

Dedication

To my parents

My husband

And every body who helped
in this work

Acknowledgment

I wish to thank God for enabling me to finish my project.

Special thanks are due to my supervisor D. Hago Elfadil Haroun.

Thanks are also extended to my colleagues in the Center of leather and industrial research & consultant center for helping me to prepare my research.

Thanks are due to every one who supported me in my work.

Contents:

Topic	Page
Dedication	I
Acknowledgment	II
Contents	III
List of tables	VII
List of figures	VIII
English Abstract	IX
Arabic abstract	X
Chapter 1	1
Introduction	1
1.2 leather industry in Sudan	1
:1.3cleaner Technological Options For Leather processing	5
1.4Cleaner productions options-pre tanning	6
1.5 Waste materiales	8
Objetives	10
Chapter Two	11
Literature review	11
Hides and skins 2.1	11
2.2Hides and skins normally used in the tanning industry	11
2.3Chemistry of hides and skins	13
:2.3.1Globular proteins	14
Fibrous proteins 2.3.2	14
Chemical constituents of protein 2.3.3	15
Properties of protein 2.3.4	17
2.3.5 Collagen	17
Properties of collagen 2.3.5.1	18
Keratin 2.3.6	19
Elastin 2.3.7	19
Reticulin 2.3.8	19
2.4 Methods of Preserving Skins between Abattoir and Tannery	21

2.4.1 Drying	21
2.4.2 Brining	22
2.4.3 Wet salting	22
2.4.4 Dry salting	22
2.4.5 Pickling	22
The Problem of Damage to Skins 2.5	23
The Tannery 2.6	24
2.6.1 Soaking :	24
2.6.2 Liming	25
2.6.4 Fleshing	25
2.6.5 De-liming :	26
2.6.6 Bating	26
2.6.7 Scudding	26
Vegetable Tans 2.7	27
("Synthetic Tans ("Syntans 2.8	27
2.9 Mineral Tans	27
2.10 Unharing (depilation) and liming	28
Methods of unhairing 2.11	29
Lime-sulphide system 2.11.1	29
Enzymatic unhairing 2.11.2	29
:Oxidative unhairing 2.11.3	30
Liming 2.12	31

Hair saving unhairing-liming methods 2.12.1	33
Direct recycling of liming floats 2.12.2	33
Splitting limed hides 2.12.3	34
:The mechanism of unhairing 2.13	35
The mechanism of hair destruction 2-14	35
The Action of Alkalis on Hair 2-15	36
Action of sulfides (and other reducing agents) on hair 2-16	38
methods of unhairing and liming 2.17	39
Straight lime liquor 2.17.1	39
paddle liming 2.17.2	39
drum unhairing 2.17.3	39
kamal eldin elfatah thesis 2.18	41
Chapter three	42
Materials and methods	42
3.1 Experimental work (micro production scale trials	42
3.1.1Method of sulphide determination (idometric method)	43
Determination the amount of lime in used lime liquor 3.1.2	44
Chemical analysis 3.2	45
Sampling location for skin 2.1	45
Determination of moisture content 3.2.2	45
Determinations of oils and fats 3.2.3	45
3.2.4 Determination of total Ash	46
Determinations of the percentage of chrome content in 3.2.5	46
leather in term of Cr2O3	
:Physical analysis 3.3	48
Sampling 3.3.1	48
Conditioning 3.3.2	48
3.3.3Measurement of thickness	48
Measurement of tensile strength and percentage 3.3.4	48
Elongation	
(Grain crack load and distention (lastometer test 3.3.5	49
Chapter 4	51
Results and discussion	51
Economical estimation	62

Conclusion	66
Recommendation	66
References	67

List of tables:

	3
Leather products in Sudan 1996 -1997	
Tanneries production in Sudan	4
Amount of sulphide and Ca(OH)_2 in fresh and used liquor	53
Amount of sulphide, lime and pH in recycled liquors	55
Comparison of recycling and conventional methods	56
Degree of Swelling and Unharing	57
Chemical Analysis	58
Physical Analysis	59
Amount of sulphide, lime, water added to replenish the liquor	60

:List of figures

Vegetable tanned sole leather	9
Anatomical Structure of skin	12
Sampling location for physical & chemical analysis	50
Flow chart amount of sulphide, lime, water in fresh and used lioquor	54
Flow chart saving of sulphide, lime water	61
Saving of lime for 1500 kg of hide	63
Saving of sulphide for 1500 kg of hide	64
Diagram: flow sheet of recycling process	65

ABSTRACT

Pollution is one of the problems facing human being and if not controlled it will gradually lead to complicated environmental problems.

According to current legislation on the environment tanners are required to reduce all kinds of pollution (solid wastes, dissolved or suspended substances in effluents, etc)

The beamhouse operations cause the highest pollution during the leather manufacturing processes. Data provided by the leather department center indicated that sodium sulphide and lime are responsible for most pollution (55%) of the total pollution and 84% of the BOD, 75% of the COD, 92% suspended solids and 100% of toxicity.

The aim of this work is to reduce the pollution load by recycling of the liming solution and at the same time reduce the amount of chemicals used in other processes and reduce the cost.

Recycling process was carried out by adding a make up of sodium sulphide, lime and water to the used liquor to raise the concentration to its initial level. Chemical analysis and experimental work indicated that the save of sodium sulphide, lime and water was 60%, 40% and 90% respectively and the leather produced had the same properties compared with that produced by conventional method.

ملخص البحث

التلوث البيئي من اكبر المشاكل التي تواجه الانسان والتي يسعى لتفاديها .
بشتي الطرق نسبه لاثارها الضاره علي البيئة .
تراعي القوانين الحالية ضرورة تقليل المخلفات الصناعية بمختلف انواعها
(واشكالها) صلبة , سائلة , مواد عالقة
من المعروف ان مرحلة ازالة الشعر و التجيير من اهم مراحل الدباغة واكثرها
تاثيرا على البيئة اذ انها مسئولة عن 55% من جملة التلوث الناتج عن عملية
الدباغة بشكل عام .
الهدف من هذه الدراسة هو تقليل نسبة التلوث الناتجة عن عملية ازالة الشعر
و التجيير وذلك عن طريق اعادة استخدام محلول ازالة الشعر وبالتالي تقليل
الاثار السالبة علي البيئة وتقليل التكلفة الاقتصادية للمواد الكيميائية
المستخدمة (صوديوم سلفايد , جير)وتوفير الماء
تتم عملية اعادة استخدام المحلول بتحديد نسبة المواد الكيميائية (سلفايد , جير
) والماء المستهلكة ومن ثم اضافتها لمحلول ازالة الشعر و التجيير لرفع تركيز
المحلول الى المستوي المطلوب
بعد اجراء التجارب المعملية وجد ان نسبة التوفير في المواد الكيميائية 40%
من الجير, 60% من السلفايد, 90% من الماء اعتمادا على وزن الجلد بعد
البلل
الاختبارات الفيزيائية والكيميائية للجلود المنتجة بطريقة اعادةالاستخدام
لمحلول ازالة الشعر والتجيير اثبتت انها مشابهة لنوعية الجلود المنتجة
بالطريقة التقليدية

