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Understanding and Dispensing Ingredients for Smart Robotic Cooking

Standards and Regulations

Team B - Ratatouille Robotics

Agenda

- **Project Description**
- **Issues in the Industry**
- **Standard #1:** NSF/ANSI 2 - Food Equipment
- **Standard #2:** ANSI/RIA R15.06 - Industrial Robots and Machinery Safety Package

Project description

User: Commercial Kitchens

User Issues:

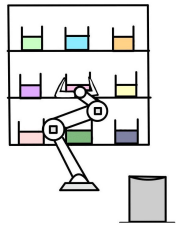
- Labor shortage
- Inconsistent meals
- Low throughput
- Food wastage

User Needs:

- Fast dispensing
- Accurate dispensing
- Consistent dispensing

Our Solution:

Ingredient dispensing robotic arm that can be deployed for cooking or serving.

- Easy set up 
- Ingredient intelligence 
- Fast, accurate and consistent dispensing 
- Can handle a variety of ingredients 
- High throughput 

Issues in the food industry

As E. coli outbreak grows, 6 Wendy's customers describe severe food poisoning

Restaurants and takeaways cop blame for 60% of food poisoning cases

◇ RESEARCH by ANDREW SEYMOUR on 25TH FEBRUARY 2020

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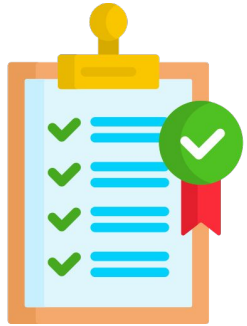
Standard #1: NSF/ANSI 2 - Food Equipment

What is the standard about?

- Comprehensive standard for **all food equipment**
- Safeguards the **consumers who eat the food** prepared using the equipment
- Minimum **Food protection** and **Sanitation requirements**
    - Food handling and
    - Food processing equipment.
- **Standard describes four major categories:**
    - Materials
    - Design
    - Fabrication
    - Performance

What are its prescriptions?



- **General sanitation practices**
  - Prevent harborage of **vermin**
  - Prevent **accumulation** of **dirt and debris**
  - Food zones shall be designed for **clean-in-place (CIP)**
- **Design & construction guidelines**

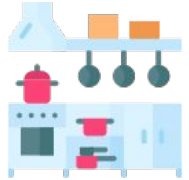
  Of all food equipment that are used in food preparation including components such as

  - Casters, shelves, joints, seams, fasteners, frames, panels, light fixtures, gaskets, guides
  - Insulation, reinforcement & framing
  - Edges & nosings, latches & catches, gliders & casters, breaker strips
  - Inspection & maintenance panels

To which products or markets does it apply?

This standard is applicable to:

- Markets such as bakery, cafeteria, commercial kitchens, pantry units
- Categories of equipment such as food handling, food processing and food storage

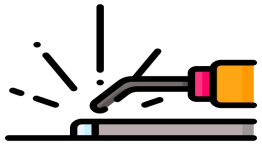


<u>Does it also apply to object xyz in the kitchen? YES.</u>

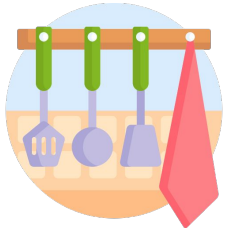
How does it apply to our project?

- **Shelving unit:**
  - Readily removable shelves to permit handling by one person
  - Pressure cleaning is recommended for knockdown shelving, joints and seams shall be either sealed or accessible for cleaning, and shall be capable of being completely drained.

- **Joints and Seams**
  - Only Lead free solder is permitted for use in food zone
  - Welded joints and seams in a non food zone shall be deburred
  - Sealants/ lubricants used in food zone must be food grade



- **Equipment mounting**
  - Portable equipment shall not weigh more than 80lb (36kg) and shall not exceed 36in in any plane
  - Utility connections on portable equipment shall be designed to be disconnected without the use of tools



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Standard #2: ANSI/RIA R15.06 - Industrial Robots and Machinery Safety Package

ANSI/RIA R15.06

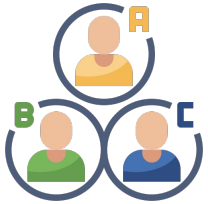
- Provides safety requirements for
  - Industrial robot manufacture, remanufacture, and rebuild
  - Robot System integration/installation
- Describes basic hazards associated with robots
- Provides requirements to eliminate, or adequately reduce, the risks associated with these hazards
- U.S. National Adoption of the ISO 10218

What is the standard about?

- **Performance requirements** for carrying out safety functions associated with
  - Industrial robots
  - Robot systems
  - Control systems

- Methods of safeguarding to enhance the **safety of personnel** associated with the use of robots and robot systems.

- Standard type:
  - **This is a Type C standard**: meant for a specific set of machinery



Why is it important?

Chess robot grabs and breaks finger of seven-year-old opponent

Moscow incident occurred because child 'violated' safety rules by taking turn too quickly, says official

U.S. NEWS

Bride-to-Be Crushed to Death by Car-Factory Robot

HORRIFIC

Regina Elsea was killed just two weeks after U.S. inspectors found two dozen safety violations at a South Korean-owned plant.

Why is it important?

- Enforces common standards and nomenclature in the industry

CONTENT FROM ABB

YuMi® the World's First Truly Collaborative Robot

Targeted Group

- **Part - 1 : Industrial robot manufacturers**
  - ABB, Fanuc, KUKA, UR


- **Part - 2 : Robot system integration / installation**
  - System integrators
  - Companies that use robotics arms in their products
  - A lot of the manufacturers are also system integrators


To which products or markets does it apply?

- **Products:**
  - Industrial robots
  - Personnel handling robots
  - Robot cells

- **Markets:**
  - Part 1 - Industrial robot manufacturers (Such as ABB, UR, Kuka)
  - Part 2 - Robot system integration / installation (Such as Ratatouille!)

What are its main prescriptions?

Part 1: Guidelines for Manufacturer

- Manufacturing guidelines
  - Power hazards shall be prevented by using guards
- Emergency stopping functions
  - Every robot shall have an emergency stop and protective stop function
- Pendant controls
  - Robot shall move in reduced speeds while initiating from pendant
  - Dropping the pendant should not result in any unexpected motions
  - When cableless pendants are active, visual indications should be present

https://www.robotics.org/userAssets/riaUploads/file/Draft_1506_Prepublication_edition.pdf

What are its main prescriptions?

Part 2: Guidelines for installer / integrator

- Installation
  - Environmental conditions should be considered
  - Perimeter should be safeguarded
- Pendant usage
  - Ensure that cable is of sufficient length and away from environmental hazards
  - Always maintain easy access to E-stop
- Maintenance and repair
  - Robot should be placed in a way as to allow easy access to all areas that may require intervention
  - Relevant guards shall be used during maintenance activities
- Collaborative usage
  - Perform risk assessment, use protective equipment.

https://www.robotics.org/userAssets/riaUploads/file/Draft_1506_Prepublication_edition.pdf

How does it apply to Ratatouille Robotics

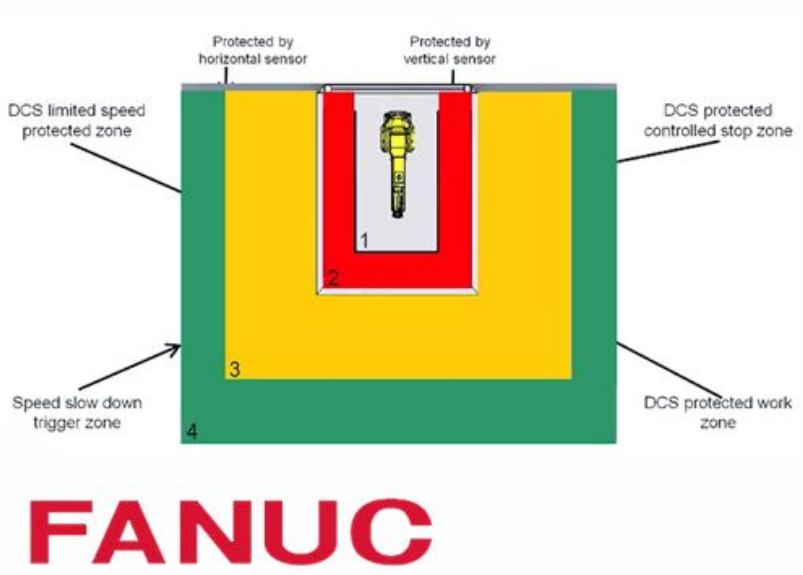
- Think about how do we want to position our system - Collaborative vs Non-collaborative

Collaborative Robot Operation

- End-effector hazards including the workpiece (e.g. ergonomic design, sharp edges, protrusions, working with tool changer)

Collaborative Robot Operation

- Identify and define collaboration space
- Prevent or detect any person from advancing further into the safeguarded space beyond the collaborative workspace
- Soft axis and space limiting



How does it apply to the team’s project?

- For Ratatouille, Part 2 of the standards is applicable -> we are integrators.

- Some applicable guidelines:
  - Pendant usage guidelines
  - Collaborative usage guidelines
  - Robot environment and safeguarding guidelines

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Questions?

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