

# Challenges and Prospects of Tannery By-product Industries (Glue, Gelatin, Poultry and Fish Feed Industries) in Bangladesh

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**Abstract**— The leather making operation conducted in a tannery involves the transformation of putrescible hides and skins to stable leather. A huge amount of solid wastes is generated during leather processing. Very few quantities of these wastes are utilized for making glue, gelatin, poultry and fish feed. Major portion of these tannery wastes are left unutilized. These are simply dumped into the environment causing critic environment and health problems. Among the solid wastes, there are fleshings, hair, wool, fat, trimmings (raw, wet-blue, crust and finished trimmings). This study reveals that glue, gelatin, poultry and fish feed production units face identity problems (they do not have trade licenses), lack of availability of raw materials, lack of investment, lack of appropriate technology, old methodology, health problems and so on. If all the tannery waste materials could be utilized properly and other problems faced by this by- product manufacturing units could be solved, then it would gain profit, more employment facilities, as well as save the environment.

**Key words:** Tannery, Fleshings, Fats, Trimmings, By-products, Gel point

## 1) INTRODUCTION

Bangladesh is a developing country in the South Asia. Rapid industrialization plays a vital role in its economy. Leather sector (leather, leather goods and footwear) is the 2<sup>nd</sup> largest foreign currency earning sector in Bangladesh<sup>1</sup>. Tanning industry is one of the oldest manufacturing sectors in our country<sup>2</sup>. The first tannery of Bangladesh established at Narayanganj by R.P. Shaha in the 1940s<sup>3</sup>. Later on, almost 95% of tanneries located in Savar, Dhaka (previously these were in Hazaribagh, in 2017 relocated in Savar). The demand of finished leather is rapidly increasing in the busy World and consequently it seems a rapid expansion of leather goods industry in Bangladesh as like as other countries<sup>4</sup>. According to Food and Agricultural Organization (FAO) report (2008), the tanning industries of

Bangladesh process 400 metric tons hides and skins in a day.

Leather industry, one of the polluting industries because of generation of huge amount of liquid and solid wastes, also emits obnoxious smell because of degradation of proteins material of skin and generation of gases such as NH<sub>3</sub>, H<sub>2</sub>S and CO<sub>2</sub>. Solid wastes are raw trimmings, fleshings, chrome shavings, buffing dusts and keratin wastes<sup>5</sup>. Accumulation of these wastes leads to sludge problem and choking of treatment pipes and finally results in reduction in efficiency of treatment plant. Treatment of solid wastes also is not cost effective, posing economic burden to the tanners. Leather industry in the developing countries is facing lot of solid wastes problem and many tanneries closed for not meeting Bio-chemical Oxygen Demand (BOD) and Total Dissolved Solids (TDS) norms<sup>6</sup>. These tanneries produce 118 metric tons solid wastes. Among these solid wastes, major portions are shaving and buffing dust, trimmings, fleshings and fats. In Bangladesh, yearly 20.1×10<sup>3</sup> MT fleshing was generated only from cow hide and goat skin where 10.3×10<sup>3</sup> MT for cow hide and 9.8×10<sup>3</sup> MT for goat skin<sup>7-8</sup>.

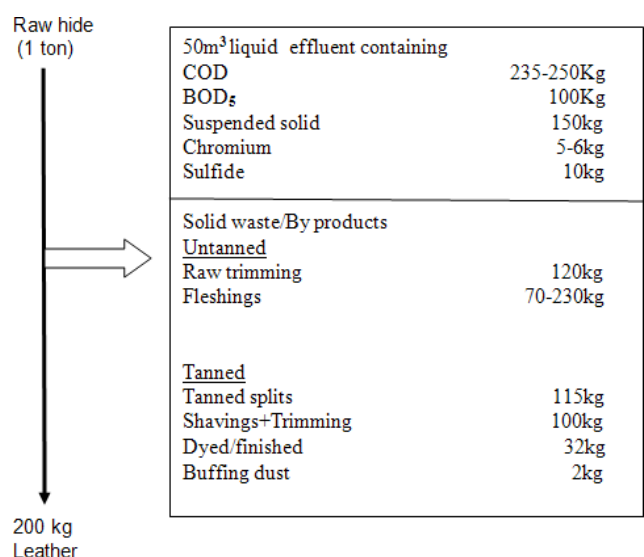


Fig. 1: Schematic representation of tannery wastes<sup>9</sup>

Each ton of raw hides requires 400 kg of different chemicals including sodium chloride, lime, sodium sulphide, sulfuric acid, basic chromium sulfate, dyes and

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others. Thus, the impact of the waste produced from the tannery industry is significant. There is also about 780,000 ton of solid waste generated from this sector each year which contains toxic chromium by 4.5 % (w/w).

#### Overview of Leather Sector in Bangladesh<sup>10</sup>

- I. Produces 2%-3% of world's leather market
- II. Meets 0.5% of the world's leather trade worth US\$ 87 billion
- III. Ranked 2nd in the BD export earning sector
- IV. Export volume: 83 million square ft
- V. The sector directly employs approximately 850,000 people

#### Current Status of Leather industries in Bangladesh<sup>11</sup>

- I. At present 207 tanneries in Bangladesh
- II. Annual Production: 485 million square ft hides and skin
- III. Chemical Consumption for tanning process: 74,000 ton/year
- IV. Waste water volume: 6 million m<sup>3</sup>/year
- V. Solid waste generation: 78,000 ton/year
- VI. Most of the tanneries do not have safe working practice and appropriate ETP
- VII. Causes serious air and water pollution

#### Aspects of Health Hazard<sup>12</sup>

- I. Exposure of toxic chemical can increase the cancer risk
- II. Different types of skin diseases
- III. High chromium content present in effluent
- IV. When exposed, chromium acts as a lung irritant and carcinogen, affecting the upper respiratory tract
- V. Poultry feed is being produced from chrome shaving dust for minimizing the cost

According to a research performed by SHED (Society for Environment and Human Development), 1000 kg (including moisture content up to 40%) shaving dust is produced daily in a small-scale industry. From this data we can easily estimate the amount of shaving dusts produced daily in our country. If we include other solid wastes and take into account the other medium and large tanneries, the quantity will be many more times of that figure. The by-products obtained in the different process are listed in the table 1

By-products	Obtained from
Unspent salt, saline water	Curing and soaking
Wool & hair, Limed fleshing, cuttings & lime sludge	Liming
Grease	Degreasing
Waste pickle liquor	Pickling
Waste chrome liquor, Vegetable tanning liquor, waste V.T. sludge and fat liquor	Tanning department
Leather shavings and splits	Machine department
Waste dye and fat liquor	Dyeing and fat liquoring
Leather trimmings, cuttings, solvent vapor	Finishing department

Table 1: Tannery by-product<sup>13</sup>

Glue is an organic colloidal substance of varying appearance, chemical constitution and physical properties, obtained upon drying the solutions resulting from boiling with water properly prepared animal matter such as skin and bone<sup>14</sup>. The jellies which form on chilling soups, stews, boiled chicken and the like, represent very impure glue solutions. Glue appears in commerce in a wide variety of forms and colors, some of which are commonly, but erroneously, believed to be criteria of quality. The colors range through all shades of white, brown and yellow, and it may be transparent, translucent, or opaque. Gelatin colored red with aniline or vegetable coloring matter is used as a top dressing for cold meats, and specially colored glue compositions are used for milking paper pads or blocks, etc<sup>15-16</sup>.

Bangladesh produces about 1/5<sup>th</sup> of the world population of hides and skins<sup>17</sup>. Instead of trashing, those tannery waste materials which can cut cost of disposal and open up additional revenue streams through selling by-products. There are lot of prospects to use all of the tannery solid wastes to make gelatin, soap, animal feed, fish feed, composting, poultry feed, direct use in soil (agricultural recycling) etc. But due to lack of planning and management of solid wastes of leather industry, lack of awareness and investment of tannery by products manufacturing units, lack of government facilities, lack of appropriate technology, old methodology, health problems and so on. Raw trimmings and wet blue trimmings are useful in developing glue and gelatin<sup>18</sup>. Fleshings and trimmings can be used to develop glue, gelatin and poultry feed. Crust and finished leather

trimmings (scrapes) are used in making Leather Composites which are applied in making sport equipments<sup>19</sup>.

Gelatin is used in making the shells of pharmaceutical capsules, cosmetics and also in food industries. Animal glues are essentially unrefined gelatin which is used to make bonds with different components<sup>20</sup>. In Bangladesh, only Oponin Pharmaceutical Industries Ltd. produces gelatin which is not sufficient for Bangladesh. Every year huge amount of money is allocated to import gelatin. Keratin hydrolysate can be used as exhaustive aid for chrome tanning. Similarly, fleshing hydrolysate can also be used as a tanning agent. Buffing dust is useful in developing retanning agents poultry feed, fertilizer and landfill sites<sup>21</sup>. If government pays attention to the prevailing problems being faced by tannery by-product manufacturing units, there would be a great prospect of the



Fig. 4: Different types of raw materials for tannery by-products



Fig. 2: Animal glue in granules Hot hide glue



Fig. 3: Produced Gelatine

growth of these units.

Dumped tannery solid wastes are washed away during rainy season and fall into the Dhaleshwari River which cause to increase Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Total Solid (TS) and decrease the Dissolved Oxygen (DO). As a result, aquatic balance is abruptly disrupted.



## 2) MATERIALS AND METHODS

### Study Area:

Tannery Industrial Zone, Savar, Dhaka and Keraniganj, Dhaka are selected to carry out this study. Different by-product manufacturing units of those areas are observed.

### Methods:

Information was collected through site visits, interviews, detailed discussions with the stakeholders.

## 3) CHALLENGES OF TANNERY BY-PRODUCT INDUSTRIES

1. Lack of Raw Materials: Trimmings of raw hides and skins get rotten even after 24 hours. There is no proper management to preserve these valuable materials for further use. Tannery by-products industries suffer from raw materials.
2. Lack of Government Awareness: In Bangladesh, there is only one recognized glue and gelatin industries. Huge amount of gelatin is imported to meet the national demand. There are some small-scale glue, gelatin, fish and poultry feed production units (unnamed) that are doing their activities very confidentially because of not having trade license. They use chrome tanned leather trimmings and shaving dust as raw materials without making them chrome-free.  $\text{Cr}^{6+}$  is carcinogenic and causes cancer to human. We know shaving dust is a great source of protein for fish and chicken. Different government institutions should give attention to recognize those considering environmental and ecological issues.
3. Unawareness of People: The people of Bangladesh are not aware of the reality. People think poultry and fish feed and gelatin produced from tannery wastes are always harmful for human health. But if we can remove chromium from the shaving dust or chrome tanned leather

trimmings, it will be safe for us.

4. Lack of Skilled Workers: Workers in these manufacturing units are not skilled enough.
5. Lack of Investment: As the poultry fish feed and some glue and gelatin production units are not authorized by government, getting bank loan is difficult. From the beginning there is no statistics about investment in poultry fish feed, glue and gelatin production units which use tannery solid wastes as raw materials.
6. Lack of Appropriate Technology: The technologies used by these units are old. They don't make the raw materials free from chromium. They don't have support of new machineries and advanced process technology.
7. Administrative Unwillingness: Administrative bodies like Ministry of Environment, Ministry of Health, Police and Fire Brigades sometimes raid these units and demand for bribe. Otherwise, they threaten to stop production even sometimes fine the entrepreneur.
8. Automation: The by-product manufacturing units run with the old methodology and techniques. New technology and machineries need to be introduced for the production of quality product. As these industries are not recognized by the government, they have to suffer a lot to import machineries bank loan getting is not possible. For these reasons automation is difficult for those units.
9. Environmental Problems: Raw trimming dust contains common salts (NaCl) which discharge directly to the sewerage line after washing the raw materials. Common salt is a threat to the environment. Calcium Carbonate is used in the manufacture of glue and gelatin that is also discharged to the sewerage line. It also causes water pollution. So the ministry of Environment prohibits these manufacturing units. Sometimes it drives out mobile court and fines those units.
10. Health Problems of Workers: Industrial safety practices are not maintained by these units. Workers are not aware of their health problems. They do not use any Personal Protective Equipment's (PPE). Workers are reported to suffer from different types of skin diseases like skin burning, rash, irritation and other problems.
11. Lower Grade of Product: In local manufacturing method, pH affects the quality of glue, gelatin, fish feed and animal feed. The ideal pH range is 6-7.5. Below this pH these products will be turbid and above that pH 7.5, glue and gelatin will lose its essential properties, viscosity and gel strength. Local byproduct manufacturing units cannot always maintain the ideal pH.

#### 4) PROSPECTS OF TANNERY BY-PRODUCTS INDUSTRIES:

1. Reduction of Unemployment: In developing countries like Bangladesh, unemployment problem is a great threat for national development. If we could develop tannery by-product industries, this unemployment problem would be reduced in certain extent.
2. Meeting the National Demand: In Bangladesh glue, gelatin, poultry and fish feed manufacturing units are not sufficient. Still we are depending on the import of these products. Even the imported feed does not contain the protein needed for the growth of poultry and fishes.
3. Utilization of Tannery Solid Wastes: A large quantity of tannery shaving dust, fleshings are thrown out from the tanneries every year. If the government concerns to the tannery by-products there would be diverse use of these wastes.
4. Increase of National Income: As a developing country, we need to increase our national income. There is a great prospect to achieve this goal through developing tannery by-product manufacturing units.
5. Protection of Environmental Threat: The tannery solid wastes are a great threat to our environment. If all these wastes could be utilized properly, it would give us relief from the pollution.

#### 5) CONCLUSION

The tannery by-products have a great prospect to manufacture different goods which have an excellent export potential. Most of the tannery by-product manufacturing units are illegal which should be legalized. Industrial safety practices are unknown to the workers. Training should be provided to them and innovative methodology should be incorporated to these units. If government stands beside those units, it would be possible to meet the national demand of glue, gelatin, organic fertilizer, fish feed, poultry feed and so on. Even Bangladesh can earn a lot of currency and employment facilities can be incorporated.

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