# 6 Analysis of Cleaning Production

Cleaning production means the continued application of whole prevention strategy for the environment in the manufacturing process and product's service so as to reduce its risk to human beings and environment. It includes the following three parts: using purified energy resources and raw materials, adopting environmental friendly processing technology and manufacturing cleaned products. Cleaning production requires the saving of raw materials and energy, removal of poisonous and harmful raw materials and reducing the emission and toxicity of the offal as well as the synthesized use and essential treatment to the pollutants in the manufacturing process.

The application of cleaning production process plays an important role in the pollution control in papermaking industry is the application of, that is, update technology, new process and advanced equipment shall be adopted as much as possible in the production in order to improve the utilization ratio of raw materials and reduce the discharge of three wastes during the production process. Its principle is stated as follows:

1. Reducing consumption of fiber resources, raising the rate of qualified paper pulp and reducing fiber loss
2. Closed recycling of the chemicals for the preparation of paper pulps and reducing the amount of chemicals in use.
3. Economizing the energy
4. Water saving and reducing the consumption of fresh water, improving the utilization ratio of recycled water.
5. Controlling of the emission of water pollutants.

The application of cleaning production technology will both do good to the environment and will improve the quality of products, reduce production cost and raise labor productivity, thus improving the enterprise's synthesized competitiveness in the market.

## 6.1 BTMP Production Line

BTMP production line will be furnished with the advanced paper pulp making technology, which adopts the process of water pre-dipping, machinery pulp milling and bleaching by perhydrol. This production line includes:

1. A complete set of thermal recovery system, recovering of thermal energy during the pulp milling process to offer supplying steam
2. Perhydrol is used as a bleaching agent, chlorineless bleaching is applied to replace the chlorine bleaching. So there is no any carcinogenic substance and other poisonous substance in the polluted water.
3. Highly concentrated pressure pulp milling, replacement filtration and medium-high thick bleaching are adopted so that the water consumption has been reduced enormously.
4. With the application of BTMP method, the rate of qualified paper pulp making is relatively high, poisonous gas is hardly discharged in the air during this preparation

process.

Unit consumption of each pulp can be seen in Table 6.1-1. It can be seen from Table 6.1-3,Table 6.1-1、Table 6.1-2 and Table 6.1-3 that the BTMP production line involved in this project can be considered to be cleaning production because it accords with the principle of it.

**Table 6.1-1 Comparison of Unit Consumption of Each Pulp**

| Types of Pulp | Electricity consumption kWh/t Pulp | Steam consumption t/t Pulp | Water consumption t/t Pulp | Raw wood consumption $m^3$/t Pulp |
|---|---|---|---|---|
| LKP | 4000 | 4.7 | 170 | 5.5 |
| APMP | | | 20 | 2.5-3 |
| ONP | 480 | 1.2 | 20 | 0 |
| TMP | 2250 | 1 | 40 | 2.26 |
| BTMP（in this project） | 2800 | 0.6(only for the starting-up) | 18 | 2.27 |

**Table 6.1-2 Comparison of Major Index of Various Pulp-making Methods**

| Types of Pulp | Waste water amount ($m^3$/t Pulp) | Rate of qualified wood-pulp | Use of chemicals |
|---|---|---|---|
| LKP | 120 | 50% | Yes |
| APMP | 16.7 | 80% | Yes |
| ONP | 20.2 | 85% | Yes |
| TMP | 35.5 | 90-95% | None |
| BTMP(in this project) | 17.7 | 90-95% | None（Only for bleaching） |

**Table 6.1-3 Air Pollution Conditions by Different Paper Pulp Preparation**

| | Odor chemicals | Sulphur dioxide | Muriate | Nitrogen oxide | Floating dust and particle |
|---|---|---|---|---|---|
| Stock preparation | — | — | — | — | × |
| Paper pulp preparation by the Methods of Sulphate and caustic soda | × | × | — | × | × |
| Paper pulp preparation by the methods of sulfite and neutral salt | × | × | — | × | × |
| Paper pulp preparation by semi-chemical method | × | × | — | × | × |
| Paper pulp preparation by machinery process | — | — | — | — | — |
| Bleaching by perhydrol | — | — | — | — | — |

Remark：“—” stands for “0” or micro-scale，“×” stands for major discharged wastes. BTMP adopts the methods of machinery process and bleaching by perhydrol.

## 6.2 Papermaking Production Line

Papermaking production line is equipped with papermaking plants and controlling system of internationally advanced level. It adopts:

⑴ Closed steam cover and heat recovery system so as to improve the thermal efficiency of paper mill.

⑵ Recovery system of coating materials, thus reducing the discharge loads and water waste discharge during the coating processing section.

⑶ Multi-filter and closed recycling system of clean water, thus, making it possible for the rate of plain water recovery reaches more than 95%, the rate of fibre recovery 90%.Raw materials and water consumption are reduced.

⑷ Cleaning condensation water in the workshop is sent to the thermal power plant for recycling

purpose, thus, the amount of soft water in use is reduced.

Table 6.2-1 shows the comparison of water, electricity and steam consumption involved in the project with those of domestic and foreign papermaking industries. It can be seen that the water, electricity and steam consumption involved in the project is lower than that of domestic papermaking sectors of the same trade and product, reaching the internationally advanced level in papermaking industry.

**Table 6.2-1 Comparison of Water, Electricity and Steam Consumption**

| Types | Unit | This Item | International Papermaking Industry | Domestic Papermaking Industry |
|---|---|---|---|---|
| Water | $m^3$/t Paper | 10 | 8-12 | 20-60 |
| Steam | t/ t Paper | 1.8 | 1.5-2.0 | 3.2-3.6 |
| Electricity | kWh/ t Paper | 760 | 800-850 | 1100-1200 |

## 6.3 Conclusion

Cleaning production has been paid great attention to at the phase of the project's designing, and the major manufacturing equipment is introduced from abroad which is of international advanced level. Meanwhile the complete set of construction including the sewage treatment station and other environmental protective facilities are all established, which will fulfill the requirement of the standards for the discharge of pollution and the total discharge control. This cleaning production involved in the whole project reaches the international advanced level.