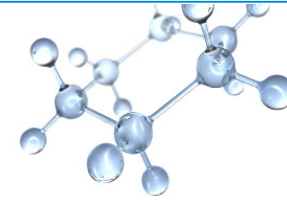




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# *Hazardous Goods Transport*



*ADR/RID - Class 7*

December 8, 2011

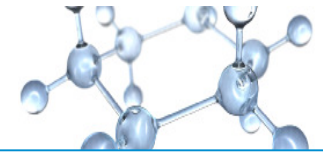
28.11.2011  
Ernst-Michael Steffan

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***EAN-NORM workshop in Hasselt, Belgium 2011***

# Agenda

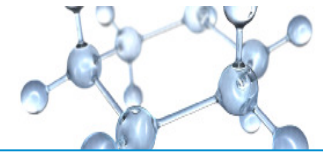
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- Thank you all for making time and coming to listen to my talk on class 7 transport of NOR Material from the crude oil and natural gas production.
- Overview
  - *Principles of Class 7*
  - *Limit values for the requirements of class 7 for the E & P – Industry*
    - *Activity concentration for exempt materials*
    - *Activity limit for an exempt consignment*
  - *Package requirements*
  - *Summary and discussion*
  - *Timing: about 25 minutes*

# PRINCIPLE OF CLASS 7

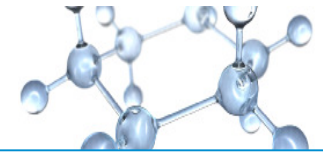
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- *Overriding principle of ADR/RID Class 7 is the safe transport of radioactive materials.*
- *Consequently one focus of Class 7 regulations stresses accident proof packaging and transport monitoring.*
- *Class 7 materials must transported either in accident proof packaging, alternatively the radioactive content within a packaging has to be minimized to a level, at which it represents no harm to the human or to the environment, when loss containment.*

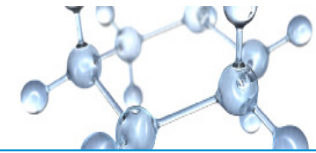
## Limit values for the requirements of class 7

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- *NOR Materials from the E & P – industry represent production residues from crude oil and natural gas production!*
- *The materials are in their natural state, and the ex-traction and use of the radionuclides is not planned!*
- *Such radioactive materials are not included in Class 7 for the purposes of ADR/RID, when the activity con-centration of the material does not exceed 10 - times the values specified in 2.2.7.2.2.1(b), or calculated in accordance with 2.2.7.2.2.2 to 2.2.7.2.2.6 ADR/RID for mixtures of several radio - nuclides*

# Limit values for the requirements of class 7



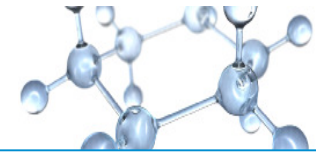
- Activity concentration for exempt materials**

*(list of radio - nuclides relevant for NORM from the E & P - industry)*

Radionuclide (atomic number)	(b) (General) Activity concentration for exempt material	(b) (NORM) Activity concentration for exempt material containing NORM in their natural state .....
	(Bq/g)	(Bq/g)
Pb-210	$1 \times 10^1$	$1 \times 10^2$ (100)
Po-210	$1 \times 10^1$	$1 \times 10^2$ (100)
Ra-226	$1 \times 10^1$	$1 \times 10^2$ (100)
Ra-228	$1 \times 10^1$	$1 \times 10^2$ (100)
Th-228	$1 \times 10^0$	$1 \times 10^1$ (10)

- Mixtures of several radionuclides – characteristic for NORM from the E & P – industry - requires the calculation of class 7 limit value for each single transport!**

# Limit values for the requirements of class 7



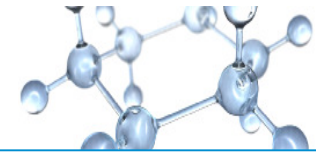
- Activity limit for an exempt consignment**

*(list of radio - nuclides relevant for NORM from the E & P - industry)*

Radionuclide (atomic number)	(c) Activity limit for an exempt consignment	
	(Bq)	(Bq)
Pb-210	$1 \times 10^4$	10.000
Po-210	$1 \times 10^4$	10.000
Ra-226	$1 \times 10^4$	10.000
Ra-228	$1 \times 10^5$	100.000
Th-228	$1 \times 10^4$	10.000

- Mixtures of several radionuclides – characteristic for NORM from the E & P – industry - requires the calculation of class 7 limit value for each single transport!**

# Facilitated transport of excepted packages



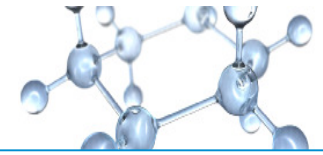
- **UN 2910 RADIOACTIVE MATERIAL, EXCEPTED PACKAGE – LIMITED QUANTITY OF MATERIAL**

<b>Activity limits for excepted packages - UN 2910</b>		
<b>Physical state of contents</b>	<b>Materials Package limits</b>	<b>Materials Package limits</b>
<b>(1)</b>	<b>(4)</b>	<b>(4)</b>
<b>Solids other form</b>	$10^{-3} A_2$	<b>Pb-210 = <math>5 \times 10^{-5}</math> TBq</b> <b>Ra-226 = <math>3 \times 10^{-6}</math> TBq</b> <b>Ra-228 = <math>2 \times 10^{-5}</math> TBq</b> <b>Th-228 = <math>1 \times 10^{-6}</math> TBq</b>

*The facilitated transport option under UN 2910 is of little to non importance for the E & P – industry, due to the enhanced threshold values for the activity concentration for exempt materials*

# Packages / Types of packages

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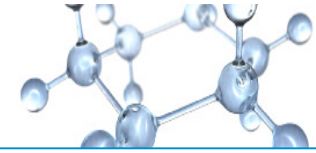
## Excepted Packages – UN 2910

- If the package meets the general package requirements, no further testing is needed
- Dose rate shall be no more than **5  $\mu\text{Sv}/\text{h}$**  at any point of the outer surface of the package
- Established threshold values for the total activity
- If the package side length is less than 10 cm, an overpack is required



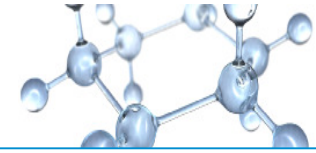


# Packages / Types of packages



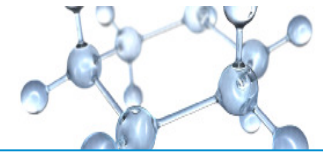
<b>Exempted Consignment (NORM)</b>	} conventional package
$\Sigma (\text{Ra-226} + \text{Pb-210} + \text{Po-210} + \text{Ra-228} + (\text{Th-228}/10)) \leq 10.000 \text{ Bq}$	
<b>Exempted Material (NORM)</b>	}
$\Sigma (\text{Ra-226} + \text{Pb-210} + \text{Po-210} + \text{Ra-228} + (\text{Th-228} \times 10)) \leq 100 \text{ Bq/g}$	
<b>LSA-I (NORM)</b>	} declaration of weight when gross weight > 50 kg
$\Sigma (\text{Ra-226} / 10 + \text{Po-210} / 10 + \text{Ra-228} / 10 + \text{Th-228}) \leq 300 \text{ Bq/g}$	
<b>LSA-II (NORM)</b>	} declaration of weight when gross weight > 50 kg
$\Sigma (\text{Ra-226} + \text{Pb-210} + \text{Po-210} + (\text{Ra-228}/10) + \text{Th-228}) \leq 1.000 \text{ Bq/g}$	
<b>LSA-III (NORM)</b>	} declaration of weight when gross weight > 50 kg
$\Sigma (\text{Ra-226} + \text{Pb-210} + \text{Po-210} + (\text{Ra-228}/10) + \text{Th-228}) \leq 20.000 \text{ Bq/g}$	

# Packages / Types of packages



Industrial Package (IP) Requirements			
Criteria	IP- 1	IP-2	IP-3
Design requirements	<ul style="list-style-type: none"> <li>• General requirements for all packages</li> <li>• Additional pressure and</li> </ul>	<ul style="list-style-type: none"> <li>• General requirements for all packages</li> <li>• Additional pressure and</li> </ul>	<ul style="list-style-type: none"> <li>• General requirements for all packages</li> <li>• Additional pressure and temperature requirements <i>if transported by air</i></li> <li>• <b>Type A additional requirements</b></li> </ul>
Test requirements - normal transport conditions	<p><b>IF NO TRANSPORT BY AIR IS INTENDED, MOST PACKING GROUP I AND II PACKAGES MEET THE REQUIREMENTS OF TYPE IP-1 OR IP-2</b></p>		<p>Each of the following tests must be preceded by a water spray test:</p> <ul style="list-style-type: none"> <li>• free drop (from 0.3 to 1.2 metres, depending on the mass of the package)</li> <li>• stacking or compression</li> <li>• <b>penetration ( 6 kg bar dropped from 1 metre )</b></li> </ul>

# Packages / Types of packages



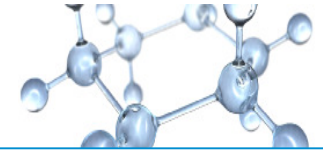
**Type IP-3 / Type A packages are required when NOR Materials are transported as bulk / unpacked (e.g. scrub materials containing NORM), or when "LSA-sludges" are transported containing Hydrocarbons**

*For transports of the named „LSA-sludges, Type-IP 3 „ABF120“ litres standard-“Amersham-container“, of Type D are used.*



*(Combined package; metal barrel with inner package; plastic barrel), packages designed for combustible solids, which are labeled with placards II-Yellow or III-Yellow.*

# Packages / Types of packages



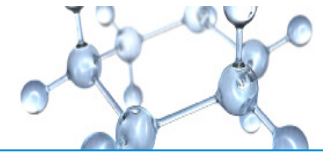
**For the transport of NORM containing scrub materials as bulk (SCO), special designed transport containers are used**



*Due to the Transport Index (TI) resulting from the great cross-sectional area of the transport container of  $> 20 \text{ m}^3$ , the transports have to be labeled III-Yellow*

MULTIPLICATION FACTORS FOR TANKS, FREIGHT CONTAINERS AND UNPACKAGED LSA-I AND SCO-I			
Size of load <sup>a</sup>			Multiplication factor
size of load	$\leq 1 \text{ m}^2$		1
1 m <sup>2</sup>	$< \text{size of load} \leq 5 \text{ m}^2$		2
5 m <sup>2</sup>	$< \text{size of load} \leq 20 \text{ m}^2$		3
20 m <sup>2</sup>	$< \text{size of load}$		10

<sup>a</sup> Largest cross-sectional area of the load being measured



# Questions ???

