CONTROLLING HEALTH HAZARDS WHEN WORKING WITH TUBALL™: QUESTIONS to ASK BEFORE STARTING

Here are some questions you should ask yourself before starting work with nanomaterials	Here are some options you can use to reduce exposure to TUBALL™ in the workplace – these options correspond with the questions on the left		
	CONTROL BAND 4 **DRY POWDER**	CONTROL BAND 2–3 **SUSPENDED IN LIQUID**	CONTROL BAND 1 **PHYSICALLY BOUND/ENCAPSULATED** (typically the lowest potential for exposure)
	See the Appendix I flowchart and Appendix IV in the SH&U guideline for TUBALL™ for general information		
FORM Have you done a job hazard analysis? What is the physical form of the nanomaterial? How much are you using? Can you reduce exposure to the nanomaterial by changing its form (creating a suspension) or by reducing the amount used in each batch?			
WORK ACTIVITY How are you using TUBALL™? Could your work activity cause exposure? Is the likelihood of exposure low or high? Can you change the way to do the activity to reduce the exposure?	**Applies to dry TUBALL™ powder:** - **High potential for exposure:** dumping bags of TUBALL™ powder, manual bagging/transferring or sieving - **Lower potential for exposure:** scooping/weighing of TUBALL™ powder	**Applies to TUBALL™ suspended in liquids:** - **Higher potential for exposure:** Spraying, open-top sonication, producing a mist - **Lower potential for exposure:** liquid spillage cleaning, blender cleaning, pipetting small amounts, brushing	**Applies to physically bound/encapsulated TUBALL™:** - **Higher potential for exposure:** Cutting, grinding, sanding, drilling, abrasive blasting, thermal release - **Lower potential for exposure:** use of solid TUBALL™ MATRIX products, manual cutting and sanding polymer nanocomposites, painting/coating with a roller or brush
ENGINEERING CONTROLS Based on the form and work activity, which engineering controls will be effective? What are the key design and operational requirements for the control? How does the non-nanomaterial base material or liquid affect exposure?	**Applies to dry TUBALL™ powder:** **Are exposure monitoring studies available?** **YES** - Follow Good Practice **NO** - **Could TUBALL™ nanoparticles become airborne deliberately?** **YES** - Control type D is applicable **NO** - **Could TUBALL™ nanoparticles become airborne inadvertently?** **NO** - Follow Good Practice **YES** - Control types B or C are applicable	**Applies to TUBALL™ suspended in liquids:** **Are exposure monitoring studies available?** **YES** - Follow Good Practice **NO** - **Could an aerosol be produced?** **NO** - Follow Good Practice **YES** - **Intentionally?** **NO** - Control types B or C are applicable **YES** - Control type C is applicable	**Applies to physically bound/encapsulated TUBALL™:** **Are exposure monitoring studies available?** **YES** - Follow Good Practice **NO** - Perform an exposure monitoring study OR: - Control type A is applicable IF there is low potential for exposure - Control type B is applicable IF there is high potential for exposure
ADMINISTRATIVE CONTROLS Have you considered the role of administrative controls? Have you set up a plan for waste management? Have you considered what to do in the event of a spill or how you will maintain your equipment and machinery?	**Applies to TUBALL™ powder and TUBALL™ suspended in liquids:** - Establish an Exposure Control Plan and a Risk Assessment! - Store material in sealed containers/bags (double contained) - Use absorbent paper/sticky mats - Use SOPs to ensure good practices - Follow rules of good housekeeping	- Carry out frequent training for employees - Using a specific sign/pictogram, e.g. 'Risk of exposure to NM possible at the work area', is recommended - Use sealed/closed containers and secondary containment - Clearly label all containers with any TUBALL™ inside	**Applies to physically bound/encapsulated TUBALL™:** Follow Good Practice
PERSONAL PROTECTIVE EQUIPMENT If the measures above do not effectively control the hazard, what PPE can be used? Have you also considered PPE for the non-nanomaterial base material or liquid?	**Applies to dry TUBALL™ powder:** - Full nonwoven coverall and hood - P3 respirator type or for US a APF50 type of respirator - see the table in Appendix V - Double gloves (nitrile - or NBR rubber) - Disposable over-booties for shoes - Close-fitting safety glasses - Long trousers (no cuffs)	**For all mixtures involving TUBALL™, the precautions according to the Safety Data Sheet should be followed** Section 8 of the SDS is relevant only	- **Lower potential for exposure:** Section 8 of SDS is relevant only - **High potential for exposure:** • Lab coat • P2 respirator type if potential for dust - see the table in Appendix V • NBR (nitrile rubber) gloves or cotton gloves treated with solid bound material • Safety glasses
WASTE & DISPOSAL	**Disposal of any waste containing TUBALL™ should follow and comply with all applicable local, regional and national waste regulations, including those that are not specific to nanomaterials.** See the SH&U guideline for TUBALL™ for precautionary measures.		
SPILL & ACCIDENTAL RELEASE Spill kit	- Evacuate employees from an area with accidental release or spill of TUBALL™ - Use tested and certified vacuum equipment Recommended **PPE for TUBALL™ spill clean-up:** - Safety goggles - Nitrile gloves - Nonwoven lab coat or coverall	- Dry sweeping should be avoided - Use tested and certified vacuum equipment - HEPA vacuum cleaners with minimum H14 filters are most effective - A sticky mat – daily new - A respirator such as a dust mask (filter P3) type or for US a APF50 type of respirator	**Applies to physically bound/encapsulated TUBALL™:** Follow Good Practice
	All residues resulting from the clean-up of a spill or accidental release (including filters, wipes, absorbent mats and materials) should be treated as hazardous waste		

CONTROL TYPES

- **A** Capturing and receiving hood, ideally discharged to a safe place outside. HEPA or ULPA+ filtration to be used if recirculated back to the workplace.
- **B** Partial enclosure with HEPAor ULPA+ filtration with recirculation to the workplace.
- **C** Partial enclosure with HEPA or ULPA+ filtration and discharged to a safe place outside.
- **D** Full enclosure with HEPA or ULPA+ filtration and discharged to a safe place outside.