

Materials consumed and waste generated⁽¹⁾

Panel 3

COLLAGEN/CORIAM	28%
FLESH/SUB CUTIS	6%
HAIR/EPIDERMIS	5.5%
BLOOD	0.5%
SALT	20%
WATER	40%

SURFACTANT	0.15%
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SODIUM HYDROSULFIDE	1.5%
SODIUM SULFIDE	2.5%
LIME	4.0%

The Mass Balance

The diagram shows the quantity of finished shoe upper leather and splits produced, and the waste generated from processing one tonne of wet salted hides⁽²⁾. The chemicals used and the processing were basic, without the benefits of best available technology. Other practical studies⁽³⁾ complement the waste-water component of these findings. These values have been included and are set in brackets/italics. (Column 4)

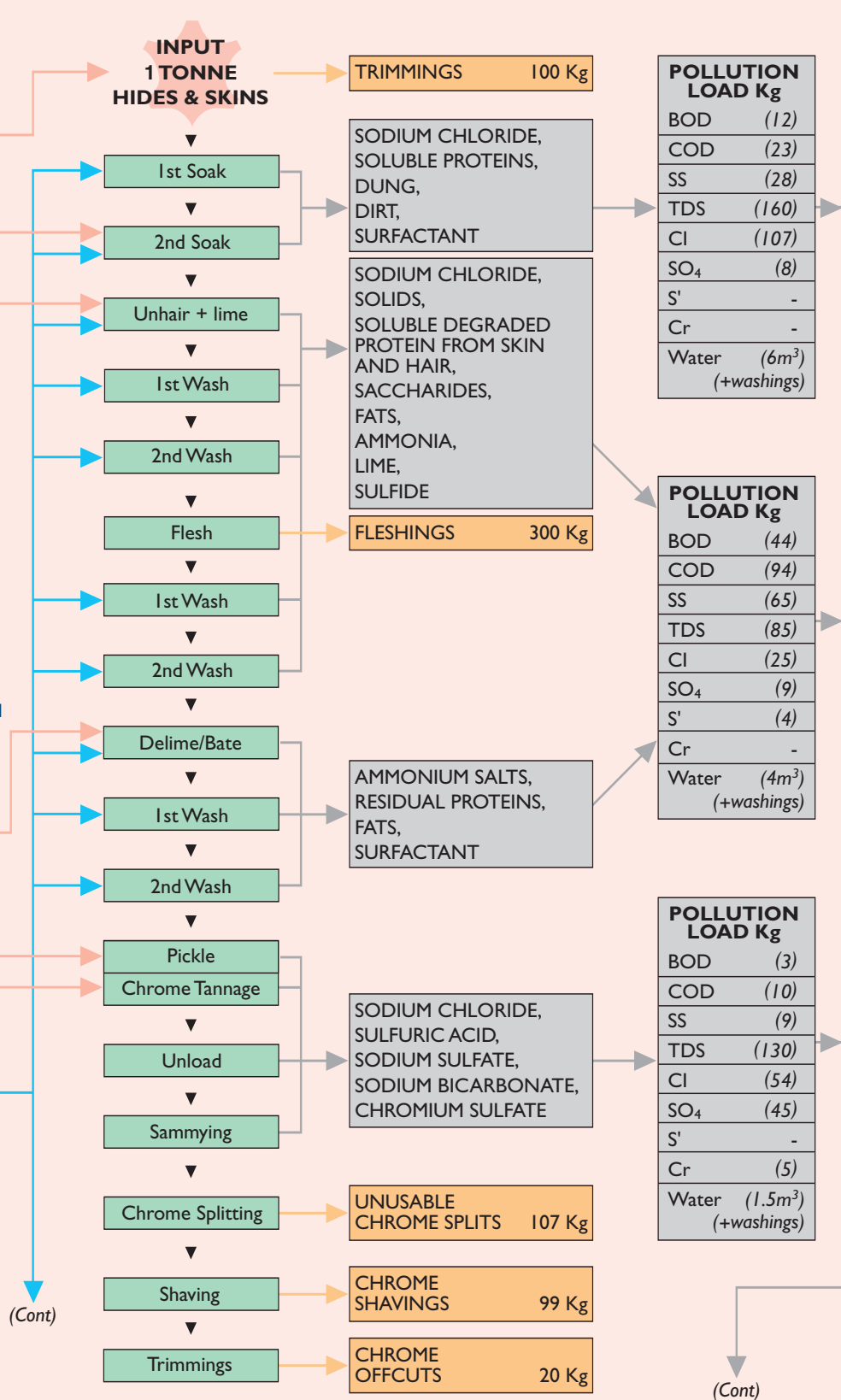
AMMONIUM SALTS	2.5%
ACID (WEAK)	0.8%
ENZYME PREPARATION	0.5%

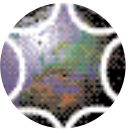
SALT	5%
SULFURIC ACID	1.1%

CHROME TANNING AGENT	8.8%
ALKALI (MILD)	0.8%

WATER	15-30m ³
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KEY:	
Materials in manufacture	
Manufacturing stages	
Water use in process	
Waste-water	
Residual solids, potential new raw materials	





Panel 3 continued

(Cont)

CHROME 25/33	5%
SODIUM BICARBONATE	1.5%
SODIUM FORMATE	1.5%
DYESTUFF	2.0%
ACID (ORGANIC)	1.5%
RETANNING AGENTS (ORGANIC)	10% (SPLITS 8%)
FATLIQUOR	8% (SPLITS 10%)

Shifting the balance

Manufactured solid waste and the volume and composition of the effluent produced are entirely dependent on the materials consumed and the technology employed. Careful selection of raw materials and chemicals, the application of clean technology, with good management and control of processes and machine operations, can considerably reduce waste and pollution at source.

RESINS,
PENETRATORS

RESINS,
PIGMENT,
AUXILIARIES

RESINS,
PIGMENT,
AUXILIARIES

RESINS,
PIGMENT,
AUXILIARIES

RESINS,
PIGMENT,
AUXILIARIES

OFFCUTS 5 Kg

Rechrome
Neutralise
Dye
Retan
Lubricate

Wash
Samm/set

Vacuum dry
+/- Toggle dry
+/- Tension free dry
[Paste dry]

Condition

Staking

+/- Vacuum dry
+/- Toggle dry

Crust Inspection

+/- Buff/Dedust

+/- Impregnation
+/- Vacuum dry
+/- Rebuff/Dedust

1st Coat Finish
Tunnel Dry

2nd Coat Finish
Tunnel Dry

Spray Finish
Tunnel Dry

Iron/Press

Spray Finish
Tunnel Dry

Inspect, Measure
Dispatch

Shoe upper leather 195 Kg (138m³)
Chrome splits 60 Kg (60m³)

SODIUM CHLORIDE,
SODIUM FORMATE,
SODIUM SULFATE,
CHROMIUM SULFATE,
VEGETABLE TANS,
RESINS,
SYNTANS,
DYE

The pollution load

The values determined as "Total Pollution Load Kg" from the Mass Balance Ref: (i), have been expressed as "Composition from Mass Balance Mg/l" Ref: (ii). These values may be considered against the variations found in mixed effluent received by Common Effluent Treatment Plants (CETPs) Ref: (iii), and the effectiveness of conventional treatment.

TRIMMING WASTE 5 Kg

BUFFING DUST 1 Kg

SLUDGE (as dry solids) 126 Kg

RESIDUAL SOLIDS FROM WASHINGS (from offer 14 Kg as dry solids) 2 Kg

POLLUTION LOAD Kg	
BOD	(12)
COD	(27)
SS	(6)
TDS	(44)
Cl	(6)
SO ₄	(22)
S'	-
Cr	(2)
Water	(5m ³) (+washings)

TOTAL POLLUTION LOAD Kg	
BOD	68 (71)
COD	188 (154)
SS	116 (108)
TDS	(419)
Cl	170 (192)
SO ₄	81 (84)
S'	7 (5)
Cr	5 (7)
Values: Non-bracket/plain text from Mass Balance studies ⁽²⁾ . Brackets/italics from independent workshop studies ⁽³⁾	

ii Composition from Mass Balance Mg/l. Water use 30m ³ /T		iii Effluent values from 8 CETPs. Max/Min values averaged over 12 months	
	mg/l	Received mg/l	Treated mg/l
BOD	2040	900 to 6000	5 to 43
COD	5640	2100 to 7000	220 to 310
SS	3480	2300 to 9000	5 to 86
TDS	-	10400 to 13000	10300 to 13900
Cl	5100	3500 to 7000	as received
SO ₄	2430	1750 to 2200	as received
S'	210	60 to 190	0 to 2
Cr	150	18 to 110	0 to 2
pH	-	7.7 - 8.5	7.0 - 7.9
TDS from 4 CETPs India, Cl & SO ₄ from CETP Italy			

⁽¹⁾See also: Back to Basics: Production flow and materials use, Part 6 of 9, WL Nov 2002

⁽²⁾Mass balance in leather processing. J. Buljan, G. Reich, J. Ludvik, UNIDO, WL May 1999

⁽³⁾Regional Workshop on cleaner Tanning Technology (Chennai), UNIDO, September 1998

Part 1: October 2003
Part 3: December 2003/January 2004

Richard Daniels, World Leather