Risk assessment of antifoulants (PT 21) using the TNsG from 2002 - an example

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Fields of use

- Commercial craft
- Pleasure craft
- Aquaculture

TNsG (2002)

- Exposure models (not for ancillary workers, paint removal)
- Appendix 7.3.1: example (184 min) (Chandler scenario not relevant according to the notifiers)
- 7.3 Antifoulant : example (184 min, ancillary worker mentioned)
- 3: examples of assumptions for patterns of use (6 hours)

- 184 minutes was chosen

Sprayer

- Model 3 - Airless spraying viscous solvent-based liquids at > 100 bar pressure, overhead and forwards
- Input values according to the User Guidance
- No indicative value for potential hand exposure
- Potential hand exposure (75^{th} percentile) was calculated from raw data

Sprayer

- PPE: double coveralls (1 % penetration)
- RPE: full facial mask

- Some representatives of wedish industry/Swedish work environment authority: APF = 500 more reasonable

Application by brush and roller

- In the TNsG on Human Exposure (2002) there is no scenario for professional use of brush and roller for applying antifouling paint

- Model 4 – Non-professionals: brush and roller painting antifoulant on the underside of small boats (leisure craft) using household gloves (Garrod et al, 2000)
- According to the notifier, as for sprayers, 184 minutes can be considered a reasonable worst case

Application by brush and roller

- Potential dermal exposure 75th %ile value:
- ✓ TNsG: 50.8 mg/min
- ✓ Garrod et al (2000): 28.3 mg/min
- The value was changed to 30.7 mg/min at TM II08.

- In Model 4, the exposure values are expressed as mg/min in-use product at nominal density 1.0 g/mL
- Unclear whether the values should be re-calculated for products with higher density

- PPE: single coverall (4 % penetration)
- RPE: half facial mask (APF = 10, i.e. 10 % penetration)

Garrod et al, 2000	Links et al, 2008
Performed in 2000	Performed in 2008
Amateurs: volunteers included HSE staff	Professionals
Wood preservatives and antifouling paints (CuO), brush and roller application	Antifouling paints: copper and diclofluanide, all scenarios
n = 10 (with gloves: 8; without: 2)	n = 15 (all with and without gloves)
Inhalation: 7 hole head mounted within 30 cm of the breathing zone	Inhalation: 7 hole sampler + IOM sampling head
Dermal: 6 gauze pads fixed in defined positions on the work clothing and one beneath the clothing. Hands: sampling gloves underneath protective gloves.	Dermal: Tyvek coverall instead of normal working clothes. Cotton undergarment worn underneath. Both coveralls were cut into pieces and analyzed. Hands: one pair of cotton gloves over and one pair under protective clothes.
Nominal density: 1.0 g/mL	Density: 1.82 g/mL

Potman

- Indicative values as recommended by the User Guidance
- Mixing and loading of paint
- Model: 6 – Loading liquid antifoulant into reservoir for airless spray application

- PPE: single coverall (4 % penetration)
- RPE: half facial mask (APF = 10, i.e. 10 % penetration)

Ancillary worker

- No model in the TNsG (2002)
- Calculations based on a HSE study (HSE-UK, 1999) where data from ancillary workers and potmen were collected together

- Patch data from six exposed ancillary workers were collected
- Body exposure: six exposure data
- Inhalation exposure: three exposure data

Ancillary worker

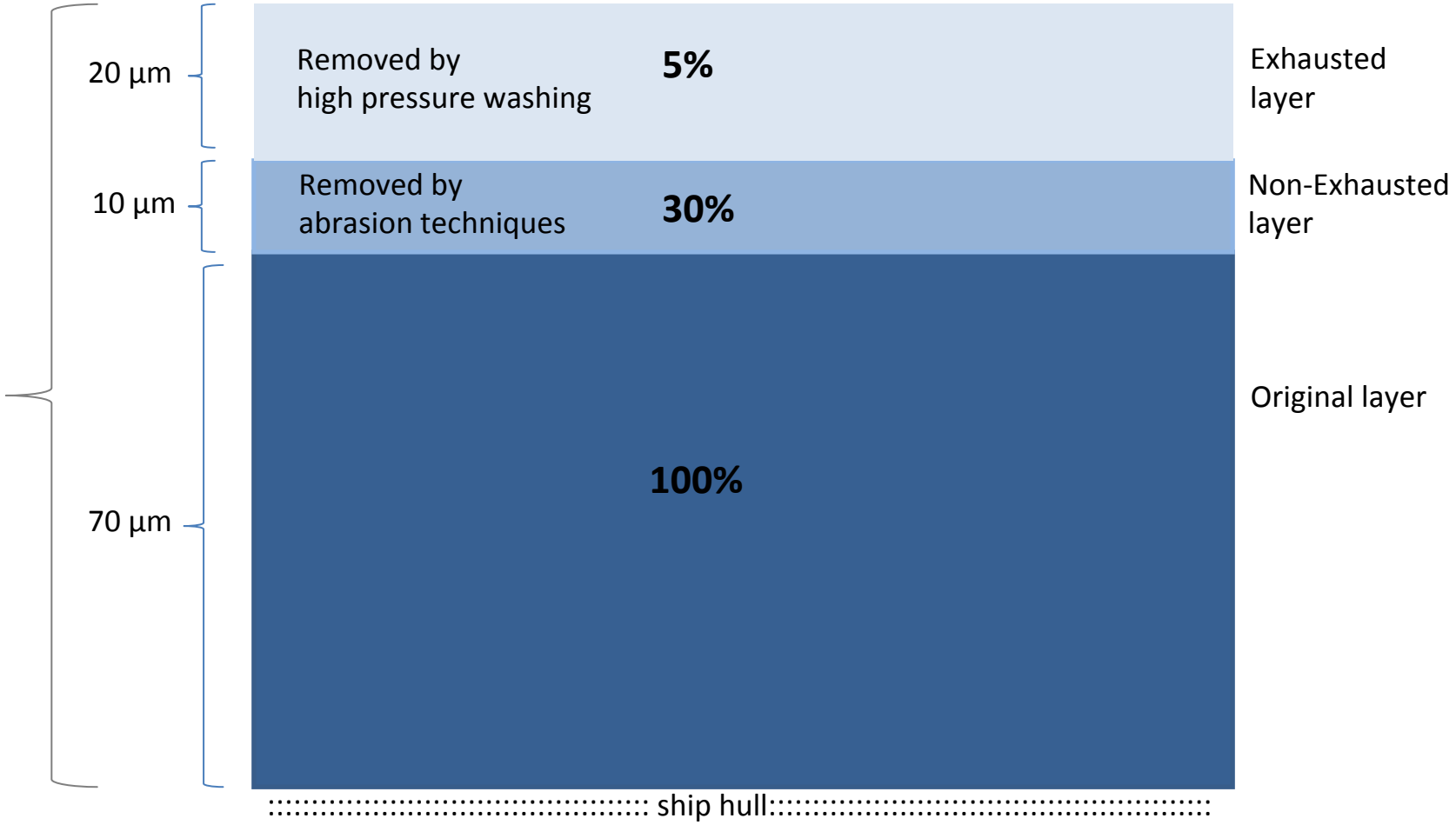
- No data on potential hand exposure
- The scenarios pertaining to the sprayer, the pot-man and the painter using brush and roller were used to estimate the protection factor of wearing gloves, i.e. the ratio between the potential and actual hand exposure
- Adopting these and calculating the 75th percentile protection factor gave a value of 43

- PPE: single coverall (4 % penetration)
- RPE: half facial mask (APF = 10, i.e. 10 % penetration)

Removal of paint

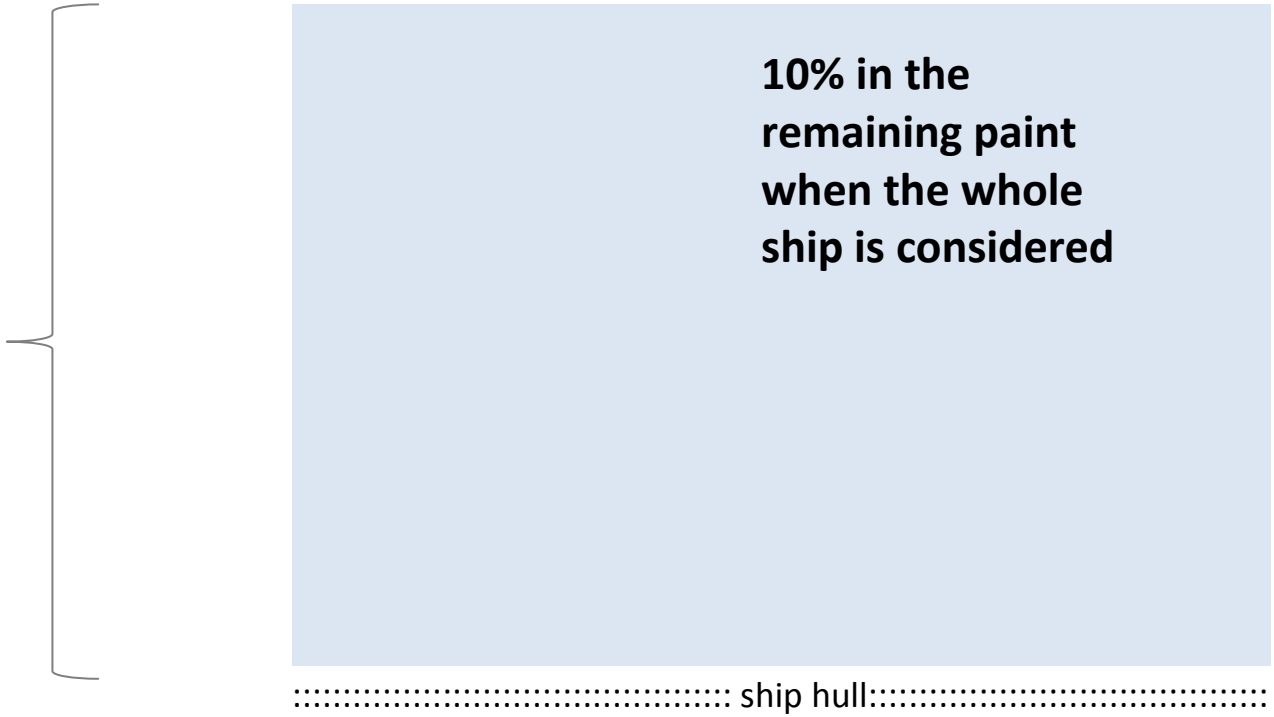
- Usually only parts of the ship hull are cleaned of antifouling paint
- Only the exhausted layer is removed
- When needed, the entire paint layer can be removed back to bare metal (worst-case scenario). This will not be done unless the paint has leached to some extent all the way in.
- For this worst-case scenario: What concentration of active substance should be used for calculating the exposure to professionals during removal of paint?

OECD ESD PT 21, page 121



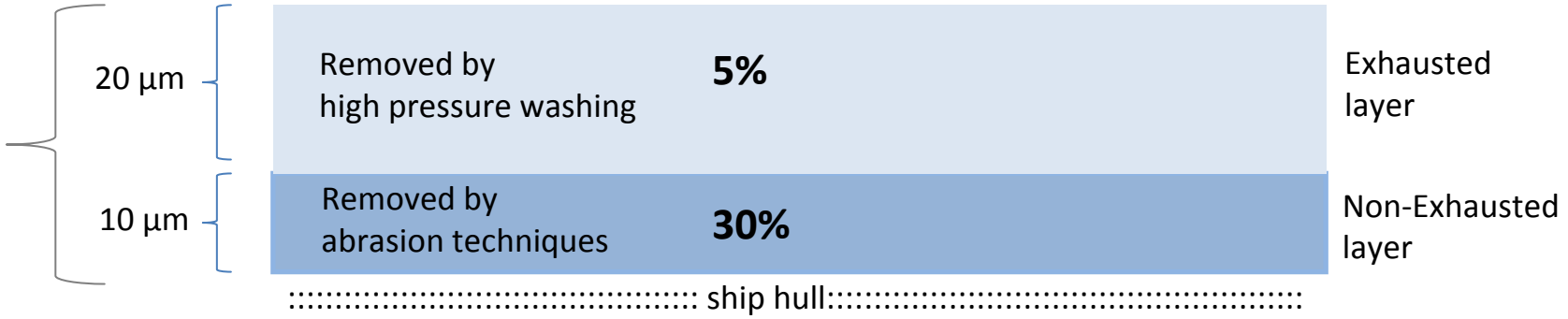
Percents relate to the original biocide concentration in the paint.

”Ispra method 10%”



Percents relate to the original biocide concentration in the paint.

”Method 13.3%”



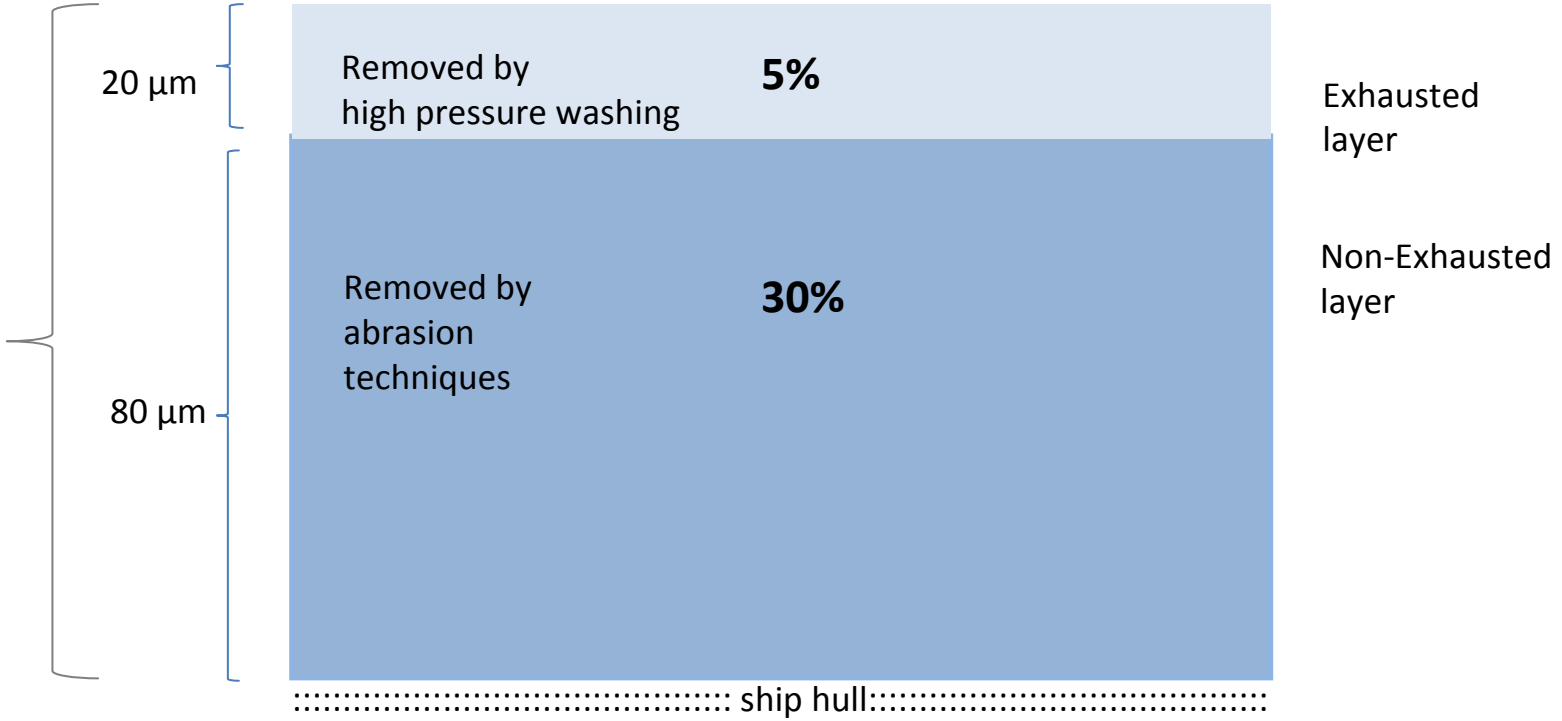
For the worst case scenario it can be assumed that there is no original layer left and that the proportional difference between the exhausted and non-exhausted layers is the same.

- The exhausted layer represent 20% of the paint film thickness
- The old layer represent 10% of the film

- The exhausted layer represent 2/3 of the paint film that is to be abraised
- The old layer represent 1/3 of the paint film that is to be abraised

Total average concentration in the paint: 5% x 2/3 + 30% x 1/3 = <u>13.3%</u>

”Method 25%”



- The old paint layers make up the remaining 80% of the total paint layer
- The concentration of active substance in this layer is 30% of the original concentration in the paint formulation

Total average concentration in the paint: 5% x 0.2 + 30% x 0.8 = <u>25%</u>

Removal of paint

- 25 % of the original concentration was used for the calculations since the guidance was not clear and 25 % was considered a worst case

- Dermal exposure not relevant

- PPE: double coveralls (1 % penetration)
- RPE: full facial mask (APF = 40, i.e. 2.5 % penetration)

Perhaps the new TNsG will make everything clear…

Thank you for your attention…

…and if you have any questions, answers or suggestions:

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