guidance material [2 and 6]. This is a very important component of the IP because of the need to ensure that load shifting is prevented during transportation. The bulk density of the uranium concentrates causes the drums to often be under filled by volume and sufficiently heavy that shipments are often either a single tier or single tier with a small partial second tier. Securing with this large a void space and balancing plus stabilizing a partial second tier are addressed in the IP. This aspect of the securing of the drums in the ISO containers has proven to also be of interest to ISO container owners due to safe handling at ports and at sea. The ISO container owners are interested in this for the same reason that producers and converters are, to avoid any shifting of loads that might result in a package breach and contamination control issues.

With drums, ISO containers and ISO container packing in hand, the last topical area discussed in some detail in the IP is good practices associated with free release of the containers back to the ISO container lessor's container pool. This is something that was requested of industry and is of great importance because it is a frequently occurring interface between the uranium business and key transportation service providers who are not in the uranium (or other radioactive materials) business.

CONCLUSION

The UCTF has almost completed the information paper and will meet again in December 2007 to wrap it up for publication. At that time the UCTF will look at other areas of common interest, such as "blue sky" thinking about ways to continue to develop and improve packaging and handling of these materials. It is hoped that the sharing of good practices will promote continual improvement as well as leadership in compliance and good product stewardship. Ultimately this contributes to responsibility for the health and safety of workers and the public, as well as the environment.

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REFERENCES

1. INTERNATIONAL ATOMIC ENERGY AGENCY, "Regulations for the Safe Transport of Radioactive Materials", TS-R-1, 2005 Edition, IAEA, Vienna (2005), www.iaea.org/books
2. INTERNATIONAL ATOMIC ENERGY AGENCY, Advisory Material for the IAEA Regulations for the Safe Transport of Radioactive Material, TS-G-1.1, 2002 edition, IAEA, Vienna (2002), www.iaea.org/books

3. INTERNATIONAL ORGANISATION FOR STANDARDIZATION, “International Standard for Series 1 freight containers - Specification and testing - Part 1: General cargo containers for general purposes, ISO 1496-1, Fifth Edition 1990, incorporating amendments 1-5, ISO, Switzerland (1990), www.iso.org
4. INTERNATIONAL MARITIME ORGANIZATION , “International Convention for Safe Containers (CSC)”, Fourth Edition 1996, publication number IA282E, IMO London (1996), www.imo.org
5. INTERNATIONAL MARITIME ORGANIZATION, “International Maritime Dangerous Goods (IMDG) Code”, Volumes 1 and 2, 2006 edition, incorporating amendment 33-06, publication number IF200E, IMO, London (2006), www.imo.org
6. INTERNATIONAL MARITIME ORGANIZATION, “IMO/ILO/UN ECE Guidelines for Packing of Cargo Transport Units”, IMDG Code Supplement, incorporating amendment 33-06, publication number IF210E, IMO, London (2006), www.imo.org
7. INTERNATIONAL PLANT PROTECTION CONVENTION, “International Standard for Phytosanitary Measures, Guidelines for Regulating Wood Packaging Material in International Trade”, ISPM 15, Secretariat of the International Plant Protection Convention Food and Agriculture Organization of the United Nations, IPPC, Rome (2002), www.ippc.int
8. INSTITUTE OF INTERNATIONAL CONTAINER LESSORS, “Guide for Container Equipment Inspection”, IICL-5, Fifth edition 2005, IICL, New York (2005), www.iicl.org
9. GERMAN MARINE INSURERS, “Container Handbook, Volume 1, II, III; Cargo loss prevention information from German marine insurers”, GDV Die Deutschen Versicherer, Berlin (2007), www.containerhandbook.de
10. HAPAG-LLOYD, “Container Packing” and “Container Specification” guidance pamphlets, Hapag-Lloyd, Hamburg (2005), www.hlcl.com