UBC (Used Beverage Cartons) Processing – Recovering Fiber Out Of Waste

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ABSTRACT

India's fast-growing paper industry for many years is now saddled with the sky rocketing prices of raw materials on account of their dwindling availability within the country. Rapidly depleting stock of forests is considered a major factor behind the declining availability of raw material for the industry which employs over 1.5 million people.

Demand for paper products in India market is on a steady upward curve; to meet the growing demand the Indian Paper Industry has increased **"The share of recycled fiber".**

Introduction

Used Beverage Cartons (UBC) also called "Tetrapak". On one hand, Tetrapak poses a serious threat to the environment as waste, on the other hand, a preferred source of economic recovery as a secondary raw material. Tetrapak is composed of 60 - 70 % cellulose fibers and 30 - 40 % polyethylene foils and aluminum (not always). All these components are valuable raw materials for further industrial use. However, there is one condition is that the components must be

UBC Product Grade:

- USED BEVERAGE CARTONS
- CUP STOCK BOARD
- WHITE LINED CHIP BOARD
- VIRGIN FIBER-BASED BOARD
- COATED UNBLEACHED KRAFT BOARD

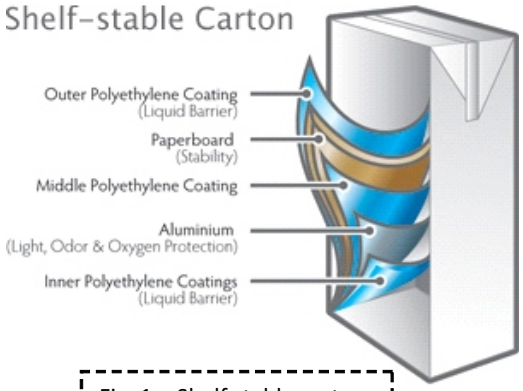

Fig. 1 – Shelf stable carton

- **Shelf-stable cartons** contain on average 74% paper, 22% polyethylene and 4% aluminum.
- **Refrigerated cartons** contain about 80% paper and 20% polyethylene.

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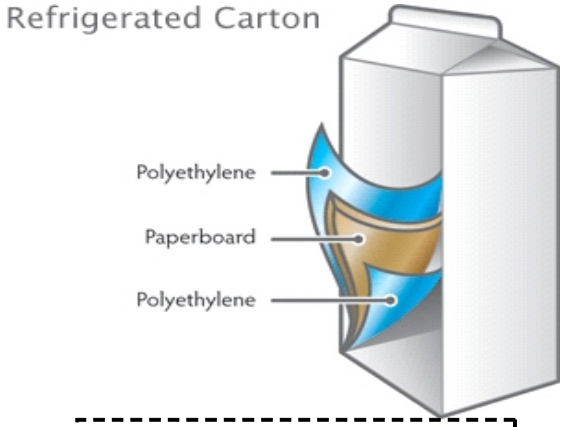

Fig. 2 – Refrigerated carton

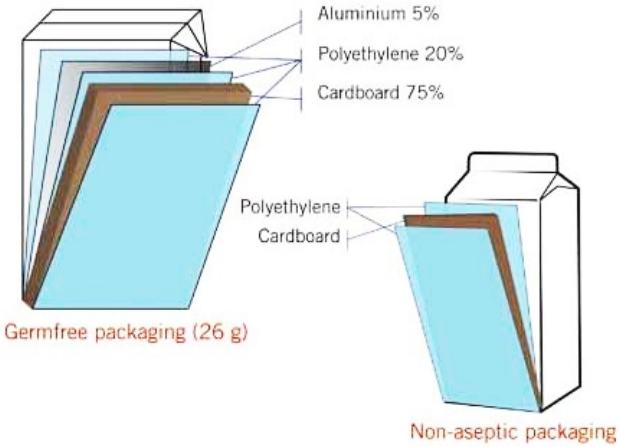

Fig. 3 Germfree packaging & Non-aseptic packaging

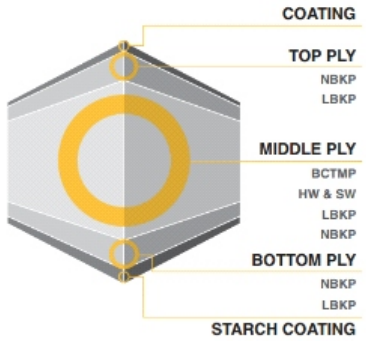

Fig. 4 – Liquid packaging for milk & juices

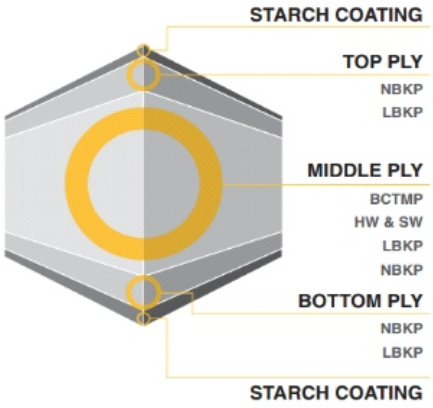

Fig. 5 – Premium refrigerated liquid packaging for milk & juices

Liquid packaging for milk and juices.

Premium refrigerated liquid packaging for milk and juices

separated from each other perfectly.

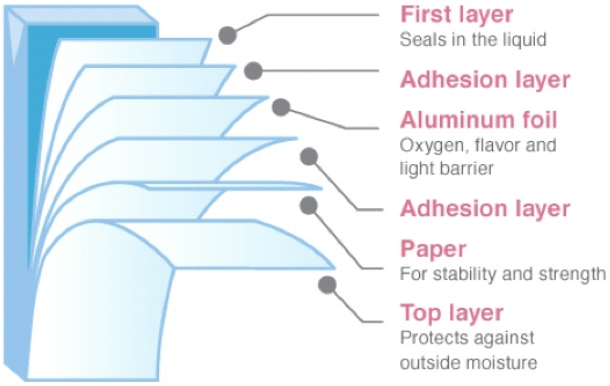

Fig. 6 layers

Grade	Aseptic packaging Germfree packaging Shelf-stable carton	Non-aseptic packaging Refrigerated carton
Cardboard Grammage	210 – 325 GSM	250 – 330 GSM
Cardboard	74%	80%
LDPE	22% | 50 µm/layer	20% | 50 µm/laye
Al mini m	4% | 6 µm/layer	-
Color	ro n hite 70 – 88%	hite 78 – 85%
La ers		3 or 4
se	Long-life be erages 80% of prod ction	resh milk ices 20% of prod ction

Table 1- Composition

Table 1 shows composition of different layers in a Beverage Carton

UBC – In & Out

Feed	**Product**
Source	Fibers
Factory outlet, or	40% dry mat, or
Municipal waste	4% stock – tissue or notebooks
Color	Foils
White, or	Mixture of PE & AL, size over 12 mm, and
Gray	Mixture of AL & PE, size 1.8 - 12 mm
Size	Rejects
Large, or	Heavy rejects (sand, stones, etc.), and
Optimal 10 - 25 cm	Light rejects (flakes, polystyren, etc.)

Table 2 - In & Out

Table 2 shows Infeed and output of collected Used Beverage Cartons.

UBC TECHNOLOGY:

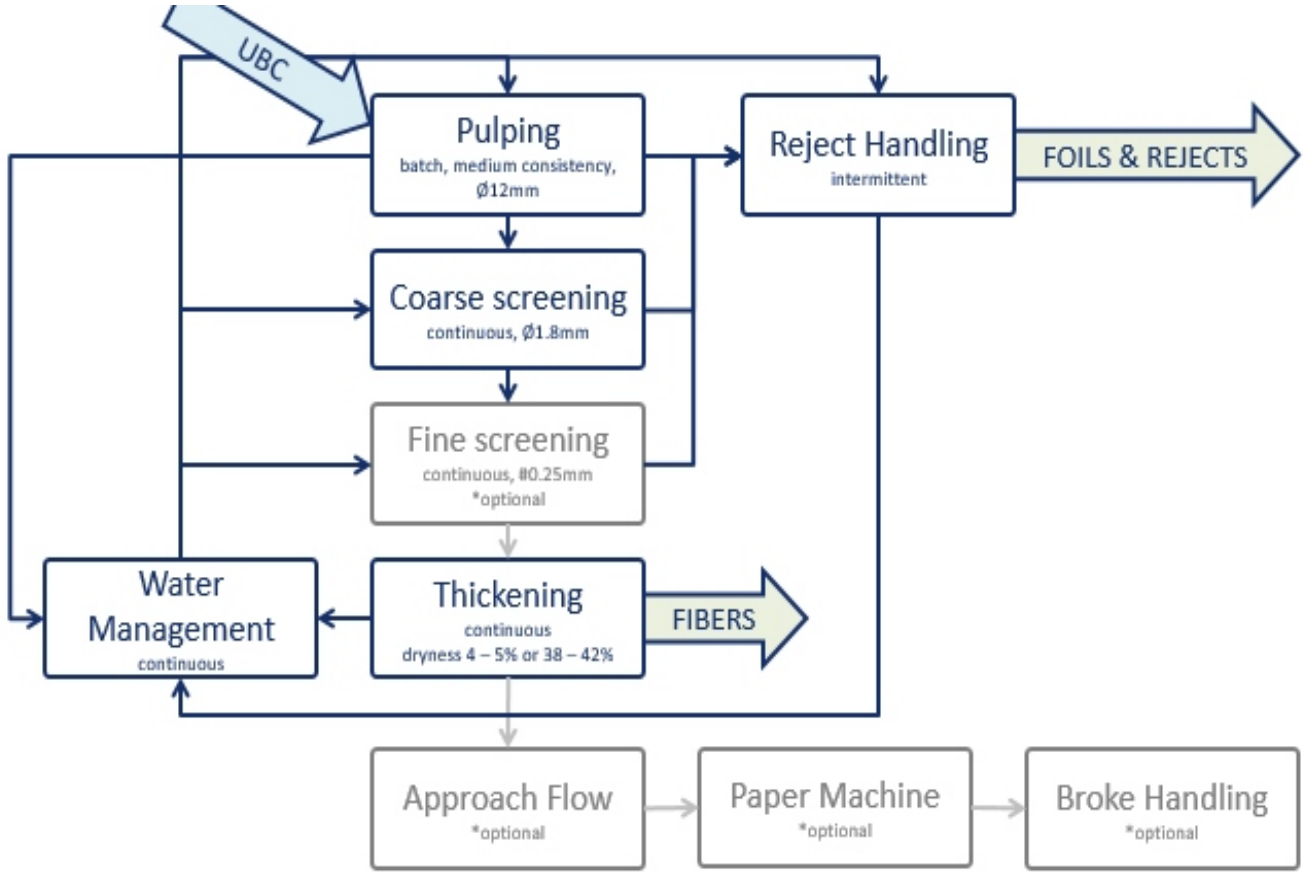

Fig. 7 Process Flow diagram

Operational line for Tetrapak processing 20 TPD

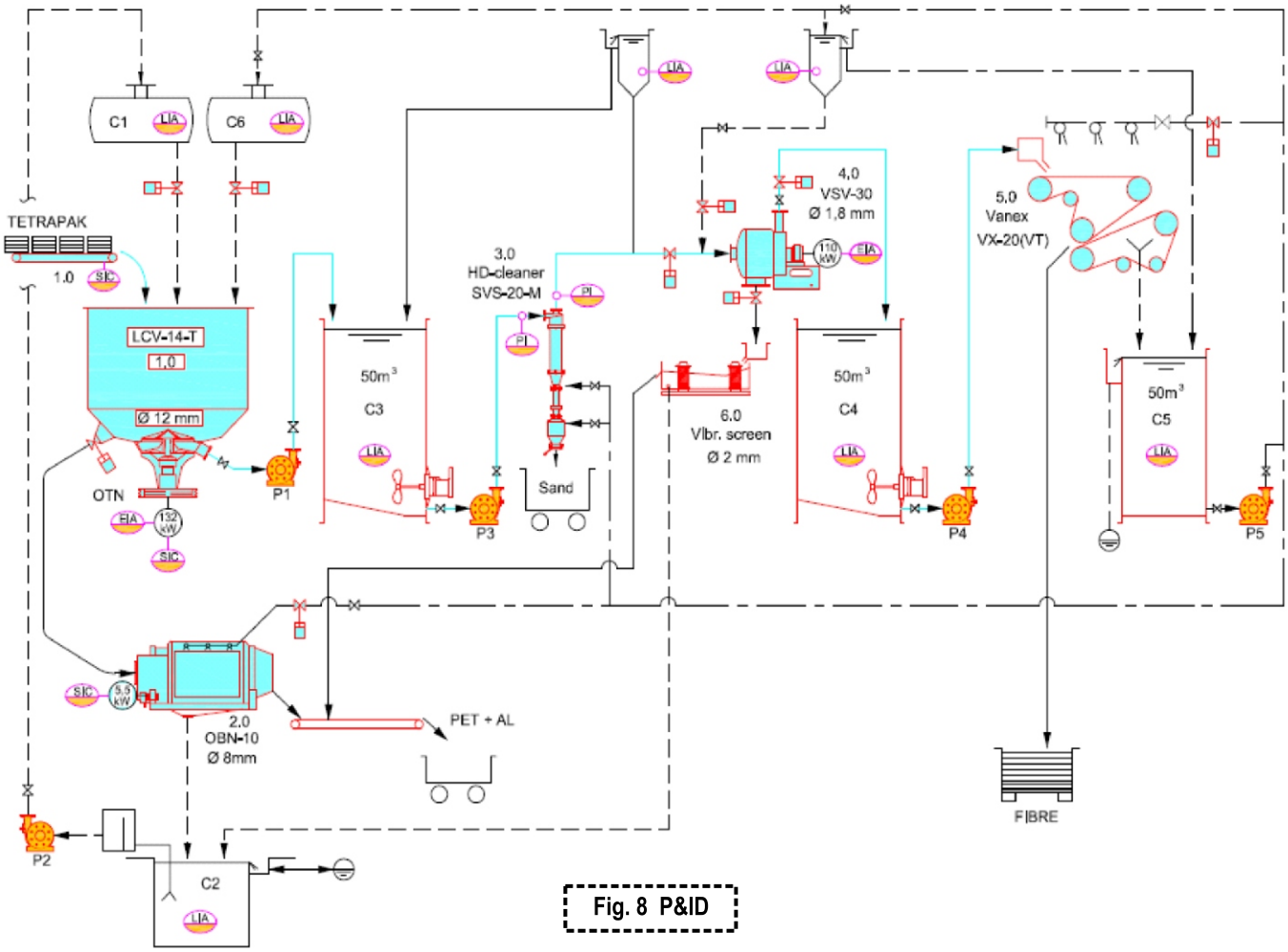

Fig. 8 P&ID

Figures 7 & 8 shows the technology involved and the operational P&ID of Used Beverage Cartons processing line.

Illustrated Figures 1-5 show different types of Beverage cartons. Figure 6 shows no. of layers in the Beverage Carton

Stock preparation Line

Beverage boxes usually contain approx. 70 % fibres and 30 % foils - depending on box type, polythene (PE) or polythene + aluminium (Al) is used. The ratio can be significantly different according to producers. Therefore the Stock Preparation Line performance is not defined in terms of foil and fibres production but in terms of an input furnish mass. Beverage cartonboards are pulpable only with difficulties and their processing is energywise expensive. The correct pulping function is crucial for the Stock Preparation Line capacity and its performance depends on board mechanical properties and on a furnish type. The most suitable for processing are boxes having size in between 10 cm and 30 cm which corresponds to the usual beverage boxes size. The unit separates fibre and foils in wet way in 3 technological stages.

Pulping Stage

During periodical pulping at high consistency (being more suitable for hard pulpable materials) fibres are separated from foils. The products in this stage are a washed foil mixture containing less than 1.5% b. d. fibres and fibre stock collected in a chest before a coarse screening stage. In this step more than 80% of foils are separated.

High density cleaning & coarse screening stage

In the high density cleaning stage, on a high-density cleaner, stock is made free from sand and specifically heavy particles.

In coarse screening, most of the remaining foils are removed. The foils are intermittently drained to a reject thickening unit.

Accept is collected in a chest before a fine screening stage.

Fine screening stage

Pressure screen (slotted screen) removes fine foils and non-pulped fractions. This reject is intermittently drained to a reject dewatering unit.

Reject volume usually is not high, beverage cartonboards do not contain kind of impurities usually in other sorts of processed raw materials.

Fine screening accept is thickened up to 35 – 40 % b.d. on a belt press with a palleting device.

Common Reject Thickening Unit

This unit is composed of dewatering elements to deal with rejects from each Stock preparation line stage with different type of screens. Dry matter of the foils leaving drum is 15 – 30 % & fibred rejects from the fine screening is 10 – 20 %. The fine screening rejects contain approx. 75 % fibre fraction. Nevertheless due to the low reject volume total fibre loss in the fine screening stage is less than 1.5 % of the total Stock Preparation Line performance.

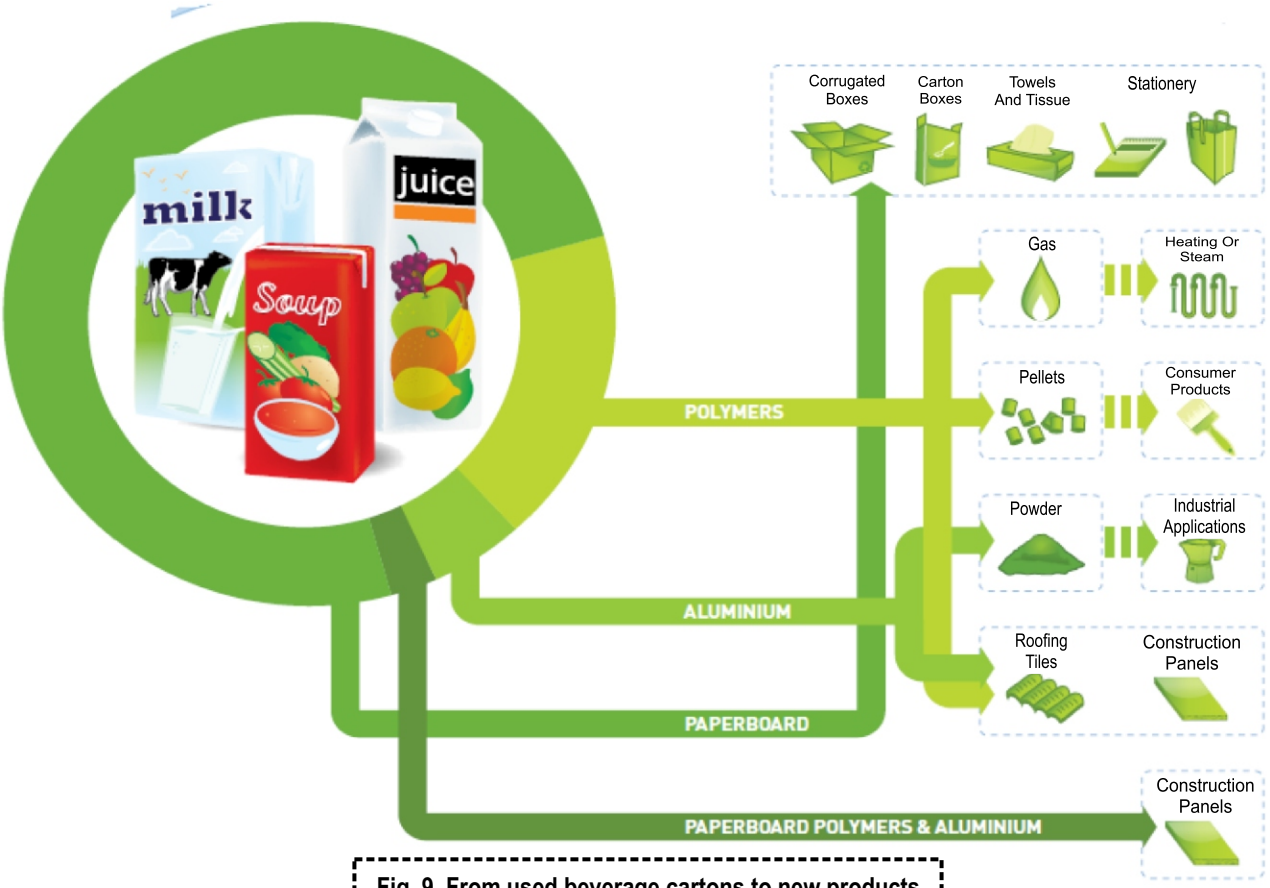

Fig. 9 From used beverage cartons to new products

Figure 9 illustrates the various derivatives from Used Beverage Cartons.

Fig. 10 Impact of Waste on Environment

Figure 10 illustrates the impact of UBC waste on Environment, if not collected and recycled.

Line for Tetrapak processing:

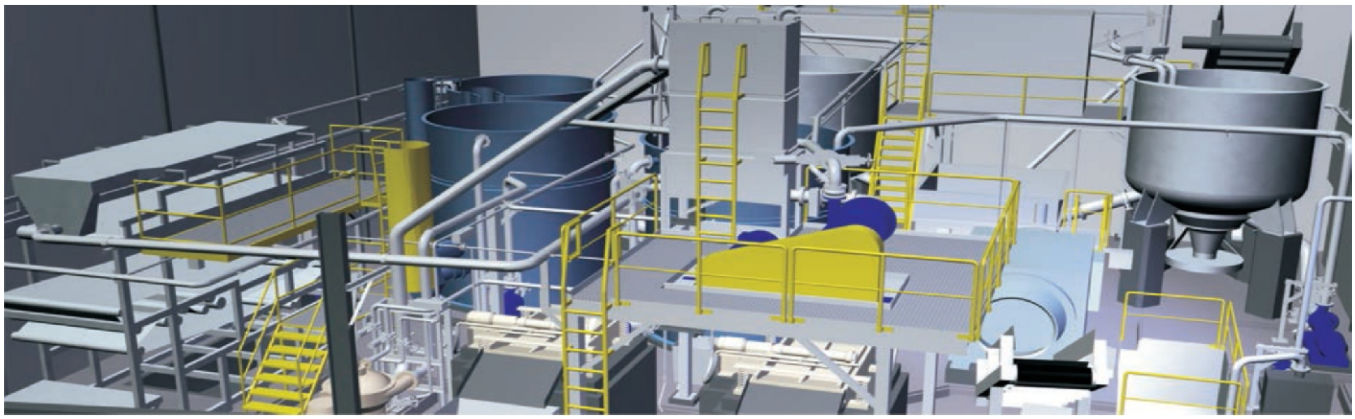

Fig. 11 3D model

Fig. 12 Feed Material Tetrapak

Fig. 13 Rejects from washing separator

Fig. 14 Foils from dewatering drum

Fig. 15 Final output material from Belt Press

Figure 11 shows a 3D model of a Used Beverage Carton Plant.

Figures 12-15 show different stages & byproducts in the Used Beverage Carton Processing Line

Utilities Consumptions

Description	Per Ton
Fresh water	4 – 5 m^3
Power	350 – 450 Units
Air 6 bar	30 – 40 m^3

Table 3 – Consumption

Table 3 shows the consumption of Fresh Water, Air & Power per ton of Final Pulp produced.

From Used Beverage Cartons To New Products

Conclusion

Recycling Used Beverage Cartons has following benefits:

- ✓ Enabling the efficient use of raw materials by extending their life into new products.
- ✓ Reducing greenhouse gas emissions.
- ✓ Diverting valuable materials from landfill.

Acknowledgement

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References

1. Internal Documentation from Technological Department of PAPCEL, a.s, Litovel Czech Republic.

2. From the Practical experience of UBC recycling line installation by PAPCEL, a.s, Litovel Czech Republic in Tetrapak-Serbia.