

TGG: JCL: ERT: MIH: AIC: RF

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TO: George Williams - Blane

FROM: T. G. Grumbles

DATE: March 13, 1991

Interoffice
Communication

SUBJ: SKIN ABSORPTION HAZARDS FOR COOPER AND LEAD SOLUTIONS

VISTA

Attached is Dave Penney's assessment of the potential hazard of the copper and lead levels we are experiencing in the ribbon trays since the recycle project was implemented. The bottom line is that there is insignificant exposure based on his analysis.

This analysis was based on levels of 350 µg/l of copper and 1000 µg/l of lead. He also assumed 10 hand and arm immersions per day. This may be low based on normal operator routines but this analysis was "worst case" in terms of absorption potential.

Let me know if you have questions on the attached.



T. G. Grumbles

dlj

Attachment

VVV 000006101

To: T. Grumbles

From: D. Penney

Date: March 12, 1991

Subject: Skin Absorption hazards for copper and lead solutions

I do not anticipate any adverse consequences for Blane polymer workers exposed to ribbon tray solutions containing 350 ug/l copper and 1000 ug/l lead. The anticipated exposure to lead and copper is approximately 1.2% and 0.23%, respectively, of the estimated acceptable occupational levels of absorption of these materials. Further details of this assessment are given below.

ABSORPTION ESTIMATES

Assuming, both arms and hands are exposed at 10 sessions per day, no protection is worn, the skin is not washed off, a daily absorption of approximately 0.004 mg lead and 0.0014 mg copper is estimated (see attached).

ACCEPTABLE OCCUPATIONAL DERMAL ABSORPTION LEVELS

The estimated acceptable occupational dermal absorption levels of lead and copper, based on permissible inhalation exposure levels, are 0.03 and 0.6 mg per day, respectively (see attached). This amounts to a daily lead and copper absorption which is 1.2% and 0.23% percent, respectively, of the estimated daily acceptable occupational absorption of these metals.

Obviously, any unnecessary exposure to heavy metals should be avoided. Wearing gloves and washing after exposures provides an additional safety factor and is recommended.

CC: J. Kirkpatrick
J. Roheim

VVV 000006102

EXPOSURE CALCULATIONS FOR RIBBON TRAY SOLUTIONSExposure Factors:

Lead concentration= 1000 ug/l
 Copper concentration= 350 ug/l
 Dermal absorption, lead and copper= 1%(estimated)
 Inhalation absorption, lead and copper= 10%(Patty's Industrial Hygiene)
 area exposed= 1620 cm (hands and half of arms combined)
 Thickness of solution remaining on exposed areas= 0.5mm
 # exposures sessions per day=10
 Lead, OSHA PEL= 0.05 mg/M
 Copper, ACGIH TLV= 1 mg/M

Volume of solution remaining on arms and hands:

1620cm (skin surface area) X 0.25mm(solution thickness) X $\frac{1 \text{ cm}}{10 \text{ mm}} =$
 41cm = 41ml.

Estimated absorption levels:

Lead,

$41\text{ml} \times \frac{1000\text{ug lead}}{\text{L}} \times \frac{1\text{mg}}{1000\text{ug}} \times \frac{1\text{L}}{1000\text{ml}} \times 10 \text{ exposures/day} \times$

0.01(dermal absorption fraction)= 0.0041mg/day, which is 1.2% of the total lead absorption allowed for occupational exposure derived from the OSHA PEL for lead(see below).

Copper,

$41\text{ml} \times \frac{350\text{ug copper}}{\text{L}} \times \frac{1\text{mg}}{1000\text{ug}} \times \frac{1\text{L}}{1000\text{ml}} \times 10 \text{ exposures/day} \times$

0.01(dermal absorption factor) = 0.0014mg/day, which is 0.23% of the total copper absorption allowed for occupational exposure derived from the ACGIH TLV for copper(see below).

Acceptable daily occupational dermal absorption levels based on acceptable occupational inhalation exposure levels:

Lead,

$0.05\text{mg/M (OSHA PEL)} \times 8/24(\text{length of work exposure}) \times 20\text{M/day (breathing rate)} \times 0.1(\text{inhalation absorption fraction}) = 0.033\text{mg/day}$

Copper,

$1\text{mg/M (ACGIH TLV)} \times 8/24(\text{length of work exposure}) \times 20\text{M /day (breathing rate)} \times 0.1(\text{inhalation absorption fraction}) = 0.6\text{mg/day}$

VVV 000006104