

# Team 16: Block Portability Michigan Foam Products

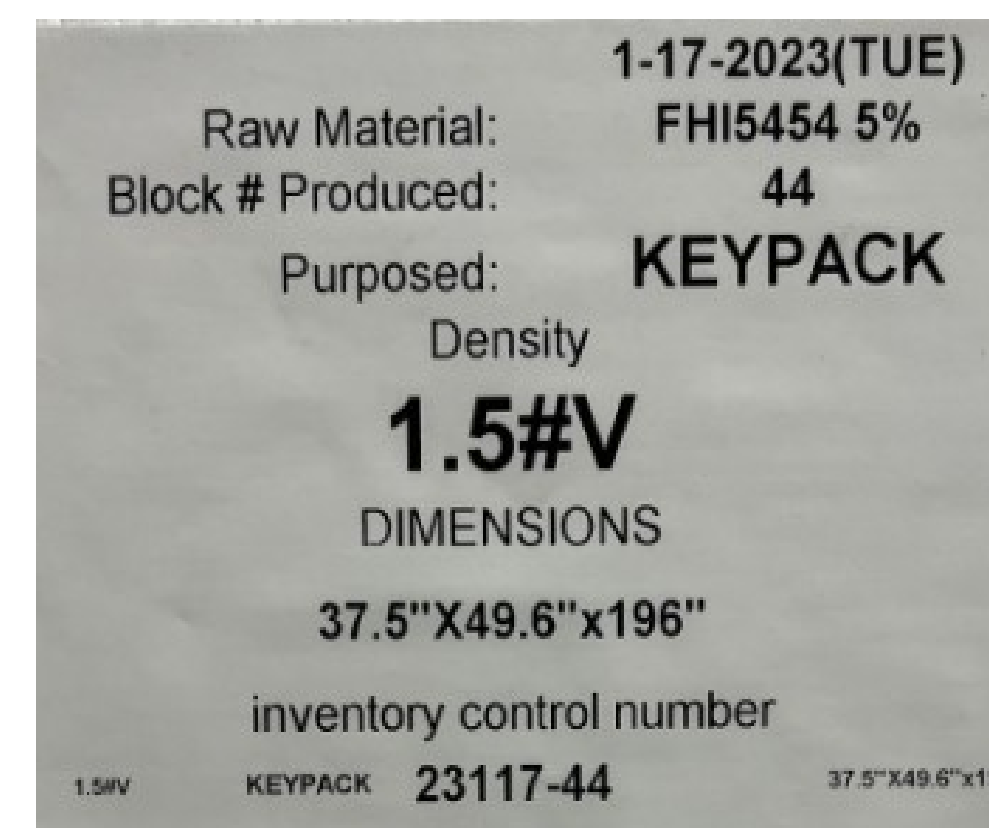
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## Background

Michigan Foam Products (MFP), a foam manufacturer located in Grand Rapids, pursued an easier way to load and transport large blocks of foam around their plant. Additionally, they wanted to implement an inventory system that tracks the location and stores specification data for each block. MFP specializes in making Expanded Polystyrene (EPS) foam which comes in a range of densities. The raw material consists of solid, circular beads that are then put through an expansion process, and finally molded into rectangular blocks. The molded blocks are typically 3 feet by 4 feet by 16 feet and weigh anywhere from 200 to 650 pounds. Blocks are stored vertically in aisles, for a minimum of one day, to cool and dry out before they are transported to production to be cut to size per the customer's order.

Their current process of loading a block for transportation involves an employee moving the block back and forth to get it out of its row and tilting it into an angled position just enough to place a wheeled cart underneath. They then pull the block onto the cart and into a resting position. Similarly, when unloading the block, the block is tilted off the cart onto the ground and the cart is pulled away.



## Objectives

The objectives of this project are to resolve ergonomic issues presented by the current process of transporting blocks, implementing a first-in-first-out (FIFO) storage system, and improving traceability of the product through an inventory system. The current process only allows for half of the current employees to complete it as it is very physically demanding. Implementing a new system will help decrease cycle times, increase efficiency, and improve ergonomics for the operators. Currently, MFP uses a manual label system to track inventory. The implementation of an electronic system will ensure that FIFO processing is enabled, block information is stored, and cycle times decrease for block placement and pickup.

## Key Specifications

### Transport

- Device dimensions must remain under 49"x25"x3"
- Device must have a weight capacity of at least 813 pounds

### Storage

- Storage dimensions must be within the range of 450"x50"x201"
- The storage system must enable First-In-First-Out (FIFO) processing
  - Must maintain the following ergonomic standards:
    - Max 50 pounds pushing force under 10 ft
    - Max 25 pounds pushing force over 10 ft

### Inventory

- Must accept block information as inputs
- Must have a display to show all blocks in inventory
- Must have the ability to search for blocks by customer and/or density

## Transport

A hydraulic lift version of MFP's current cart was created to drive between the FIFO storage rollers shown to the right. The cart will transport the blocks from the molding side of the facility, into storage, and out of storage to production. The pump is equipped with a foot pedal, and foot release pedal for lifting and lowering. The sequence of operations for transport are detailed below.

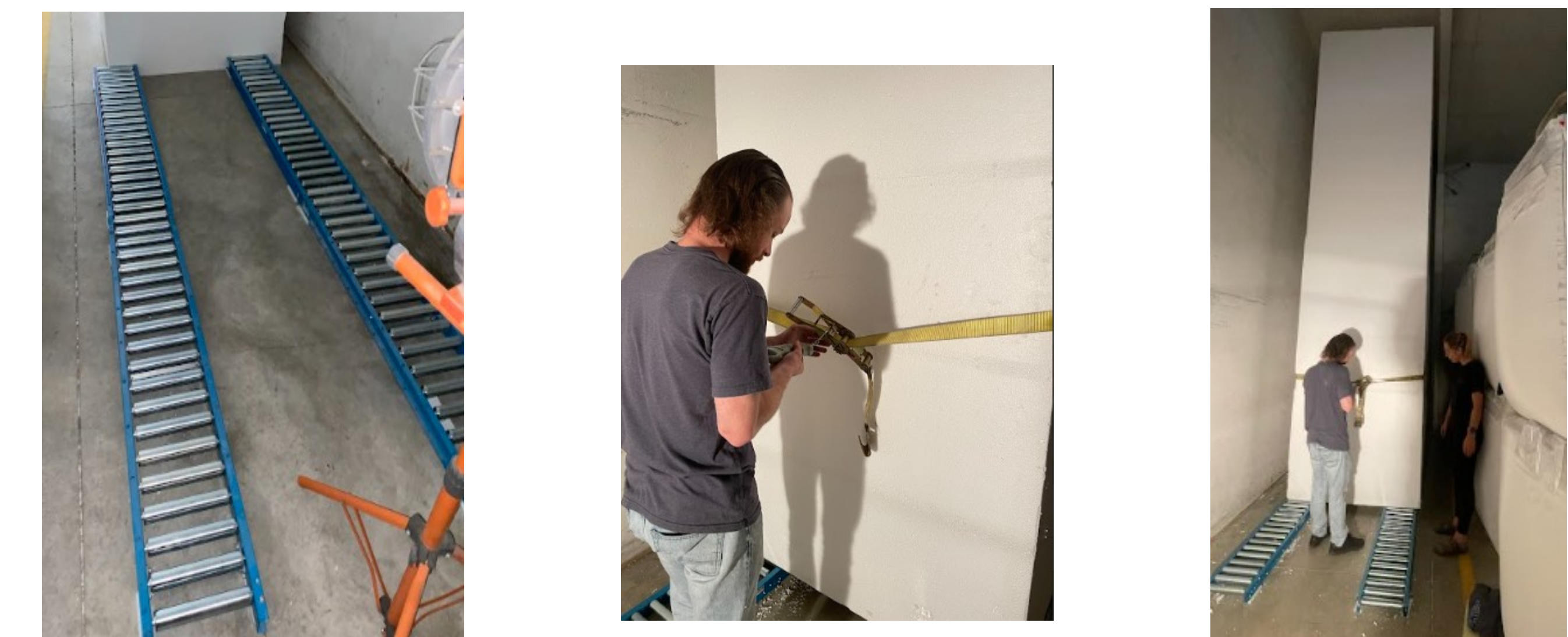
**Into Storage:** Obtain block from the block tipper post molding, transport to desired storage row, raise the lift plate once in line with the rollers, drive the cart between rollers until fully loaded, press the relief foot pedal to lower the plate, then pull the cart out.

**Out of Storage:** Drive the cart between the desired row rollers and under the first block (desired block), raise the lift plate, pull the cart out of the row, lower the lift plate and block.



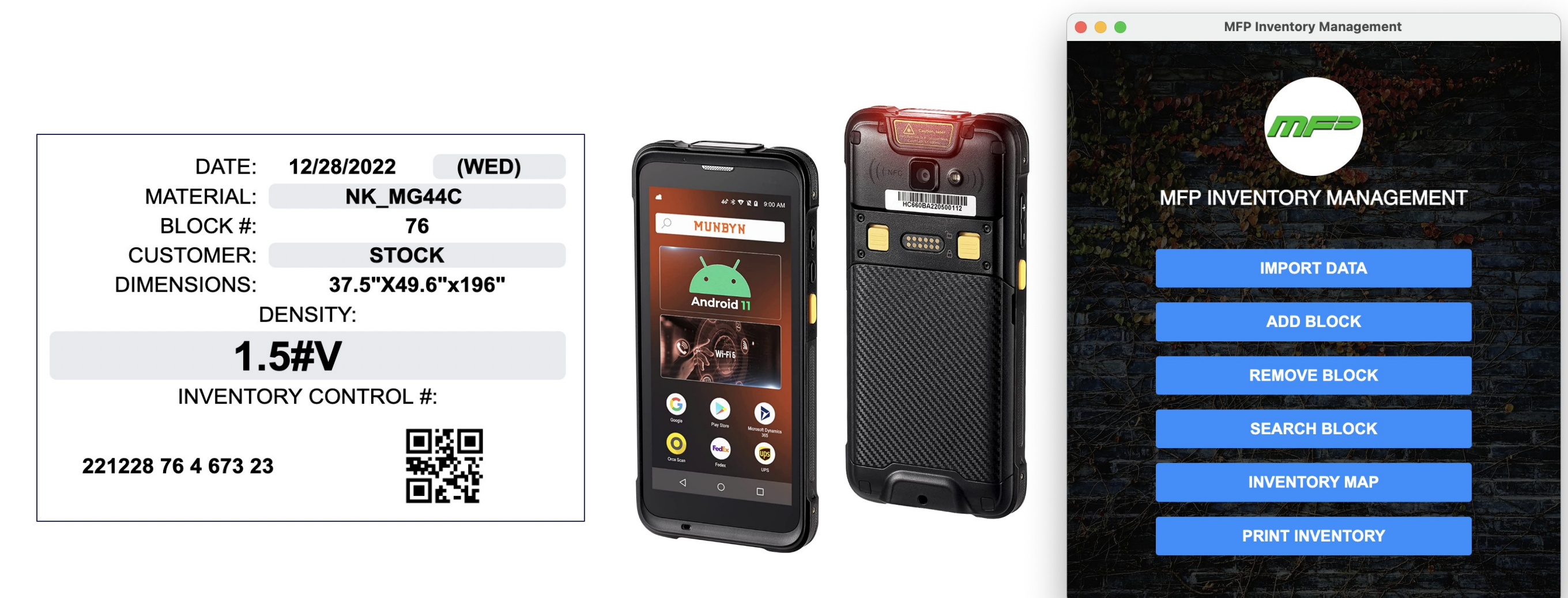
## Storage

Rollers were implemented to help with FIFO. Blocks are loaded from the back, pushed to the front of the row towards the production side of the plant. They get removed from the front when a customer order needs to be processed. To ensure that ergonomic specifications were met, a force gauge was used to test the force required to push a block on the rollers. The resultant force of one block was then multiplied for the maximum number of blocks possible to push (11) and determined to pass the requirement.



## Inventory

There are three main components to the new inventory system at MFP: desktop computer, portable scanners, and TV display. To tag each block, there is an excel generated label with a scannable QR code that will be printed and adhered to the block. An example label with all required tracking information is shown below. An Android application downloaded onto each scanner and desktop was developed to allow operators to add and remove products from inventory, and search for blocks within inventory by density and/or customer code. When considering cycle times during the block searching process, having the device on hand allows for the operators to complete these actions more efficiently. A smart TV will be used to display a live map of inventory to operators, giving them more visibility to block locations, and openings on the shop floor.



Scan to watch how the device works!

