🔑 Why Multiple Grades Exist in Thermoforming

1. Processing Behavior

- **Melt Flow Index (MFI):**
  - **Low MFI grades** → higher viscosity, better sheet stability during heating and forming, ideal for large trays or industrial packaging.
  - **High MFI grades** → easier flow, faster cycle times, suited for thin-walled or complex thermoformed parts.
- Thermoforming requires **uniform sheet extrusion and controlled sag resistance**, so different grades ensure stability across part sizes.

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2. Mechanical Property Requirements

- **Homopolymer PP (HOMO):**
  - Provides **high stiffness, rigidity, and heat resistance**.
  - Multiple grades allow tuning between productivity and mechanical strength.
  - Common in rigid food packaging, industrial trays, and technical thermoformed parts.
- **Random Copolymer PP (RACO):**
  - Offers **clarity, gloss, and flexibility**.
  - Different grades balance transparency with mechanical performance.
  - Used in clear cups, lids, and medical packaging where aesthetics and visibility are critical.
- **Heterophasic Copolymer PP (HECO):**
  - Provides **impact resistance and toughness**, especially at low temperatures.
  - Multiple grades balance toughness with stiffness depending on whether the thermoformed part must resist drops, stacking, or cold-chain logistics.
  - Common in heavy-duty packaging, automotive liners, and industrial containers.

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3. Application Diversity

- **Food packaging (cups, trays, lids):**
  - Needs clarity and heat resistance → random copolymer or homopolymer grades.
- **Industrial packaging (crates, pallets, containers):**
  - Requires toughness and drop resistance → heterophasic copolymer grades.
- **Automotive thermoformed parts (liners, panels):**

    - Need impact resistance and durability → heterophasic copolymer grades.
- **Medical packaging (blister packs, trays):**
    - Requires transparency and chemical resistance → random copolymer grades.

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4. Additive & Performance Packages

- Grades differ in **stabilization packages** (UV resistance, antistatic, slip agents) depending on whether the thermoformed part is for outdoor use, food contact, or medical applications.
- Some grades are optimized for **pigment dispersion** or **recycling compatibility**, which is increasingly important in thermoformed packaging.

⚖️ Summary

- **Homopolymer PP grades** → chosen for **rigidity, heat resistance, and dimensional stability**.
- **Random copolymer PP grades** → chosen for **clarity, gloss, and consumer-facing packaging**.
- **Heterophasic copolymer PP grades** → chosen for **impact strength, toughness, and durability**.
- Multiple grades exist because thermoforming applications range from **clear food cups** to **industrial crates**, each requiring a different balance of **flowability, stiffness, toughness, and optical properties**.

👉 I can also prepare a **comparison chart of Braskem's thermoforming PP grades** (melt flow, impact strength, clarity, and typical applications) so you can see how each one is positioned in the portfolio. Would you like me to build that chart?