



HackMTY 2025 – Pick & Pack of the Future
Pillar: *Smart Execution*

Alcohol Bottle Handling

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gategroup

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Alcohol Bottle Handling

1. Understanding the Context

In airline catering, alcohol handling is one of the most delicate and judgment-based processes that employees perform every day. After each flight returns, trolleys and drawers containing bottles of wine, champagne, or spirits are received back into the catering unit for inspection, replenishment, and repacking. Each bottle must be evaluated carefully before being placed again on a new flight. This evaluation depends on multiple factors, including the type of alcohol, brand, bottle size, fill level, cleanliness, and seal condition, as well as the airline's specific service-level agreements (SLAs) that define how these bottles should be managed.

Unlike miniature bottles, which are typically discarded or replaced after each service, regular bottles used in premium cabins or bar setups often continue their journey across several flights. A single bottle of wine, for example, may be opened during one flight and returned partially used. The next steps depend entirely on the airline's defined policy. Some airlines allow opened bottles to be reloaded if they are properly sealed, clean, and above a certain fill level. Others require complete replacement or refilling before reuse. These rules are documented in detailed customer specifications, but in daily operations, the application of those rules relies mostly on the employee's own judgment and experience.

Every day, staff members in the packing or replenishment area handle hundreds of bottles coming from inbound trolleys. They must quickly decide what to do with each one: keep it as is, replace it, refill it, or discard it. To make this decision, they visually assess the bottle's condition, interpret the relevant SLA, and cross-check whether it matches the airline's product presentation standards. They must also consider flight destination and local regulations, since some countries prohibit reloading opened bottles on board. All of this happens under high time pressure, often within narrow turnaround windows between aircraft arrivals and the preparation of new departures.

This process is highly dependent on individual interpretation, experience, and memory. Two employees may reach different conclusions about the same bottle depending on how they perceive its cleanliness, seal condition, or fill level. Even small inconsistencies can lead to customer dissatisfaction, product waste, or unnecessary replacements. In many cases, employees must refer to printed SLA sheets, manuals, or color-coded guides to verify what each airline allows, losing valuable time and interrupting their workflow. Supervisors must then double-check random samples to ensure the rules have been correctly applied.

Airline catering operates with high volumes and strict standards, and this decision-making process directly affects both cost and customer experience. Each incorrect judgment, either too strict or too lenient, has financial and compliance implications. Overly cautious employees may discard bottles that could have been reused safely, increasing waste and expense. On the other hand, failing to replace a bottle that does not meet presentation or hygiene standards may result in a service complaint or quality audit finding. Balancing these decisions manually is complex, repetitive, and mentally demanding, making this one of the most error-prone steps in the entire beverage management cycle.

In essence, alcohol bottle handling in catering is not only about physical logistics or traceability but about guided decision-making. Employees need support to ensure that every decision they take, whether to keep, refill, or replace a bottle, is aligned with the airline's rules, hygiene standards, and operational efficiency goals. A digital solution capable of automatically interpreting SLA requirements and providing live visual cues could transform this process, making it faster, more consistent, and more reliable across catering units worldwide.

2. The Current Challenge

When alcohol bottles return from flights, employees in the packing or replenishment area face a demanding and repetitive task. Each bottle must be evaluated one by one to decide the correct action according to the airline's service-level agreements (SLAs) and product standards. The employee must quickly determine whether the bottle should remain in use, be refilled, replaced, or discarded. This decision depends on several factors such as the type of alcohol, brand, label appearance, cleanliness of the bottle, condition of the seal or cap, and the remaining fill level. Applying these criteria correctly requires a deep understanding of each customer's expectations and compliance rules, but in practice this judgment is still performed entirely manually.

Each airline defines its own specifications for handling opened or partially used bottles. Some allow resealing and reloading of bottles that are still above a certain fill percentage and meet hygiene requirements, while others demand that all open bottles be removed and replaced before the next flight. Certain destinations prohibit the use of opened bottles altogether, while others allow reuse only for specific products such as wine or liqueurs. These differences make the process highly complex. Employees must remember and apply dozens of customer-specific conditions during every shift, often under intense time pressure as multiple flights are being prepared simultaneously.

The current system depends heavily on individual knowledge and interpretation. Employees rely on visual inspection and personal experience to decide what meets the required standards. For example, one person may consider a bottle with a slightly damaged label acceptable, while another may discard it immediately. Similarly, an

employee may overestimate or underestimate the remaining fill level, leading to inconsistent decisions. Supervisors often have to intervene or perform spot checks to ensure compliance, which consumes valuable time and still does not guarantee uniform results across all shifts and teams.

This manual judgment process creates several operational challenges. It increases the risk of human error, inconsistency, and inefficiency. Bottles that could still be reused are often discarded unnecessarily, leading to higher product costs and waste. On the other hand, bottles that do not meet customer standards or hygiene expectations may accidentally be reloaded, resulting in service complaints or brand image issues. Because employees handle hundreds of bottles per day, the repetition and cognitive load also lead to fatigue and reduced attention over time, further raising the likelihood of mistakes.

Documentation and verification add another layer of complexity. Employees may need to record the number of replaced, refilled, or discarded bottles manually or through barcode scans. If this step is skipped or performed incorrectly, the reported data no longer reflects the actual condition of the stock. This misalignment not only affects financial accuracy but can also lead to compliance risks if discrepancies are identified during audits or customer reviews. Despite the importance of this process, there is currently no automated tool that can guide employees step by step, interpret SLA rules in real time, and provide clear visual instructions on what action to take for each bottle.

The lack of automation means that employees must constantly switch between visual inspection, rule interpretation, and manual record-keeping. This slows down the process, introduces variability, and increases costs. What is missing is a smart assistant or system capable of analyzing bottle characteristics instantly, cross-checking them against the applicable SLA, and showing the employee a simple visual cue such as keep, refill, or replace without requiring manual interpretation. Introducing this level of decision support would reduce errors, ensure consistent application of rules, and make alcohol handling more efficient, reliable, and transparent across the entire operation.

3. Your Mission

Your challenge is to design a solution that supports catering employees in making fast, accurate, and consistent decisions when handling alcohol bottles that return from flights. The goal is to eliminate the need for subjective judgment and manual interpretation of customer rules by creating a system that automatically analyzes bottle conditions and provides clear, real-time guidance based on the airline's service-level agreements (SLAs) and product standards.

Imagine a tool that assists employees directly at the packing or replenishment station. As bottles are placed on the table or scanned, the system instantly evaluates their

condition and compares it with the applicable SLA for that airline and destination. It could recognize whether a bottle is open or sealed, estimate the fill level, detect label or seal damage, and determine cleanliness through visual sensors or employee input. Based on this information, it would display a simple visual instruction such as “Keep,” “Refill,” “Replace,” or “Discard,” ensuring that the correct action is taken immediately and consistently.

Your concept can integrate different technologies or process improvements. You might envision a digital assistant using computer vision or smart cameras to assess fill levels and label condition. You could design a handheld or tablet-based app that allows employees to confirm or override automated suggestions, while logging each decision for traceability. Another option could be a workstation equipped with sensors that recognize bottle types and match them with predefined criteria stored in a central SLA database. The goal is to make the decision process instant, guided, and fully aligned with customer requirements.

In addition to guiding decisions, your solution should help reduce cognitive load, training time, and variability between employees. A new worker should be able to achieve the same level of accuracy as an experienced one, simply by following the system’s visual cues. The tool should also make supervisors’ jobs easier by providing transparent, real-time data on decisions taken, exceptions raised, and overall bottle handling performance. Ideally, it would integrate with existing catering systems to record usage patterns, replenishment trends, and waste levels automatically.

In scope:

- Automating bottle evaluation based on SLA rules, product type, and physical condition
- Providing clear visual cues or digital instructions to employees in real time
- Using sensors, cameras, or manual inputs to determine bottle fill level, seal integrity, and cleanliness
- Recording each action automatically for traceability and quality monitoring
- Enabling adaptability for multiple airline SLAs, product categories, and destination requirements

Out of scope:

- Changing airline SLAs, service concepts, or product specifications
- Modifying customs regulations or bonded stock control procedures

Your mission is not to design a complex enterprise system, but to create a practical and intelligent concept that improves the decision-making process for employees in a fast-paced catering environment. The emphasis is on usability, clarity, and consistency. A great solution will combine automation with intuitive design, helping employees act confidently while ensuring full compliance with each airline's service and quality standards.

4. Inspiration and Example Ideas

There are many possible ways to approach this challenge. The best ideas will combine technology, process understanding, and usability to support employees in making faster and more accurate decisions while handling alcohol bottles. The objective is to reduce dependence on individual judgment and to ensure that every action taken at the packing or replenishment station follows the correct customer rules and hygiene standards. Below are several ideas that can serve as inspiration. You can adapt them, combine them, or use them as a starting point for something completely new.

a. Smart workstation with visual recognition

A fixed workstation equipped with cameras and sensors that automatically identify the type of bottle, estimate the fill level, and detect whether it is sealed or opened. The system cross-checks this information with the airline's SLA and displays a clear on-screen instruction such as "Keep," "Refill," "Replace," or "Discard." Employees can process bottles one by one while the workstation provides instant feedback and records each decision automatically.

b. Handheld decision assistant

A portable scanning device or tablet app that allows employees to take a quick photo or scan of each bottle. Using computer vision or a set of predefined criteria, the tool analyzes label cleanliness, seal condition, and fill level, then displays the required action on screen. This could be especially useful for mobile teams or small workstations that do not have fixed equipment.

c. SLA-driven digital checklist

A lightweight web or mobile application that stores all airline-specific rules and guides employees step by step. As they input details such as bottle type, brand, fill percentage, or seal condition, the system instantly applies the SLA logic and outputs the right action. This solution could be combined with a color-coded interface: for example, green for keep, yellow for refill, red for replace, and grey for discard.

d. AI-based decision engine

A cloud-based model that learns from historical data of bottle handling and continuously improves its recommendations. It could analyze past decisions, product consumption patterns, and inspection results to predict which bottles are likely to be reusable or which ones should be discarded. The AI could also adapt to specific airlines and seasons, offering data-driven optimization of replenishment and reuse ratios.

e. Augmented reality (AR) guidance system

A headset or smart glasses that recognize bottles through a camera feed and project visual indicators directly into the employee's field of view. For example, as the employee looks at a bottle, a green, yellow, or red overlay appears depending on the SLA evaluation. This could help maintain speed while reducing the need for manual references or screens in busy environments.

f. Integrated dashboard and traceability link

A central digital dashboard that connects the guided decisions made by employees with the overall catering system. It could display live statistics such as how many bottles were reused, replaced, or discarded per airline and per shift. Supervisors would gain visibility of compliance performance and could identify where errors or inconsistencies occur. This feature could also generate automatic reports for customer review or quality audits.

A strong idea does not have to rely on complex hardware or advanced artificial intelligence. Even a simple digital solution that translates SLAs into visual, actionable guidance can bring major improvements. The focus should be on clarity, speed, and reliability. The best solutions will make the employee's job easier, reduce waste, and ensure consistent compliance with every customer's expectations while maintaining operational efficiency in a high-pressure environment.

5. Supporting Mock Data

To help you design and test your solution, you will receive a dataset that simulates real inbound alcohol bottle handling data from an airline catering environment. The dataset represents bottles returning from multiple airlines, each with its own service-level agreements (SLAs), presentation standards, and handling rules. It captures the diversity and complexity of real operations, where employees must evaluate each bottle's condition and decide how to proceed based on both product status and customer-specific requirements.

Each row in the dataset represents a single bottle that has been returned from a flight and is awaiting inspection before being repacked or replaced. Employees must decide

what to do with it: keep, refill, replace, discard, or in some cases, add an additional sealed bottle to the trolley, based on fill level, cleanliness, label condition, and the corresponding SLA. The dataset integrates these key variables to allow you to model how a digital decision-support tool could interpret bottle data and generate consistent recommendations in real time.

Column	Description
Record_ID	Unique identifier for each record in the dataset. Example: 0001, 0002, 0003.
Bottle_ID	Unique identifier for each bottle. Example: WINE_00123, SPIR_01045, CHMP_00890.
Customer_Name	Name of the airline customer, such as Swiss International Air Lines, Emirates, or British Airways.
Customer_Code	Short code representing the airline. Example: LX, EK, BA.
Service_Class	Cabin class where the product was used, for example First or Business.
Product_Name	Full name of the product, for example Glenlivet 12 Whisky 1000ml or Dom Pérignon Vintage 2013 750ml.
Category	Product category such as Wine, Champagne, Spirits, or Liqueur.
Brand	Brand or producer name as printed on the label.
Bottle_Size	Volume of the bottle in milliliters, typically 750ml or 1000ml.
Fill_Level	Estimated percentage of remaining liquid in the bottle, for example 100%, 85%, or 60%.
Seal_Status	Indicates whether the bottle is Opened, Resealed, or Sealed. Bottles with 100% fill may still appear as Opened if the seal was broken during previous service.
Cleanliness_Score	Descriptive assessment of bottle and label cleanliness such as Excellent, Good, Fair, or Poor.
Label_Status	Describes the state of the label, for example Intact, Slightly_Damaged, or Heavily_Damaged.

Bottle_Condition	General evaluation of physical appearance and usability such as Excellent, Acceptable, or Poor.
Inbound_Flight	Flight number from which the bottle returned. Example: LX0415, EK089, BA0123.
Origin	Origin airport of the inbound flight (IATA code). Example: ZRH, DXB, LHR, DOH.
Destination	Destination airport where the bottle is planned to continue after repacking. Can be the same as Origin when the trolley continues service on another flight from the same unit.
SLA_Reuse_Policy	Customer-specific rule that defines how to handle the bottle. Examples include "Refill if fill <90% using incoming bottles and reseal," "If fill between 60–80%, add 1 additional sealed bottle for next flight," or "Discard all opened bottles."
Recommended_Action	The resulting action derived from the SLA policy and bottle condition: Keep, Refill, Add Bottle, Replace, or Discard.

This dataset introduces a realistic level of complexity similar to what catering units face daily. It includes multiple airlines with differing SLAs, variable product categories, and a wide range of bottle conditions and fill levels. For instance, some SLAs may require employees to add an additional sealed bottle when the returning one is below a defined fill threshold, ensuring that the next flight departs with full availability. Others allow refilling of spirits by combining contents from partially used bottles and resealing them, as long as hygiene and presentation standards are maintained.

You can use this dataset to prototype or simulate different solutions. For example, you might build an algorithm that interprets each SLA_Reuse_Policy automatically and generates live visual guidance for employees, or a dashboard that summarizes daily decisions by airline and category. The dataset can also support data-driven models that predict the impact of automating these decisions on cost, waste reduction, and consistency.

Using the dataset is optional, but it provides a realistic structure for testing how automation could improve accuracy and efficiency in alcohol bottle handling. It reflects a real operational challenge where employees manage mixed returns from multiple customers, each with their own set of rules. Your solution should focus on making this process simpler, faster, and more reliable, helping employees take the right decision every time without needing to interpret the SLAs manually.

6. What Makes a Great Solution

Judges will evaluate your project based on several dimensions that combine creativity, realism, and operational value. The goal is not only to propose a clever idea but to design something that could truly improve how alcohol bottles are handled in catering units. A great solution will simplify complex decision-making, ensure consistency across different airline SLAs, and enhance speed, quality, and compliance in daily operations.

a. Innovation

How original and creative is your solution? Does it introduce a new way to assist employees in evaluating bottle conditions or interpreting SLAs? Innovation can take many forms: a smart vision system that recognizes bottle characteristics automatically, a digital assistant that translates SLA logic into live visual cues, or a data-driven dashboard that predicts how many bottles will need replacement before the next rotation. Judges will value solutions that rethink how technology can replace manual judgment with intelligent automation.

b. Feasibility

Can your solution realistically work in an airline catering environment? Consider the space, speed, and hygiene requirements of a busy packing area. Employees often handle hundreds of bottles within limited timeframes and under bonded-stock rules. A feasible solution will integrate naturally into this environment, requiring minimal additional steps or equipment. It should be practical to implement and robust enough to perform accurately in real operating conditions.

c. Efficiency

Does your solution make the process faster, reduce repetitive work, or minimize waste? In catering operations, every second counts. Solutions that automate bottle checks, standardize decision-making, and minimize unnecessary discards will score highly. For example, a system that instantly identifies when a partially used bottle can be refilled or when an additional bottle must be added for compliance can significantly reduce the time employees spend interpreting SLAs.

d. Sustainability

How well does your solution help reduce product waste, improve resource utilization, or minimize overstocking? Alcohol bottles represent high-value items, and every unnecessary discard increases both cost and environmental impact. Sustainable solutions might reduce bottle wastage through better reuse decisions, optimize refilling procedures, or track performance data to guide future purchasing and stock management. Demonstrating measurable improvements in efficiency or waste reduction will strengthen your proposal.

e. User Experience

Is your solution intuitive, visual, and easy to use for catering employees? Users work under time pressure and must make quick decisions with full confidence. A great design uses clear visual signals or simple language to show whether a bottle should be kept, refilled, replaced, or discarded. The system should minimize cognitive load, allowing employees of any experience level to apply rules correctly without memorizing SLAs. An excellent user experience ensures speed, consistency, and trust in the solution.

A strong project will balance all these dimensions, demonstrating creativity without losing practicality. It should clearly show how technology can remove subjective judgment from alcohol handling, standardize decisions across airlines, and support employees with real-time, accurate guidance. The most successful ideas will be those that make life easier for the workforce while improving compliance, efficiency, and sustainability across the catering operation.

7. Real-World Impact

Imagine your solution being implemented across large airline catering facilities around the world, where thousands of bottles are handled every day. Each catering unit must process incoming trolleys, evaluate bottle conditions, and prepare outbound flights under strict time and quality standards. If your system can automate and guide even part of this process, the operational and financial impact could be substantial.

A successful solution could allow employees to instantly identify what to do with each bottle without needing to remember customer-specific SLAs. Instead of reading long documents or asking supervisors, they would simply see a clear visual instruction such as “Refill,” “Add Bottle,” or “Discard,” based on live analysis of the bottle’s condition. This would not only save time but also ensure that decisions are consistent across all employees, shifts, and units.

The benefits go beyond operational speed. By ensuring that every action aligns with the correct SLA, the risk of service or compliance issues with airline customers is reduced. Supervisors would gain real-time visibility of handling accuracy, reuse ratios, and wastage levels. Bottles that can safely continue in circulation would be identified immediately, while those that must be replaced or refilled would be flagged automatically. This reduces human error, improves resource allocation, and ensures that every flight departs fully stocked and compliant with airline expectations.

From a sustainability and cost perspective, the impact can be even greater. Reusing and refilling bottles appropriately minimizes waste of high-value products such as wine, champagne, and spirits. Even a small percentage reduction in unnecessary disposal can lead to significant savings across hundreds of flights per day. Over time, data generated

by such a system could also support strategic improvements in stock management, procurement, and forecasting.

Beyond airline catering, the same concept could be applied in other industries where high-value or regulated products must be inspected and reused, such as hospitality, cruise operations, or beverage distribution centers. The ability to automatically evaluate product condition, interpret standards, and guide employees visually has wide applicability.

By developing a practical and intelligent solution for this challenge, you are contributing to the future of smart catering operations. Your idea could inspire digital tools that improve compliance, reduce waste, and create measurable value for both employees and customers, ultimately transforming how precision-driven processes are managed at scale.

8. Tip for Participants

Do not worry if you have never worked in an airline catering environment before. You can think of this challenge as a high-precision quality control process that must operate at speed and scale. The same logic could apply to any operation where employees must evaluate the condition of returning products, follow strict brand or compliance standards, and make fast decisions based on multiple variables. What makes this case special is the added complexity of handling multiple airlines, each with its own SLAs and expectations.

Focus on understanding the main issue: how to help employees take the right action for each bottle, keep, refill, replace, discard, or add another bottle, without having to interpret customer rules manually. The process must be quick, intuitive, and reliable. Whether your idea involves a scanning system, an AI assistant, or a visual dashboard, what matters most is that it simplifies the workflow and increases consistency across all users and shifts.

When designing your solution, imagine the physical environment. Employees move continuously between inspection tables, packing areas, and bonded storage rooms. They often wear gloves, handle wet or sticky bottles, and work under tight deadlines before flights close for loading. Your design should consider these real-world conditions. A solution that uses clear visuals, minimal text, and instant feedback will be far more effective than one that requires complex navigation or manual data entry.

Think about how to make your idea both intelligent and human-centered. The goal is not to replace employees but to empower them with better tools that remove uncertainty and repetitive decision-making. Even a simple improvement, like an on-screen indicator showing when to refill or add a bottle, can save time, prevent mistakes, and reduce waste.

Finally, remember that innovation does not have to mean complexity. The most successful ideas are often those that use technology in a clear, purposeful, and user-friendly way. Whether you design an AI-based system, a rule-driven digital checklist, or a smart interface that visualizes SLAs dynamically, what will stand out is how well your concept improves confidence, accuracy, and efficiency in a fast-paced catering environment.