

# Improving the Efficiency of Transporting Clothes at Gentle Beau Dry Cleaners



Fig.1: Front Entrance of Gentle Beau Dry Cleaners, located on 891 Yonge St.

## Introduction

Gentle Beau Dry Cleaners provides eco-friendly dry cleaning services in the Downtown East neighbourhood of Toronto. The owner, Mr. Joe Kim, values quality, efficiency and creativity in his business. With more than 30 years of experience in the dry cleaning industry, Mr. Kim is a professional who has developed his own method of dry cleaning clothes using entirely water. This new technology reduces the amount of damage caused to clothes by harmful chemicals during the cleaning process, giving the clothes longer lives. To minimize the amount of physical labour, Mr. Kim has designed his workspace accordingly; for instance, his two shirt press machines are set up 90 degrees from each other so he can operate both machines just by rotating his upper body (see Appendix - Fig.3).

## Description

The inside of the shop can be divided into three main sections:

- Front Desk Reception Area - Located near the entrance of the building. This is where the employees of Gentle Beau Dry Cleaners receive and return the clothes that were dropped off for dry cleaning.

- **Clothes Sorting Area** - Located behind the Reception Area. This is where the employees print and attach tags, which contain customer info, onto the cleaned clothes. The clothes are then sorted by the tags alphabetically and are hung onto a motorized clothing carousel.
- **Clothes Processing Area** - Located in the back of the shop. This is where all the dry cleaning machinery are located and the dry cleaning (processing) happens.

## Opportunity

After a clothing article is dry cleaned in the Processing Area, it is hung on a hanger. The hanger is then hung on a ~15m metal bar that runs from the Processing Area to the Sorting Area (see Appendix - Fig. 2). Once 16 to 20 articles of clothing hang from the bar, they are manually pushed along the bar to the Sorting Area. This current method of transporting clothes is inefficient as frequent trips must be made between the two areas. Additionally, since there is a large volume of clothes and no method of separating the hangers, they often get pushed into the each other and create a big tangled mess, forcing the person pushing the batch of clothes to stop and untangle them. The hangers must also be oriented in a specific direction (see Appendix - Fig. 3) to avoid getting blocked by the metal hooks (see Appendix - Fig. 2) that support the metal bars.

The current method of transporting clothes is inconsistent with the direct stakeholders' requirements of an efficient design that increases productivity and reduces manual labour (see Stakeholders). Hence, there exists an opportunity at Gentle Beau Dry Cleaners to allow dry cleaned clothes to be transported from the Processing Area to the Sorting Area automatically.

## Stakeholders

### Direct

1. **Owner of Gentle Beau Dry Cleaners**, who wants an efficient design that will increase productivity and reduce manual labour.
2. **Employees at Gentle Beau Dry Cleaners**, who are responsible for the transportation of clothes between the Processing and Sorting Areas, and want to reduce the amount of trips they make.
3. **Customers of Gentle Beau Dry Cleaners**, who want to drop off and retrieve their dry cleaned clothes in the shortest time span possible.

### Indirect

4. **Other Dry Cleaning Stores**, who can benefit from a similar design to improve their own clothes transporting system.
5. **Neighbours of Gentle Beau Dry Cleaners**, who want a design that will cause minimal disturbance to their living environment.

# Objectives

## High-Level Objectives

1. Increase efficiency of transporting clothes. (S1, S2, S4)
2. Safe to use inside the shop. (S1, S2, S4)
3. Minimize potential side effects when transporting clothes (S1, S2, S3, S5)

## Detailed Objectives

1. Allow clothes to be transported automatically. (HL1)
2. Transport clothes with high speed (HL1)
3. Prevent wrinkles and dirt on clothes (HL3)
4. Minimal Noise (HL3)
5. Easy to use (HL2)

# Reference Designs



## 1. Motorized Clothing Carousel [1]

### Advantages

- Automatic and High Speed
- Saves Space

### Weaknesses

- Costly
- Difficult to install

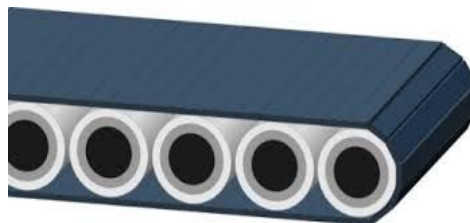
## 2. Conveyor Belt [2]

### Advantages

- Automatic and High Speed [3]

### Weaknesses

- Takes up too much space
- Costly
- Difficult to install
- May cause wrinkles and spread dirt on dry cleaned clothes





### 3. Twisted Metal Bar + Motor [3]

Mr. Kim tried to solve this problem by replacing the existing metal bars with twisted metal bars and attaching a motor to the bars at one end to rotate them. The hanger would be placed on one of the twisted indents of the bar and be slowly transported from the Processing Area to the Sorting Area. This solution was not implemented as neighbouring residences complained about the noise.

#### Advantages

- Ease of Installation
- Saves space

#### Weaknesses

- Noisy Motor
- Unaesthetic
- Transfers clothes slowly



### 4. Circle Hook Clothes Hanger [4]

#### Advantages

- Cost-Effective
- Ease of Installation
- Allows the hangers to be oriented in any direction

#### Weaknesses

- Hard to take off once installed

## Appendix - Description of Physical Space



Fig. 2: Two metal bars run from the processing area to the sorting area. The bars are supported by metal rods and metal hooks that extend from the ceiling. The hooks support the bar from the left side, which means all the clothes hangers must be hung from the right side.



Fig. 3: Example of which direction all hangers must be oriented in when pushed along the bars.

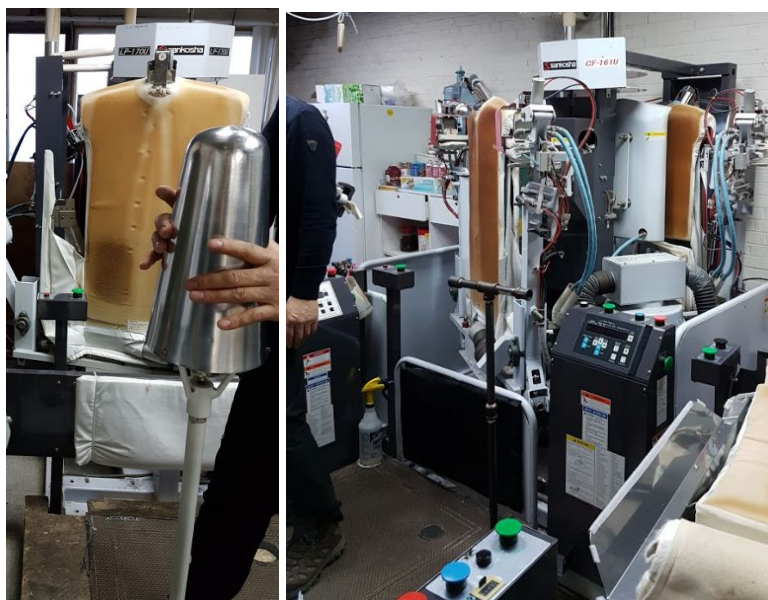


Fig. 4: Shirt Press Machine #1 (Left) and Shirt Press Machine #2 (Right), located 90 degrees from each other.



## References

[1] <https://ru.pinterest.com/pin/496733033875692368/>

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### ELECTRIC GARMENT STORE & RETRIEVAL CONVEYORS

*for Clothing, Garments and Uniforms*

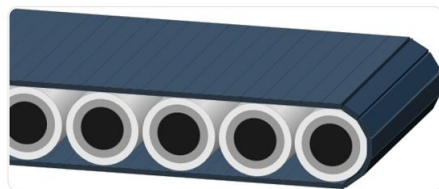
#### SYSTEM 722-922



The Systems 722-922 is an electric rack activated by remote controls, either hand or foot, or by a Railex "Robot-Matic" Selector. The position corresponding to the attendant within seconds.

A Railex has many advantages, First is speed. No longer do attendants have to run up and down aisles carrying garments and looking for numbers. One just presses a number and in a few seconds the garments are at the attendants position. Space is another factor. By actual measurements 33% of existing space is saved and becomes available for other purposes. Aisle space is eliminated.

[2] [http://all-free-download.com/free-vector/download/conveyor-belt-clip-art\\_23580.html](http://all-free-download.com/free-vector/download/conveyor-belt-clip-art_23580.html)



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[3] [http://spaceengineerswiki.com/Conveyor\\_Tube](http://spaceengineerswiki.com/Conveyor_Tube)

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The conveyor tube is a pipe that can transfer items from two opposite sides. It is similar to the [Conveyor](#) but slightly stronger and only has 2 ports. For curves, the player must use [Conveyors](#) or [Curved Conveyor Tubes](#). For a full explanation on conveyors, see [Conveyor Network](#).

Another interesting feature of the conveyor tube is that it also has indicator lights on it that inform the player of its status. Currently, there are only two states that it can be in:

[4] Conveyor belt: <https://www.britannica.com/technology/conveyor#ref195002>

**Conveyor**, any of various devices that provide mechanized movement of material, as in a factory; they are used principally in industrial applications but also on large farms, in warehousing and freight-handling, and in movement of raw materials. Conveyors may be only a few inches in length, or they may be integrated systems several miles long.

[Belt conveyors](#) of fabric, rubber, plastic, leather, or metal are driven by a power-operated roll mounted underneath or at one end of the conveyor. The belt forms a continuous loop and is supported either on rollers, for heavy loads, or on a metal slider pan when the load is light enough to prevent frictional drag on the belt. Electric motors operating through constant- or variable-speed reduction gears usually provide the power.