Leather Dyeing

In the leather dyeing industry, the annual amount of PMN active colorant in the dyestuff solution used ranges from 200-2500 kg/tannery, with an average use rate of 1000 kg/tannery. The total amount of hides to be dyed at each facility is typically on the average of 1000 sides/day. Based on a weight of 11 kg/side for grain leather, and 4.5 kg/side for suede leather, and a batch consisting of 450-900 kg, with a typical value of 680 kg, a typical batch will consist of 40-80 grain leather sides, and 100-200 suede leather sides.

The amount of formulated dyestuff used per batch is 6.8 kg for the grain leather sides, and 20 kg for the suede leather sides. The amount of active PMN in the formulated dyestuff (% active PMN) is typically 50% for powdered dyes and 15% for liquid dyes (most dyes used in leather dyeing are acid dyes).

1. Number of Sites and Use Rate

   a. Number of Sites

   Use - 200-2500 kg of PMN active colorant/tannery/yr.
   Typically, 1000 kg PMN/tannery/yr.

   PV(kg/yr) ÷ 1000 kg/site/yr = # of Sites

   b. Use Rate:

   Batch Size - 450-900 kg leather.
   Average batch size - 650 kg

(450-900 kg) x (PMN conc.) x (% o.w.f.) = kg PMN used/batch

Assume % o.w.f. = 1.0 for grain leather dyeing.
Assume % o.w.f. = 3.0 for suede leather dyeing.

   c. Operating days per year

Assume 9 batches/day for grain and suede leather dyeing.

1000 kg/tannery/yr ÷ kg PMN used/batch ÷ # batches/day = days/yr

2. Occupational Exposure

   a. Worker Activities and Number of Workers/Activity.

   i) Weighing - 1,
   ii) Mixing - 1,
   iii) Dyeing - 1
   iv) Drying - 2, and
   v) Buffing - 1-2

b. Duration of exposure

Weighing - up to 1.5 hrs/day
Mixing - up to 8 hrs/day
Dyeing and Drying - up to 8 hrs/day
Buffing - up to 8 hrs/day

c. Frequency of Exposure

Use calculated use rate from above.

d. Dermal Exposure

Weighing - (650-1950) × (% concentration) = mg/day

assume: 50% of the active PMN for powdered dyes and 15% of the active PMN for liquid dyes.

Mixing - (1300-3900) × (% concentration) = mg/day

assume: up to 50% of the active PMN

Dyeing - Sampling:

(6500-18,200) × (% concentration) = mg/day

assume: 0.3% of the active PMN for grain leather dyeing and 0.7% of the active PMN for suede leather dyeing.

Transferring:

(6500-18,200) × (PMN concentration) = mg/day

assume: 10-1000 ppm of active PMN when fat liquoring is done before dyeing, and
1-100 ppm when fat liquoring is done after dyeing.

Buffing - (6500-18,200) × (% concentration) = mg/day

assume: up to 1% of the active PMN.

e. Inhalation Exposure

Weighing - 0.001-3.2 mg/m^3 or an 8 hr geometric mean of 2.1 mg/m^3 total dust.

Multiply by the % active PMN concentration using the same assumptions from above.

Mixing - 0.002-0.083 mg/m^3 or an 8 hr geometric mean of 0.009 mg/m^3 total dust.

Multiply by the % active PMN concentration using the same assumptions from above.

Dyeing and Drying - negligible

Buffing - 15 mg/m^3 total dust assuming worst case when ventilation equipment is not working. Otherwise use a range of 0.14-3.3 mg/m^3 or an 8 hr geometric mean of 1.1 mg/m^3 total dust.

Multiply by the % active PMN concentration using the same assumptions from above.

3. Environmental Releases

a. Source of Release

i) Cleaning or disposing of shipping containers
ii) Scrap and off-spec material
iii) Exhausted dyebath solution.

b. Amount Released

i) 0.1% of PV container residue to landfill.
ii) 1% of PV from scrap and off-spec material to landfill.
iii) 5-40% of PV from exhausted dyebath based on degree of exhaustion ranging from 60-95% to POTW.

c. Duration of Releases

i) 1-12 days/yr for cleaning waste.
ii) Use calculated days/yr for exhausted grain and suede leather dyebath solution, and scrap material.

REFERENCES

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3. PEI Associates, Inc. CEB Engineering Branch Manual for the Preparation of Engineering Assessments. U.S. EPA OTS/ETD/CEB. February 28, 1991.

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