CHROME RECYCLING PROCESS OF TANNERY LEATHER INDUSTRY WASTE USING LIMES

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ABSTRACT

Tannery wastes containing chromium are high, bad for humans and environmental components. The high chromium content of which can be recovered by process neutralization, the amount of chromium waste until the level is not harmful. Decision-chrome with good results and low cost, it can be done using a mixture of lime (Ca (OH) 2) with various concentration of 0.2% lime, 0.4%, 0.6% and 0.8%. The results that addition of 0.4% lime can produce chrome of 61.35% with a purity of 56.14%, calculated sulfate and chromium compounds can raise the pH of the waste water of pH 3.2 to pH 12.0.

Keywords*: Waste,Chrome, reuse.*

1. INTRODUCTION

Leather tanning industry uses a lot of chrome, chromium compounds are still imported from abroad, so the price is relatively expensive, as a consequence of the use of chrome in the process, the leather tanning industry wastewater contains a lot of chromium ions that are either toxic to plants, animals and man. The Chromium ions when discarged into the enviroment must go through a process that can reduce up to meet effluent quality raw leather tanning industry.

The most common way to reduce the amount of chromium ions in the waste water is to use coagulation process. Chrome metal ions can be precipitated and then buried in the ground, as well as other metals, metal chrome can't be degraded in nature, so the longer it will be more and more a result of the accumulation of waste disposal and will gradually be bad for people and the environment. Given the devastating impact it would cause, it is necessary to attempt to reduce the amount of chromium metal disposal of tannery industry by utilizing methods such as chromium compounds back original function or can be used for other purposes. Efforts to recover the chromium compound of tannery wastewater as a function initially or for other purposes requiring chromium compounds. The success of recovery of chromium compounds from leather tanning industry is expected to reduce the amount of chromium metal waste in the environment and at the same time can save foreign exchange used to import chrome tanning leather as raw material.

2. THEORETICAL BACKGROUND

Metal Chrome

Leather tanning process is the processing of raw hides into leather is ready for further processing. Broadly speaking, leather processing can be divided into three (3) stages of processing, namely the introduction, tanning and completion. Already tanned leather will have different properties with raw leather, especially in terms of resistance to decomposition. Leather tanning process is most often done by the tanning industry uses chemicals that chromium sulfate. Leather tanning using chromium sulfate tanning substances will result in leather that can be used as raw material for jackets, shoes, gloves and so on.

At this stage of the tannery is two (2) ways of working, which is a process one stage

and two stage. In a simple one-stage process tannery began to soak in a solution of chromium during a certain time or by soaking in a solution of dichromate followed by the addition of glucose as a reductant. Two-stage process consists of two steps, the first step is the reduction of dichromate solid leather for a certain time, then peel the leather is removed and then soaked in a solution tiosulfat. During this process one step further to be done considering the process easier and shorter. Neither one phase or two phases, both of which will produce chrome waste. Chromium tannery required is part of the leather. Part chromium constructed Posted woven tissue collagen, collagen-containing polar groups are positively charged and negatively proportional to strengthen the effectiveness of ion pairs. Almost half of the total number of polar groups containing residual negative charge on the oxygen which acts as a hydrogen bond. The presence of chromium metal ion will cause the formation of a bond with the hydroxyl bridge calogen, so that the collagen protein structure becomes more stable.

Impact of chromium pollution.

Chromium is a metal ion that is toxic to humans and other living things. Epidemology Studies show that Cr compound is very responsive to the respiratory tract. These compounds can also cause local cancer in organs of mice and rabbits exposed to chromium compounds. In addition, Cr compounds can cause mutagen which ultimately affect directly deoksiribo nucleic acid (DNA) so that the cells of living things will change. Due to changes in these cells can cause cancer. Period 1930-1947 chrome mine workers in the United States have a relative risk of respiratory cancer twenty channels is higher than other workers. According to the decision of the Minister of State for Population and the Environment No. KEP.01 / MENLH / 10/1995 on the quality of raw tannery wastewater using chrome, the maximum level allowed in waste water is 0.6 mg / l.

The use of metal production and Chrome. Chrome metal and compounds resulting from the mineral chromium, chromium-containing minerals that both $Fe(CrO_2)_2$ between 62% to 82%. Chrome needs in the United States approximately 14 million tons are used for need refractory, metallurgy and chemical applications.

Chromium compounds widely used for various purpose, among other :

a. Cr sulfate, used for tanning leather;
b. Chromium sulfate solution, is used as a pigment dye;
c. ZnOCrO3xH2O, used as a corrosion prevention;
d. Cr2O3, used as a catalyst;
e. CrO3, used in coating process and anodizing.

3. RESEARCH METHOD

Materials and Methods

Tannery wastewater is added lime (Ca (OH) 2) with various concentration of 0.2%, 0.4%, 0.6% and 0.8%. Deposition of Cr (OH) 3 were separated using a centrifuge, waste washed and then the precipitate is dissolved in sulfuric acid, is intended to remove insoluble impurities, then re-precipitated and purified by re crystallization. Crystal CR2 (SO4) 3 is formed is then separated, dried and characterization. Chromium content measurements performed using visible light spectrophotometer, work flow diagram is shown in Figure 1.

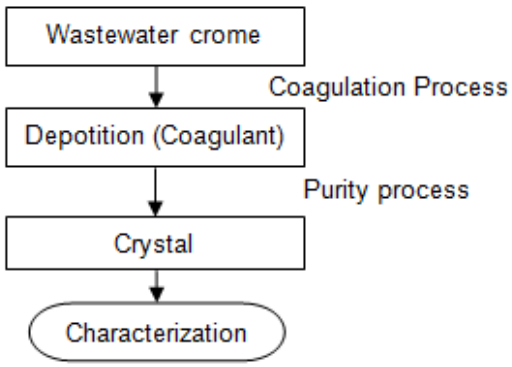

Figure 1 : Chromium Compounds Making Process of Liquid Waste Tannery

Characteristics of Tannery Wastewater

a. Dark green waste water;
b. Temperature 27oC;
c. Degrees of acidity (pH) of 3.0;
d. Total content chromium of 1.32%.

Effect of Acquisition Chalk At pH Waste water. Results of pH measurement tannery

industrial wastewater before and after treated with lime can be seen in Table 1.

Table 1. Results of pH measurement Wastewater

pH Wastewater	pH After Treatment			
	0,2 %	0,4 %	0,6 %	0,8 $
3,2	11,3	12,0	12,3	12,5

The addition of lime to the tannery waste water can raise the pH of the solution up to pH 12.5, the more the addition of lime, the greater the increase in pH occurs. Effect of Addition of Lime On Acquisition Chrome. Effect of the addition of lime with various concentrations of lime to the acquisition of chrome can be seen in Table 2. Graph the relationship between the concentration of the addition of lime to the chrome recovery can be seen in Figure 2, while the results of the analysis of variance test the effect of variations in the concentration of lime to the acquisition of chromium can be seen in Table 3.

Table 2. Results Measuring Acquisition Chrome

Additional of lime (%)	Acquisition (%)
0,2	38,92
0,4	61,35
0,6	60,39
0,8	61,48

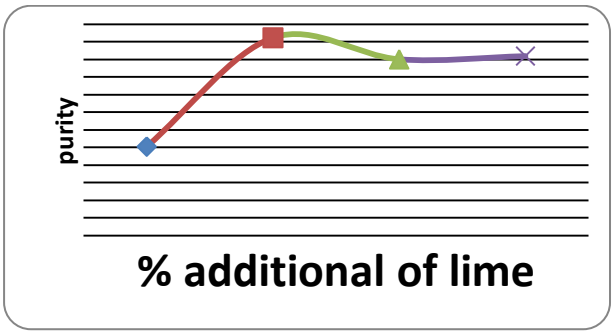

Figure 2. Graph of relationship between the concentration of chromium addition of lime to the Acquisition

Table 3. Results of Cost Variance Analysis Chrome Test

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	1844.683	3	614.894	13.818	0.000105	3.239
Within Group	712.0062	16	44.5003			
Total	2556.69	19				

ANOVA test showed that there were significant differences between the concentration of lime is added to the acquisition of chrome. Significant difference occurred at a concentration of 0.2% lime with 0.4%, 0.6%, 0.8%, but the addition of lime 0.4%, 0.6% and 0.8% showed no appreciable difference means. ANOVA test results and Figure 2 shows that the acquisition rose dramatically on the addition of lime with a concentration of 0.4%, then relatively constant. This shows that the addition of lime at a concentration of 0.4% is the optimal addition of having reached equilibrium between the amount of chrome metal ions contained in the waste with hydroxide ions produced by lime, so the addition of a larger amount of lime does not raise the percentage of chrome acquisition.

Purity Limestone Addition influence on Chrome

Effect of the addition of lime with various concentrations of lime on chrome purity obtained, it can be seen in Table 4. Graph the relationship between the concentration of chromium addition of lime to the purity can be seen in Figure 3, while the variance analysis test results can be seen in Table 5.

Table 4. Effect of addition of lime on Purity Chrome Sulfat

Additional of lime (%)	Purity (%)
0,2	25,22
0,4	56,14
0,6	50,02
0,8	50,92

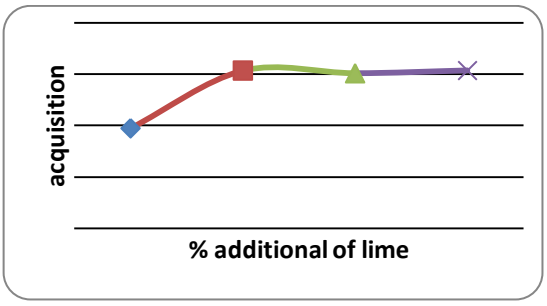

Figure 2. Graph of relationship between the concentration of chromium addition of lime to the Acquisition

The results of variance analysis the effect of adding lime to the purification of chromium

sulfate obtained show a significant difference in the concentration of lime 0.2% to 0.4%, 0.6%, 0.8%. The addition of lime with a concentration of more than 0.4% decrease chrome sulfat obtained (on Table 4 and Figure 2).

Table 5. Test Results Analysis Purity Chrome

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	2870.516	3	956.8385	34.516	3.23E-07	3.239
Within Group	443.5446	16	27.72153			
Total	3314.06	19				

4. RESULT AND DISCUSSION

Optimal addition of lime to precipitate chromium sulfate at a concentration of 0.4% is achieved, the addition of a greater number of chalk would just be an addition to the amount of impurities so that the percentage purity chrome obtained to be down on the addition of lime with a concentration of 0.6% and 0, 8.

5. CONCLUSION

The result of session are the following matters:

a. The addition of lime to the tannery waste water industry can raise the pH of the wastewater;
b. Lime can be used as a capture medium contained chromium in tannery waste water industry;
c. The addition of lime by 0.4% in the waste water can raise the pH of the waste from pH 3.2 to pH 12.0.
d. Optimal amount of additional lime (effectively and efficiently) is achieved at a concentration of 0.4%;
e. The addition of lime by 0.4% in the leather tanning industry waste water, produce chrome acquisition of 61.35% with a purity of 56.14%, calculated as chromium sulfate compound, which is ready to be reused as raw material for leather tanning;

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