

Checklist: PU industry activities → Process categories (PROCs) (July'17)

| PU examples (for industrial and/or professional use*) | PROCs** |
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| 1. Production of chemicals <ul style="list-style-type: none"> Production in technically “tight” equipment, typically in a large industrial scale, as e.g. for polyols or isocyanates (or precursors) Storage, blending operations, pipeline transport, etc. in technically “tight” equipment Medium scale industrial production of isocyanate terminated prepolymers – continuous / discontinuous | <p>1</p> <p>1</p> <p>2 / 3</p> |
| 2. Delivery (loading / unloading / transfer of substances into containers) <ul style="list-style-type: none"> Tank truck with dedicated vapour return line Transfer to or from container/vessels with dedicated equipment under use-specific safety standards (e.g. in mining industry) Transfer to or from drums/cans with dedicated equipment under industrial safety standards Tank truck unloading / transfer from drums (non-dedicated) | <p>8b</p> <p>8b</p> <p>9</p> <p>8a</p> |
| 3. Mixing, blending of chemicals <ul style="list-style-type: none"> Enclosed blending of chemicals – continuous / discontinuous Blending of chemicals in almost closed reactors or vessels Open blending of chemicals. | <p>2 / 3</p> <p>4</p> <p>5</p> |
| 4. Enclosed PU production processes <ul style="list-style-type: none"> Blow line injection in technically “tight” equipment for composite wood production Storage, blending operations, pipeline transport, etc. in technically “tight” equipment Enclosed automated PU production (continuous / discontinuous), including controlled exposure e.g. during sampling, maintenance, equipment breaks, equipment cleaning <ul style="list-style-type: none"> Enclosed block production – continuous / discontinuous Enclosed panel production – continuous / discontinuous Enclosed pressing operations Injection into closed mould Closed cavity filling Spraying in cabinet (spray booth - industrial safety standards) | <p>1</p> <p>1</p> <p>2 / 3</p> <p>2 / 3</p> <p>2 / 3</p> <p>3</p> <p>3</p> <p>3</p> <p>7</p> |
| 5. Open PU production processes <ul style="list-style-type: none"> Open PU production (continuous or discontinuous), including controlled exposure e.g. during sampling, maintenance, equipment breaks <ul style="list-style-type: none"> Open block production Pouring into open mould, on open conveyor or in box Casting, cavity filling, other open uses Application of coating, adhesive or dispensing of One Component Foam (OCF) by low energy spreading Dispensing of two component foam by low energy spreading (e.g. in mining industry, rock lock, grouting) Spray foam application by professional workers using PPE Application of coatings via dipping or pouring Rebonding of PUR flakes or particles; forming/curing prepregs (PU impregnated mats) in a hot mould, forming/pressing of minerals (e.g. in foundry industry) | <p>4</p> <p>4</p> <p>4</p> <p>4</p> <p>10</p> <p>10</p> <p>11</p> <p>13</p> <p>14</p> |
| 6. Activities before final curing <ul style="list-style-type: none"> Demoulding; “foam crushing” (compression of foam for cell-opening); trimming; repairing; cutting of PU articles, sawing with low energy through soft articles (flexible foam, rigid foam, adhesives) before they are fully cured Sawing through hard PU articles, e.g. wood | <p>21</p> <p>24</p> |
| 7. Chemical waste collection & transfer <ul style="list-style-type: none"> With dedicated (closed) equipment Open collection | <p>8b</p> <p>8a</p> |
| 8. Mechanical cleaning operations <ul style="list-style-type: none"> Removal of solidified material from containers, vessels, blenders (e.g. with hammers) Cleaning with high pressure air Cleaning with brush | <p>24</p> <p>7</p> <p>10</p> |
| 9. Quality / Process control in laboratories <ul style="list-style-type: none"> Use of chemical in a laboratory environment, typically limited to 1 kg or 1 L of the chemical; working in extracted cabinet / booth / fume hood, if necessary | <p>15</p> |
| 10. Cleaning activities/process Typical APS solvents are Dimethylsulfoxide, N-methylpyrrolidone, N-butylpyrrolidone N-ethylpyrrolidone, Methyl ethyl ketone or butanone, acetone, dimethylacetamide or any other solvent with a dielectric constant above 15. <ul style="list-style-type: none"> Enclosed cleaning processes | <p>1</p> |

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| <ul style="list-style-type: none"> • Mechanical and automated cleaning activities that are undertaken in predominantly closed systems/equipment (e.g cleaning solvent are transferred via closed systems into a tight vessel/daytank and are then stirred inside. Discharge is also done without open transfer and with occasional but controlled exposure) | 3 |
| <ul style="list-style-type: none"> • mechanical/automated but also manual cleaning activities that are undertaken in predominantly semi-closed systems/equipment (e.g. cleaning solvent are transferred via closed systems into a tight vessel/day tank and are then stirred inside. Discharge is also done without open transfer but with opportunity for exposure | 4 |
| <ul style="list-style-type: none"> • cleaning activities (mainly mechanical/automated, but can be manual), that are predominantly undertaken in semi-open to open systems/equipment (e.g. cleaning solvent are mixed in a semi tight vessel/day tank or flushing of mixing heads in a semi open system). | 5 |
| <ul style="list-style-type: none"> • transfers of cleaning solvents (charging/discharging), not using dedicated equipment (e.g. pumping of cleaning solvents out of a drum into a vessel/day tank or draining of cleaning solvents, waste collection and transfer). | 8a |
| <ul style="list-style-type: none"> • roller application or brushing using cleaning agents, e.g. cleaning surfaces or equipment with paper, clothes or brushes | 10 |
| <ul style="list-style-type: none"> • cleaning of articles and equipment parts by dipping, pouring, immersion and soaking (e.g. dipping a basket with mixing head parts into a bath with cleaning solvents). The handling of wet/treated articles/equipment parts is included in this PROC. | 13 |
| <ul style="list-style-type: none"> • cleaning of equipment parts with small amounts of cleaning agents in fume hoods in laboratories. | 15 |

 *Note: PROCs are not applicable for consumer uses.

** Please check details of the relevant PROCs (below)

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Checklist: Process categories (PROCs) → PU industry examples

| PROCs | Official description and PU examples (for industrial and/or professional use* : |
|--------------|--|
| PROC 1: | <p>Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions. Describes the general nature of processes taking place in sectors where the manufacture of substances or production of mixtures takes place or processes with closed process conditions as applied in chemical industry. The closed transfers inherent to the process including closed sampling are included.</p> <p>Open transfers to charge/discharge the system are not included.</p> <p>E.g. large scale industrial production of polyols or isocyanates (or pre-cursors), including enclosed sampling, cleaning, waste collection & transfer, charging (via pipeline), filtering, sieving, discharging, blow line injection for composite wood production, blender operations, storage.</p> |
| PROC 2: | <p>Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions Describes the general nature of processes taking place in sectors where the manufacture of substances or production of mixtures takes place (continuous processes that involve limited manual interventions), or processes with equivalent closed process conditions as applied in chemical industry.</p> <p>The closed transfers inherent to the process including closed sampling are included. Open transfers to charge/discharge the system are not included.</p> <p>E.g. industrial scale continuous production of isocyanate terminated prepolymers or in line mixing with additives or enclosed automated continuous PU production, like enclosed panel or block production, including mixing, heating, refluxing, distillation.</p> <p>Controlled exposure e.g. during sampling, charging, sawing, discharging, maintenance, equipment cleaning, occasional interventions/inspections inside enclosed areas, checking quality of sand mix).</p> |
| PROC 3: | <p>Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition Describes the general nature of processes taking place in sectors where the manufacture of substances or production of mixtures takes place (batch processes that involve limited manual interventions) or processes with closed process conditions as applied in chemical industry.</p> <p>The closed transfers inherent to the process including closed sampling are included. Open transfers to charge/discharge are not included.</p> <p>E.g. medium scale batch production of isocyanate terminated prepolymers or closed (IBC) manufacture of polyol formulation or enclosed automated discontinuous PU production, like enclosed panel or block production, closed cavity filling, injection into closed mould, including mixing, heating, refluxing, distillation, blending, sawing in cabinet.</p> <p>Controlled exposure e.g. during sampling, maintenance, equipment breaks, equipment cleaning, occasional interventions, waste collection & transfer, charging, discharging, checking quality of sand mix).</p> |
| PROC 4: | <p>Chemical production where opportunity for exposure arises Describes the general nature of processes taking place in sectors where the manufacture of substances or production of mixtures takes place (processes where the nature of the design does not exclude exposure).</p> <p>The closed transfers inherent to the process including closed sampling are included. Open transfers to charge/discharge the system are not included.</p> <p>E.g. blending of chemicals in almost closed reactors or vessels or pouring into open mould, pouring on open conveyor or in box, casting, during mat dumping, cavity filling and other open uses, including mixing, heating, refluxing, distillation, filtering.</p> <p>Controlled exposure e.g. during use, sampling, maintenance, equipment breaks, equipment cleaning, waste collection & transfer, occasional interventions at open areas, open sawing.</p> |
| PROC 5: | <p>Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact).</p> <p>Covers mixing or blending of solid or liquid materials in the context of manufacturing or formulating sectors, as well as upon end use. Charging/discharging of the blending vessel and sampling are considered separate activities and are not included in this PROC.</p> <p>E.g. open blending of chemicals, cleaning vessels with solvents.</p> |
| PROC 6: | <i>Calendering - not relevant</i> |
| PROC 7: | <p>Industrial spraying.</p> <p>Air dispersive techniques i.e. dispersion into air (= atomization) by e.g. pressurized air, hydraulic pressure or centrifugation, applicable for liquids and powders.</p> <p>Spraying for surface coating, adhesives, polishes/cleaners, air care products, blasting.</p> <p>The reference to 'industrial' means that workers involved have received specific task training, follow operating procedures and act under supervision. Where engineering controls are in place, they are also</p> |

operated by trained personnel and regularly maintained according to procedures. It is not meant that the activity can only take place at industrial sites..

E.g. spraying inside cabinet (spray booth) under industrial safety standards, cleaning with air pressure when there is a possibility that there is still MDI on dust/particles, such as in composite wood plants

- PROC 8a: Transfer of substance or mixture (charging and discharging) at non-dedicated* facilities Covers general transferring operations of large quantities of chemicals from/to vessels, containers, installations or machinery without dedicated engineering controls in place for reducing exposure. Transfer includes loading, filling, dumping, bagging and weighing. E.g. “non-dedicated” loading/unloading of chemicals from tank truck; charging/discharging of chemicals/cleaning agents from/to drums - in industrial or professional use - including sampling, waste collection & transfer, dispensing. * Non-Dedicated means that the installation, its containment and engineering controls are NOT specifically designed for a particular process (it does not mean it is substance or product specific).
- PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities. Covers general transferring operations from/to vessels or containers with provision of dedicated* engineering controls in place for reducing exposure: it addresses operations where material transfers are undertaken at locations that are specifically designed and operated for the transfer of larger quantities (tens of kilos and higher) of chemicals and where the exposure is primarily related to the uncoupling/coupling activity rather than the transfer itself. Such situations include tanker loading bays and drum filling. Transfer includes loading, filling, dumping, bagging. E.g. loading/unloading of chemicals from tank truck with dedicated vapour return line or enclosed transfer of MDI / polyol formulation from bulk to day tank or vessels, including sampling, waste collection & transfer, charging, discharging, dispensing. * Dedicated means that the installation, its containment and engineering controls are specifically designed for a particular process (it does not mean it is substance or product specific).
- PROC 9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing). Filling lines specifically designed to both capture vapour and aerosol emissions and minimise spillage. This PROC can also be used to cover sampling operations. E.g. “dedicated” transfer from/to drums or re-packaging in small containers or re-bulking from drums under industrial safety standards.
- PROC 10: Roller application or brushing. Low energy spreading of e.g. coatings. This includes application of paints, coatings, removers, adhesives or cleaning agents to surfaces with potential exposure arising from splashes. This PROC can also be assigned to tasks such as cleaning of surfaces using long-handle tools.. E.g. application of coating or adhesive AND dispensing of One Component Foam (OCF), or two-component foam (e.g. in mining industry, rock lock, grouting) Cleaning with brush, paper, towels.
- PROC 11: Non industrial spraying. Air dispersive techniques. Air dispersive techniques i.e. dispersion into air (= atomization) by e.g. pressurized air, hydraulic pressure or centrifugation, applicable for liquids and powders. Includes spraying of substances/mixtures for surface coating, adhesives, polishes/cleaners, air care products, blasting. The reference to ‘non-industrial’ is to differentiate where conditions mentioned in PROC7 cannot be met. It is not meant that the activity can only take place at non-industrial sites. E.g. PU spray application by professional workers using PPE.
- PROC 12: *Related to blowing agents – not relevant for isocyanates or polyols*
- PROC 13: Treatment of articles by dipping and pouring. Immersion operations. Treatment of articles by dipping, pouring, immersing, soaking, washing out or washing in substances; Includes handling of treated objects (e.g. from/to treatment basin, after drying, plating). The service life of the article after the treatment needs to be reported separately. E.g. application of coatings via dipping or pouring, putting equipment in or taking equipment out of solvent baths.
- PROC 14: Production of preparations or articles by tableting, compression, extrusion, pelletisation. This covers processing of mixtures and/or substances into a defined shape for further use. E.g. non-enclosed rebonding of PUR foam flakes or particles; non-enclosed forming/curing of preregs (PU

impregnated mats) in a hot mould. Preparation/compounding of TPU. non-enclosed forming/pressing of minerals (e.g. in foundry industry)

PROC 15: Use as laboratory reagent.
Use of substances at small scale laboratory (< 1 L or 1 kg present at workplace).
Larger laboratories and R+D installations should be treated as industrial processes.
This includes the use in quality control processes
E.g. quality control in extracted cabinet / booth / fume hood, if necessary.

PROC 16 - 18: *Not relevant for isocyanates or polyols*

PROC 19: **Not applicable, because of no scenario with intimate and intentional contact → use PROC 5 instead.**

PROC 20: *Not relevant for isocyanates or polyols*

PROC 21: Low energy manipulation of substances bound in materials and/or articles.
Cover activities such as manual cutting, cold rolling or assembly/disassembly of material/article.
It can also be used for handling/transfer of massive (metal) objects.
E.g. PU article treatment like demoulding, trimming, “foam crushing” (compression of foam for cell-opening), repairing, cutting of soft PU articles before they are fully cured.

PROC 22 – 27: *Not relevant for isocyanates or polyols*

Special PROCs for mechanical cleaning operations:

PROC 24: High (mechanical) energy work-up of substances bound in /on materials and/or articles
Substantial thermal or kinetic energy applied to substance by e.g. hot rolling/forming, grinding, mechanical cutting, drilling or sanding, stripping
Removal of solidified material from containers, vessels, blenders with high mechanical energy (e.g. with hammers), potentially causing dust/aerosol formation.

*Note: PROCs are not applicable for consumer uses.

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