Design Intent for the Essentials of Basic machine Design Course

Design intent can be thought of as the starting place of any successful design or project. It is used as a tool to prioritize what's important and reflect the values of an organization or person. The conversation about design intent may be thought of as a preliminary design meeting, but the goals are the same. It usually takes place between the engineer or engineering manager and owner of a company and may involve customers.

1. The practicality of the design is usually at or near the top of the list.

2. The **purpose** of our machine is to flip x number of boxes per minute by 90° (from flat to standing which is harder than the opposite).
This is the most important function of the machine so everything is designed around this goal.

3. A few other priorities or (intentions of the design) are as follows;
- sustainably designed, cost effective for company & customer,
- labor efficient and
- look beautiful.

Sustainably designed means using materials that will last a very long time and not require the use of more materials. To meet this goal, we designed the machine out of 304 stainless steel and 416 stainless steel. It is more expensive initially but also has a less expensive life cycle than the same machine designed out of different grades of steel.

4. The materials chosen help to meet 2 of the (intentions of design).

5. The machine is also designed for manufacturing (DFM) and designed for assembly (DFM). This means it was designed so that building it would be as simple as possible for the workers. This means making it out of parts that can be easily handled, placed and fit together intuitively. This reduces cost for the entire operation and for the end user.

6. Finally, the drawings were designed to facilitate efficient flow of information through the company. The title blocks have certain bits of information such as the stock size the parts are cut from, the material, the part number, etc so that they can be ordered/inventoried and staged at the proper time while informing the proper team member. This is an example of how Solidworks can make an entire organization more efficient by intelligently facilitating the flow of information.

Application of design intent to Basic machine design

In our case, the most important item on the list of design intent is the motion of the boxes. This is a very practical and objective goal, not all design intent is this concrete but we're fortunate in our case; the objectives of the project are clear.

The goal is to flip x number of boxes per minute 90° (from flat to standing).
Great designers always solve the biggest challenge first.

Taking into account the design intentions of **keeping costs down and sustainability**, the most intelligent way of designing this is with the least number of moving parts (including motors and actuators) possible. The concept of a waterwheel comes to mind… this requires an "incoming" flow. It capitalizes on difference of elevations and if the upper conveyor is first, it could be designed so that it doesn't need any extra sources of power. The device can be passive and rely on the energy of the active conveyor and friction and building backpressure from boxes pushing from behind. It can be designed to accept exactly 1 box and rotate the box 90° and so that it drops onto another conveyor. The lower conveyor must be powered because unlike water, the boxes won't freely flow away. To further meet our goals, we decided to allow the upper conveyor to be driven off of the (back-work) or excess power of the lower conveyor.

Now that we have the basic concept, we must think about how the boxes will be moved.

The conveyors move them, but they need to be powered and we will use motors. The motors, conveyor and box size will all determine how the conveyor side walls will be designed. The last element is the positioning of the conveyors relative to each other. This is derived from the star wheel and its dimensions.

This design intent is very clear and starts with the most important thing; the box. It moves to the less important elements.