Product Teardown

A product teardown process is a formal approach to learning about and modeling the functional behavior and physical components of a product.

### Purpose

**Dissection and analysis during product evolution**

Evaluate the current status of a product. Understand the current technology, functions, and components. Identify strengths, weaknesses, and opportunities for new products.

**Competitive benchmarking**

Establish a baseline in terms of understanding and representation of the competition. The baseline provides a comparison for new conceptual designs.

**Gain experience and knowledge**

Grow engineering knowledge from which to draw in new concept development. Provide the basis for transferring solutions to analogous problems.

### Teardown Process

1. **List the design issues**

Identify the purpose of the teardown. Determine what models should result from this exercise. Create a data sheet in which all information can be captured. Possible information includes:

- component names
- weight
- material
- dimensions
- finish
- manufacturing process
- tolerances
- functions
- cost
- notes

2. **Prepare for teardown**

Gather tools needed for collecting the desired information (identified in step 1) and documenting the teardown process such as metrology tools or scales. A digital camera and ruler is capable of capturing geometry quickly when only rough dimensions are needed.
3. Examine the distribution and installation
How is the product packaged? What is involved in installation? Both are important factors in product development process. Examine installation and operation documentation and packaging for cost effectiveness and liability.

4. Disassemble, measure, analyze data, and model by assemblies
Analyze and measure the complete product first. Coordinate disassembly with measurement, experimentation, and modeling. Take apart assembly (be clear about what non-destructive disassembly is acceptable and needed). Take pictures of each component, major assembly, and photograph the product in an exploded view. Take measurements to complete data sheet. Be sure that all data models and pictures are referenced in the data sheet.

5. Create system models
*Product assembly and geometric model*
When photos do not provide sufficient detail, geometric models can be created as part of the teardown learning exercise.

*Force flow diagrams*
Track the movement of forces through a product. Used to expose opportunities for component combinations, highlights opportunities to improve product. See the resource on force flow diagrams.

*Functional models*
Capture the behavior of of a product by focusing on what it does not how it does it (which is the role of geometry). Functional models demonstrate the product’s transformation and transference of materials, information, and energy from an input state into the desired functions. See the resource on generating functional models with the subtract and operate procedure.
Product Teardown

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Product Before Teardown
Product with Ruler
Heating Element Up Close
Trigger Assembly

- Glue Guide
- Glue Lock
- Connecting Rod
- Trigger
Product Functional Model

Hand Energy

Plug In Cord

Hand Induces Translational Force

Input Electrical Energy to Device

Translational Force Converted to Rotational Force

Convert Electrical Energy to Thermal Energy

Guide & Melt Glue

Guide & Export Glue From Device

Tactile Feel Heat

Heat

Correctly Placed Melted Glue

Electrical Energy

Glue Stick

Insert Glue Stick

Guide Glue Stick

Secure Glue Stick

Translate Glue

Aim
Product Teardown (Part I)

- **Product Teardown 28 pieces**
- Plastic packaging: protect and display product for purchase.
- (4) Exterior screws: hold case halves together.
- (1) Right case half: acts as part of a handle and contains the rest of the parts.
- (1) Left case half: acts as part of a handle and contains the rest of the parts.
- (1) Short flat spring: provides resistance for trigger?
- (1) Long skinny spring: provides a returning force for the trigger.
- (1) Trigger assembly:
  - (1) Trigger: acts a activation of glue gun operation.
  - (1) Linkage arm: connects trigger to rest of trigger assembly.
  - (1) Glue clamp: clamps glue stick to be fed into heating element.
  - (1) Clamp shaft: connects clamp to rest of trigger assembly.
  - (1) Glue guide: guides glue into heating element.
Product Teardown (Part II)

- **(1) Heating element assembly:**
  - (1) AC cord: transfers electrical energy from wall outlet to heating element. Cord is wrapped with 1 white wire tie as part of packaging for sale.
  - (2) Heat shrink sleeves: cover and protect connection from AC cord to smaller wires.
  - (2) Small wires: transfers electrical energy from AC cord to heating pads.
  - (2) Heating pads: convert electrical power to heat.
  - (1) Rectangular block: heating element core.
  - (1) Heating element shroud: contains heating pads and rectangular block and acts a barrier between heating pads and casing.

- **(1) Rubber guide:** guides glue into part # 5 casing.

- **(1) Clamp:** clamps rubber guide to part # 5 casing

- **(1) Metal part # 5 casing:**
  - (1) Check ball valve in tip: stops glue from flowing when no pressure is on trigger.
  - (1) Valve backing plate: holds check ball valve in place.
  - (1) Check ball valve spring: returns check ball valve to closed position.