



Development of Gearboxes for Conveyors in Poultry Processing Facilities by Technicon

November 6, 2018

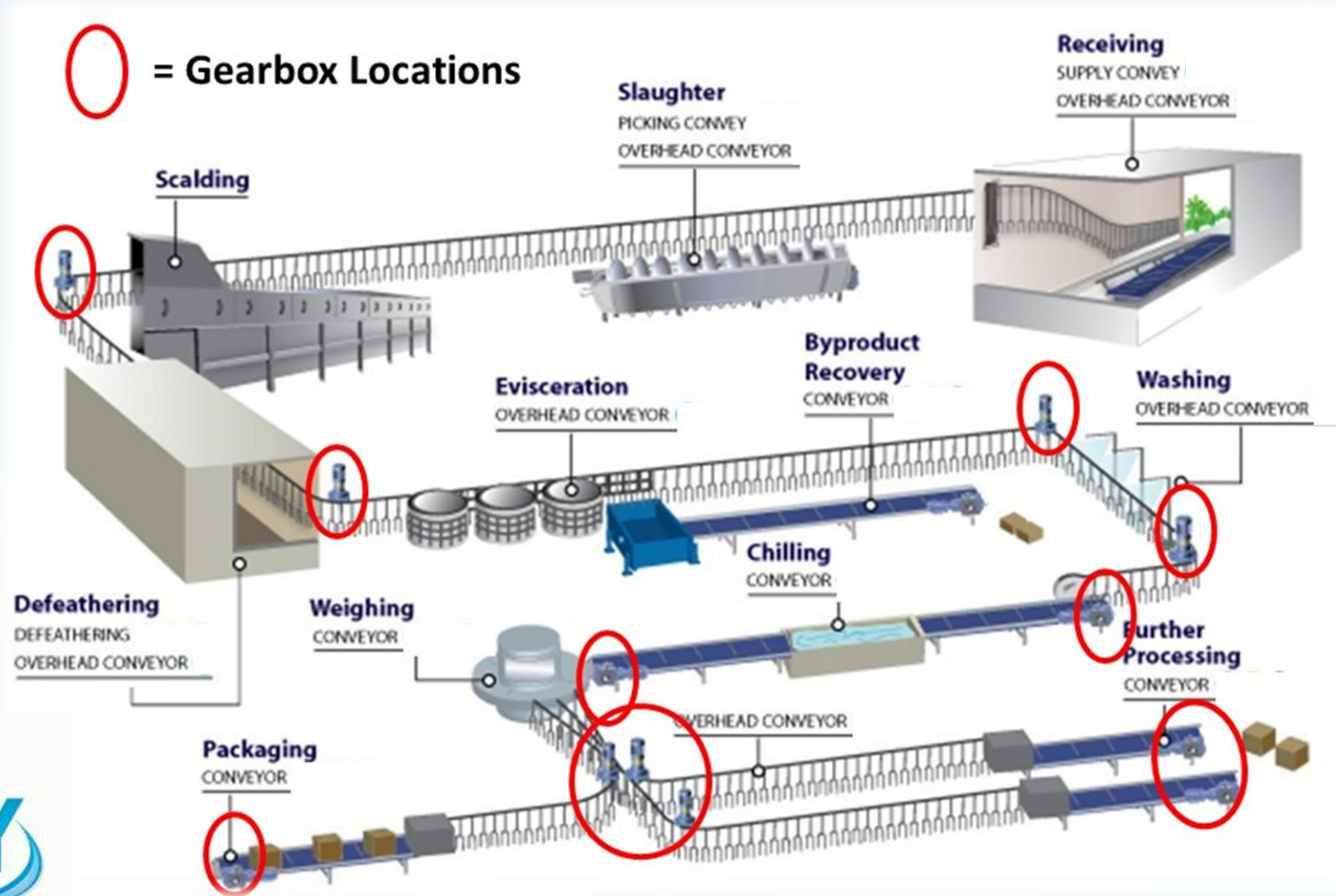


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Poultry Processing Facilities Have Many Gearboxes Driving Conveyors

- If you see poultry moving with a conveyor, there is likely a gearbox nearby.



Background on Gearboxes

- A gearbox is a mechanical device that transfers power from one device (an electric motor) to another (a conveyor) and is used to increase torque while reducing speed.
- Gearboxes are also called “Speed Reducers” or “Reducers”.

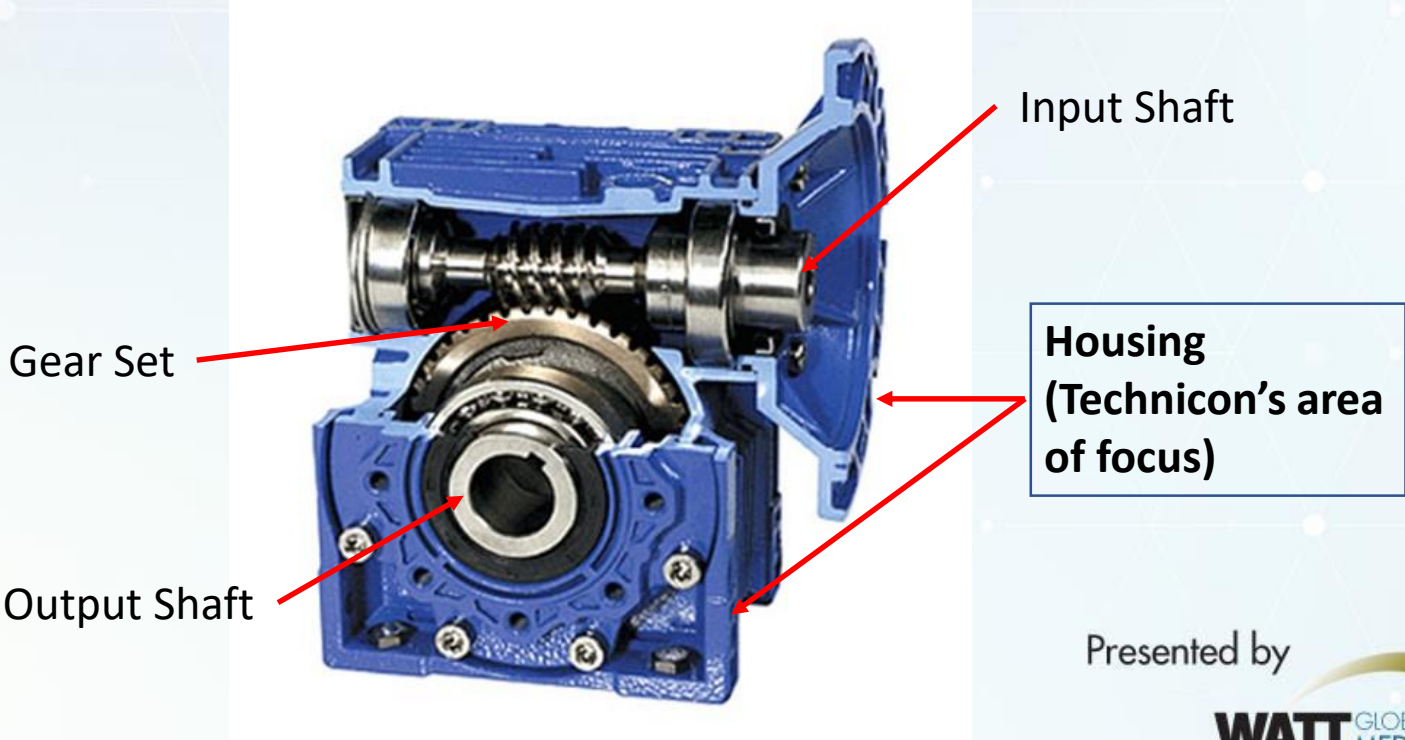
Gearbox with Motor



Gearbox

Motor

Gearbox Components



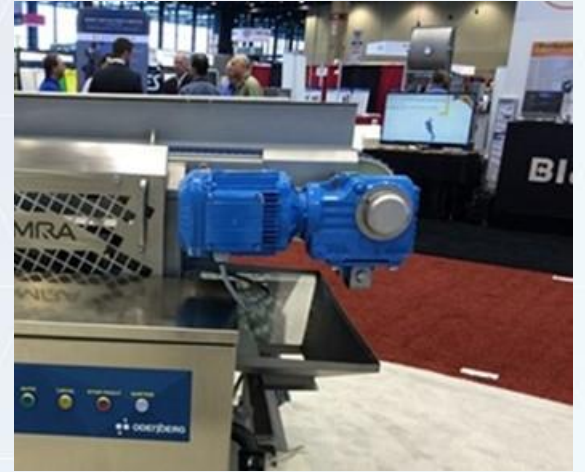
Why is the Gearbox Housing Important?

- Government regulations from organizations like the USDA have required poultry processing facilities to increase the effectiveness of their sanitation efforts.
- This has resulted in more aggressive washdown processes.
- These processes continue to present challenging environments for gearboxes in poultry processing facilities.
- **Current housing options leave opportunity for improvement.**
 1. **Painted cast iron housings**
 2. **Cast stainless steel housings**



Challenges with Painted Cast Iron Housings

- Cast iron housings are painted to prevent corrosion.
- High pressure washdown process with high-temperature, caustic solutions often damage the paint.
- The paint then chips leaving open cast iron surfaces to eventually rust.
- The paint chips have the potential to enter the food stream, and the rusted areas present locations for bacteria to grow.



Challenges with Cast Stainless Steel Housings

- Cast stainless steel housings are primarily chosen due to corrosion resistance.
- From published academic research:
 - Microorganisms can remain in a viable state on stainless steel equipment surfaces even with cleaning and sanitation processes consistent with good manufacturing practices.*
- Gearboxes with cast stainless steel housings are priced at a significant premium compared to gearboxes with painted cast iron housings.



Technicon's Innovation: Composite Housing

No More Rust

- Engineered composite housing material is 100% corrosion-resistant and eliminates the possibilities of rust on the housing.

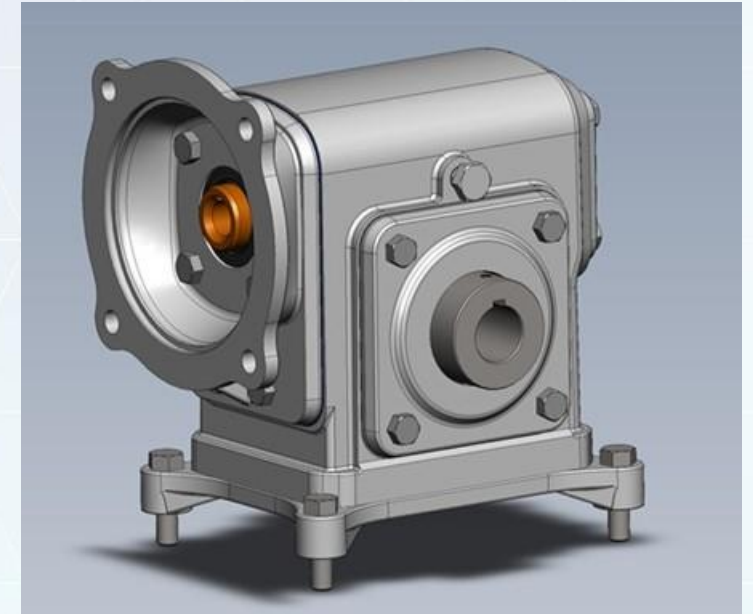
Inhibits Growth of Bacteria

- Composite housing is blended with an antimicrobial material and does not exhibit odor or staining in harsh environments.
- Antimicrobial properties exist throughout the composite housing, so any type of scratch will not decrease the proprieties.

High Pressure Washdowns are Quick, Easy, and Effective

- Washdowns are quick and easy with rounded geometry where all liquids flow down the sides; composite housing material is smooth and non-absorbent.
- The design includes side plates that prevent the high pressure washdown solution from directly impacting the seals around the output shaft.
- Composite material is chemically compatible with a wide range of washdown cleaning solutions.

Gearbox with Composite Housing



Challenges and Requirements with a Composite Housing

Challenges

1. The gearbox needs to firmly hold the gears in place

- If the gears are not held in place, the gear mesh will shift, and the gears will generate excess heat.

2. Composites are insulators

- If the gears generate excess heat, the composite housing may have difficulty dissipating the heat.
- This will result in rising gear and oil temperatures which will reduce the ability of the oil in the gearbox to effectively lubricate the gears.
- This will result in even more heat being generated, and at some point, the gears will fail.

3. Composite material must be able to withstand the washdown processes.

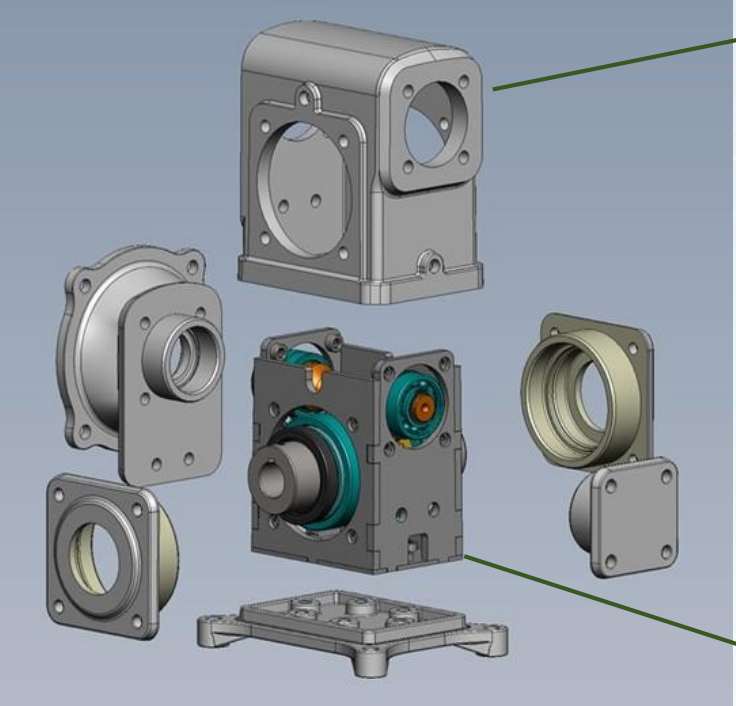
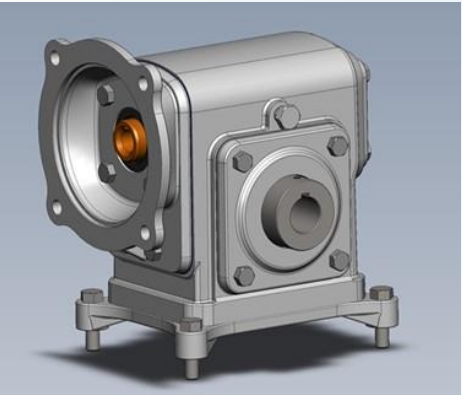
Solution Requirements

The gearbox must:

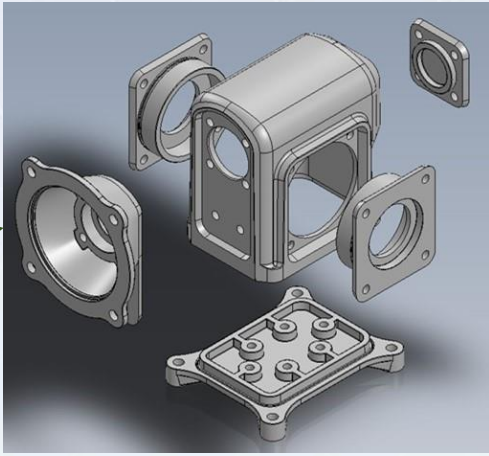
- Have the required strength and rigidity to keep the gears in place.
- Dissipate the heat generated in the gearbox.
- Be compatible with the chemicals used in washdown solutions.

Strength and Rigidity Requirements are Met With a Patented Housing Design

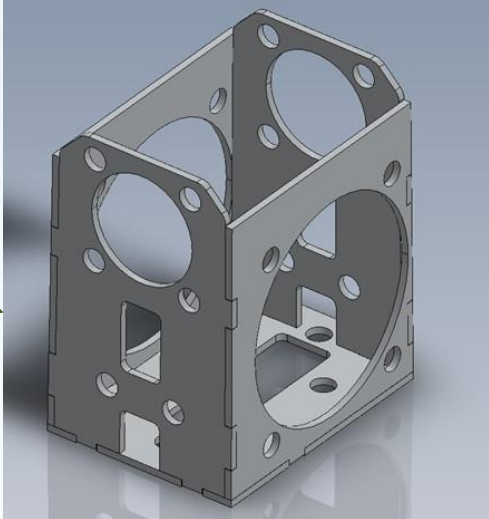
Gearbox with Composite Housing



1. Composite Housing



2. Steel Endoskeleton



US09551412B1

(12) **United States Patent** (10) **Patent No.:** **US 9,551,412 B1**
 (45) **Date of Patent:** **Jan. 24, 2017**

(54) **GEARBOXES AND RELATED ASSEMBLIES** 2010/0803793 A1* 4/2010 Ko F16H 25/20
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 2010/030142 A1* 12/2010 Falk A61N 43/30
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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No. **14/026,428** CN 2766626 6/2005
 (22) Filed: **Aug. 14, 2015** CN 20787006 4/2011
 CN 202902052 6/2013
 CN 203390673 11/2013
 CN 104110484 10/2014
 DE 102012008895 11/2012
 EP 1453182 9/2004

(51) Int. Cl. (2012.01)
 F16H 57/02 (2012.01)
 F16H 57/02 (2012.01)
 F16H 57/025 (2012.01)

(52) U.S. Cl. (2013.01); **F16H 57/025** (2013.01); **F16H 57/025** (2013.01); **F16H 2057/0225** (2003.01)

(58) **Field of Classification Search** CPC: F16H 2057/025; F16H 57/032; F16H 57/025
 See application file for complete search history.

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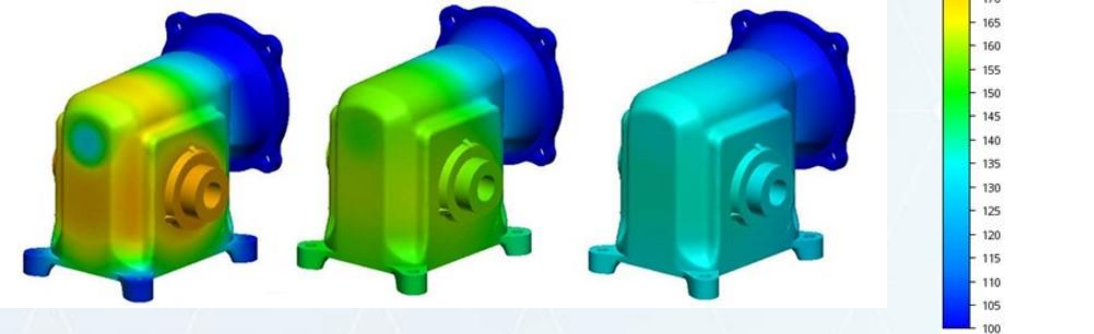
ABSTRACT
 A gearbox housing assembly includes a base plate, a metal inner gearbox housing coupled to the base plate and a polymer outer gearbox housing on the base plate and surrounding the inner housing.

11 Claims, 13 Drawing Sheets

Composite Material Selection Driven by Thermal Conductivity, Strength, and Chemical Compatibility

Thermal Conductivity

- Thermal conductivity was modeled to confirm the chosen composite material and gearbox design will dissipate the heat.



Strength and Chemical Compatibility

- Strength of composite material was tested before and after chemical exposure (at room and elevated temperature) to confirm performance.
- Component testing was conducted to confirm material performance in the designed form.

Chemical Testing

Control Exposed



Exposure to Bevro-Sheen and Vortexx was tested

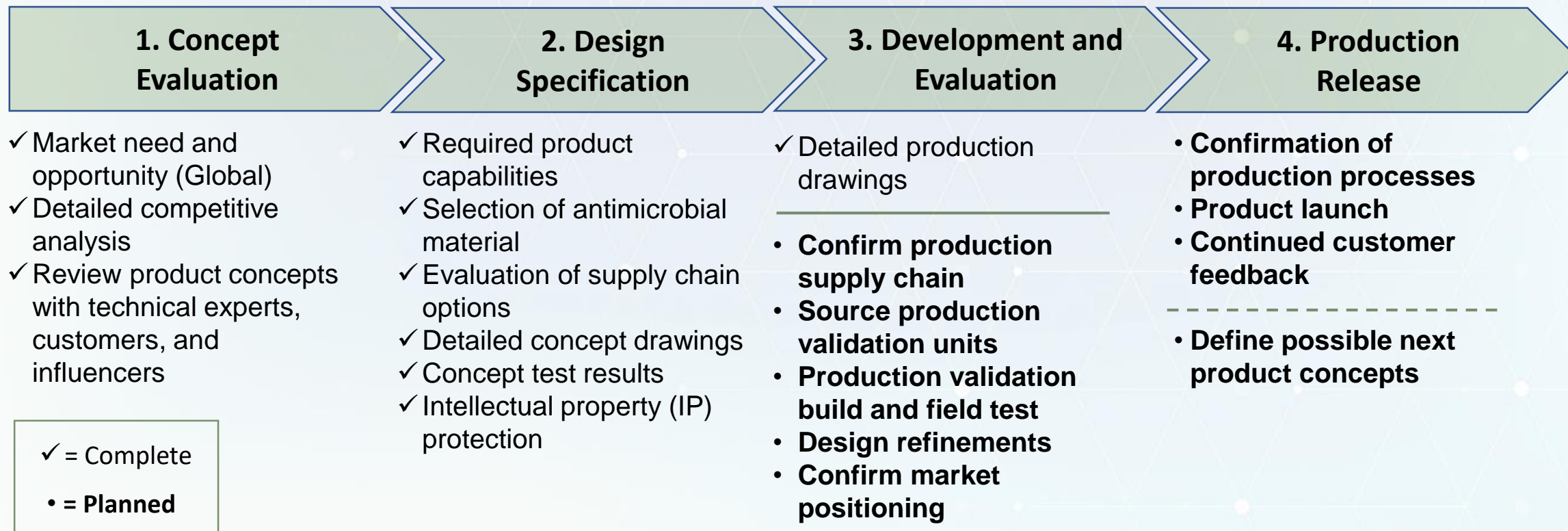
Component Testing



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Summary of Progress and Next Steps



Timeframe:

- Completion of Phase 3 within the next year
- Phase 4 will depend on the breadth of product mix; launch of gearbox size will likely be done in phases

Capital and expense: Requirements depend on product mix

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