

CHEF

Case Study

Amy's®

CHEF



Amy’s Kitchen leveraged Chef Robotics to improve product consistency of runs by Chef by 12%, lower food giveaway by 4%, and increase labor productivity by 17%.

Chef Robotics has provided Amy’s Kitchen a flexible automation solution for food assembly that can pick and place many different kinds of ingredients portion sizes into many kinds of trays, position within the

trays, and conveyors, all with easy changeover. Unlike traditional automation which requires costly infrastructure changes, Chef Robotics’ flexible automation System fits within a human-sized footprint on existing lines, with no retrofitting required.

ABOUT AMY’S KITCHEN



Frozen Food Manufacturing Company



Based In Santa Rosa, CA



~\$843M In Annual Revenue (ZoomInfo)



“The biggest wins with Chef are the [quick] setup and changeover time, the yield improvements, and the most impactful is the labor savings”

Amy’s Plant Manager

3000+ hrs

Chef Production Hour

12+ hrs/day

Run Time Per Day

None

Retrofitting Necessary

5 mins

Changeover Time

PROBLEM 1: Labor is Difficult and Expensive to Hire and Retain

With demand for their meals higher than ever following the COVID-19 pandemic, Amy's Kitchen had to deal with the reality that labor is difficult to hire and retain. When Amy's Kitchen just started working with Chef Robotics in 2022, the plant was understaffed and recruiting costs were higher than ever before. As a result, Amy's was limited to running severely less than their desired production volume.

PROBLEM 2: Quality Control and Giveaway

The differences in deposit weights increases challenges for Amy's quality control. For each type of ingredient deposit, Amy's defines acceptable weight ranges, but the existing assembly process has a significant percentage of deposits being over-deposited. The inconsistency also led to food waste as human line workers tend to over-deposit by 2~12%. The giveaway has decreased yield for Amy's.

PROBLEM 3: No Flexible Automation Solutions on the Market

To overcome the labor shortage, Amy's Kitchen embraced automation. They tested a dozen different solutions ranging from vertical form fillers, auger based dispensers, vibratory feeds, to other methods of hard automation. However, none of the readily-available solutions on the market worked for Amy's Kitchen due to the following:

Poor Placement Accuracy And Aesthetic:

Amy's Kitchen has a high standard for the visual quality of their meals; Amy's Kitchen highly values the aesthetics and customer experience, which means limited spillage and each deposit has a specific location within the bowl. However, machines like depositors crush solid ingredients like corn and lack fine-grained control over where an ingredient is placed within the bowl.

Low # Of Compatible SKUs:

Specialized machines only work for a small number of SKUs. Amy's Kitchen uses dispensers for liquids, but they didn't work for many other solid ingredients required for Amy's high mix production such as Individually Quick Frozen (IQF) ingredients, fresh rice, and cooked ingredients like vegetable korma.

Long Changeover Time:

Amy's Kitchen does frequent line changeovers per day. Given machines like depositors take 3-4 hours to break down, clean, and re-assemble, it is near-impossible for Amy's Kitchen reuse the same equipment for two 8-hour production shifts in the same day.

Amy's Kitchen Ideal Automation Solution

Achieves human-level food assembly performance with the flexibility to handle various ingredients, portion sizes and placement requirements.

Deployment Requirements	
Required Infrastructure	Can work within existing lines without infrastructure changes
Footprint	Similar to a human footprint
Product Quality Requirements	
Product Consistency	At least as consistent as Amy's Kitchen's current assembly process
Product Aesthetics	Acceptable to Amy's Kitchen's culinary standards
Placement Requirements	
Conveyor	Can work with a two lane conveyor on a sloped floor
Placement Position	Can place into 4 quadrants of a bowl
Bowl Type	Can work with various container types (e.g., round, rectangular)
Flexibility Requirements	
Changeover Frequency	Can work with 2 product changeovers per day and 10+ per week
Changeover Time	< 10 mins to disassemble, clean, and reassemble each module between runs
Throughput Requirements	
Throughput	34 bowls per minute per conveyor lane
Safety Requirement	
Human Safety	Acceptable for collaborative human operation as per Cal OSHA standards

Build a modern automation solution with the flexibility and placement aesthetics of a human.

Since traditional automation was not flexible enough, Amy's Kitchen worked with Chef Robotics to develop a flexible automation system to increase production volume, increase worker productivity, increase yield, and improve product quality.

Amy's Kitchen's Line After Chef



Product Approach

Equipped with machine-learning based perception, a collaborative robot arm, and proprietary utensils, Chef Flexible Automation System maximizes SKU compatibility while maintaining product quality and production throughput, all with maximum uptime.



Machine Learning Based Perception:

Eyes of Chef Flexible Automation System. The perception system leverages Machine Learning to accurately detect bowl location and food topology for accurate deposit placement and weights.



Collaborative Robots:

Arms of Chef Flexible Automation System. It provides great throughput while meeting industry standards (ISO 10218) for working alongside humans.



Proprietary Utensils

Hands of Chef Flexible Automation System. By simply swapping utensils, Chef can deposit hundreds of different SKUs with quick changeover and minimal sanitation time.



Inside Chef's computer vision and robotics software



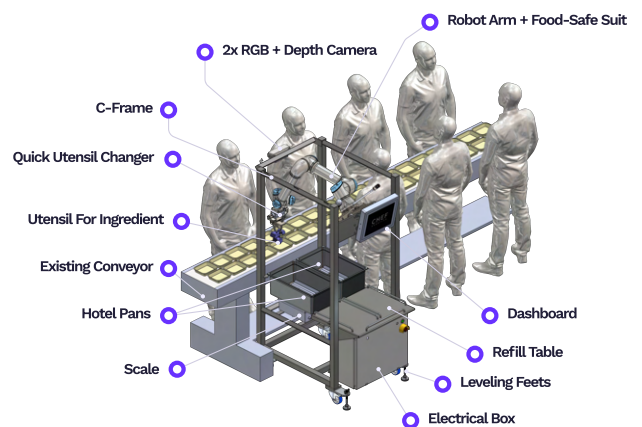
Chef Picks and Places Corn and Peas



Chef Picks and Places Poblano Peppers

Deployment Approach (Low Integration Risk)

It is low-risk for customers to use Chef as customers don't have to buy new infrastructure. Chef Robotics' Flexible Automation System easily slides onto Amy's Kitchen's conveyor lines with the same footprint of a single human. All that Chef Robotics' Flexible Automation System needs is a 120V AC power and a pneumatic line with a standard industrial quick-disconnect air coupling, both of which are commonly available in food assembly facilities.



Fast Deployment and Creating Value from Day 1

Chef can deploy in a few weeks after closing the contract. It's possible to deploy the system at one station at a time without having to automate the full line. This allows Chef to start assembling food & creating value day 1.

Robotics-as-a-Service (RaaS) eliminates upfront CapEx and hidden fees.

Most traditional automation partners create custom one-off automation, which requires an initial capital (CapEx) investment. However, this approach requires customers like Amy’s Kitchen to limit their cash flow and budget adequate time for planning and budgeting. This slows down the deployment timeline and delays getting value to customers like Amy’s Kitchen.

Chef Robotics uses an innovative Robot-as-a-Service (RaaS) model, wherein Chef acts as a

staffing agency for Amy’s, providing both the hardware and necessary support. This model eliminates the various challenges of CapEx by removing the upfront investment, providing transparent pricing and charging a standard annual fee instead of CapEx add-ons. Additionally, because Chef doesn’t require full line automation, it’s easy to get started and try out 4-6 robots with a “Starter Pack” without having to pay hundreds of thousands or millions upfront in CapEx.

For a flat monthly fee, Chef provides the following:



Core Hardware
And Software



Sunbasket-Specific
Configurations



Hardware And
Software Upgrades



Field Support And
Maintenance

	Robotics as a Service (RaaS)	Traditional Automation, Capital Expenditure (CapEx)
Application Scoping	N/A	Scoping + Feasibility Study Fees
Design + Engineering Time		Engineering NRE Fees
Parts		BOM + Material Fees
Build + Manufacturing		Labor Fees
System Upgrades		Upgrade Fees
Spare Parts		Spare part Fees
Shipping and Training		Shipping fees and training Fees
Downtime and Onsite Support		Emergency maintenance Fees
Recurring Service Plan	✓ A monthly service fee	Service Plan

Improved product consistency by 12%, reduced food giveaway by 4%, and increased labor productivity by 17%.

Since June 2022, Chef Robotics' Flexible Automation Systems has been working at Amy's Kitchen's Santa Rosa facility up to two shifts a day. They're running at a throughput of 34 bowls per min. And they're accommodating Amy's Kitchen's two changeovers per day and 10+ per week.

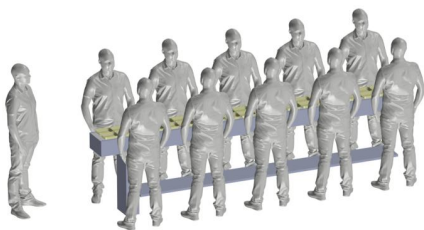


“The key wins: It's the is the labor savings. it's the yield savings. It's able to be reliable. And it's the service. ”

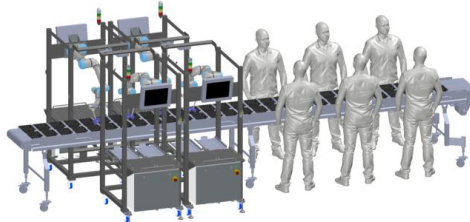
*Senior Director of Engineering
Speaking about Chef*

Increased worker productivity by 17%.

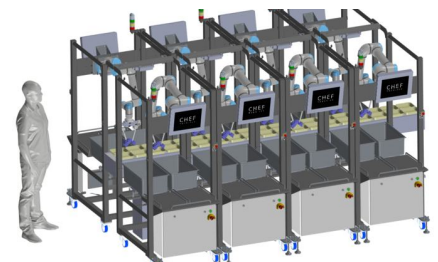
Amy's Kitchen's meals leveraging Chef increased labor productivity during assembly by ~17%. For instance, for the Chile Relleno line, before Chef, each Amy's Kitchen's assembly line required ~12 assembly workers on average. With two Chef systems, Amy's Kitchen's line only needs ~10 assembly to operate. Amy's Kitchen can reallocate those original assembly line workers to help with other parts in the plant.



Past: Amy's Line Before Chef



Today: Amy's Line After 4 Chef Systems Deployed



Soon/Goal: Fully Automated Line with Chef

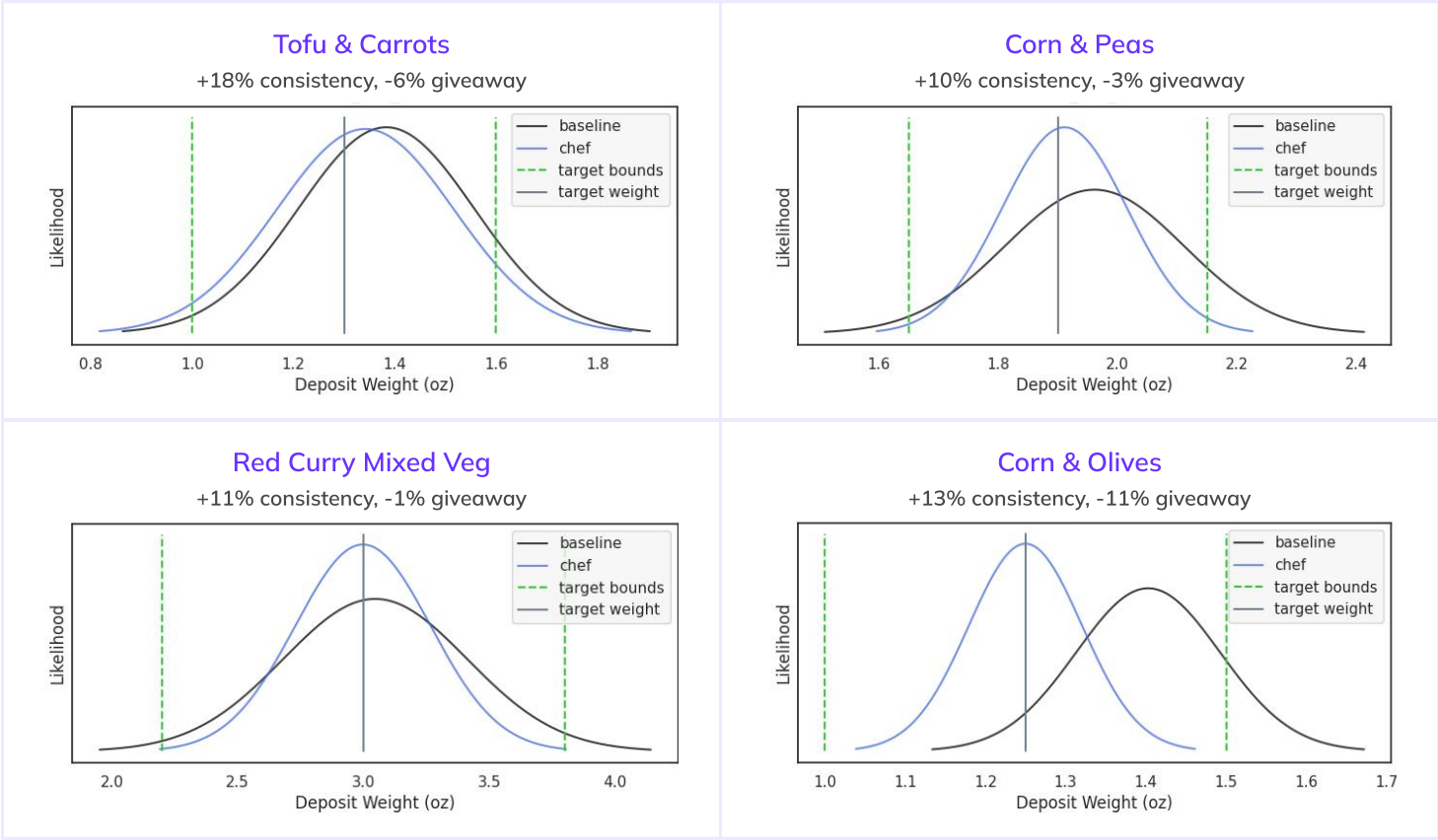
Improved product consistency* by 12% and reduced food giveaway by 4%.

With Chef, Amy’s Kitchen has been able to improve the percentage of deposits within the desired weight range by 12% on average for meals leveraging Chef. For example, in the ‘Tofu & Carrots’ weight distribution plot below, you can see that the consistency of this ingredient has improved by 18% after Chef.

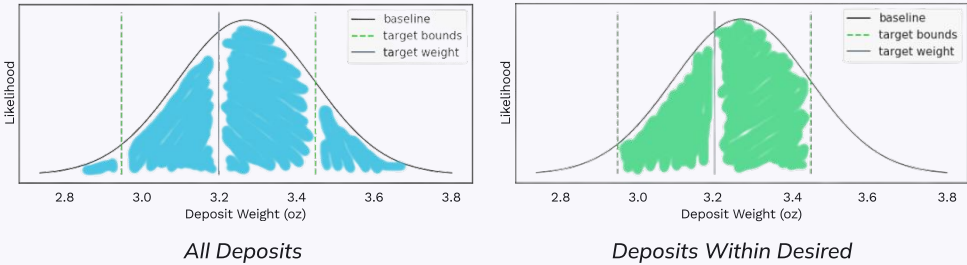
And further Amy’s Kitchen has been able to reduce

estimated giveaway during assembly by 4% on average for meals leveraging Chef. For example, in the ‘Corn & Olives’ weight distribution plot below, you can see that human line workers tend to over-deposit this ingredient by 12% on average, while Chef is able to deposit this ingredient within 1% of the target weight on average. This leads to improved yield.

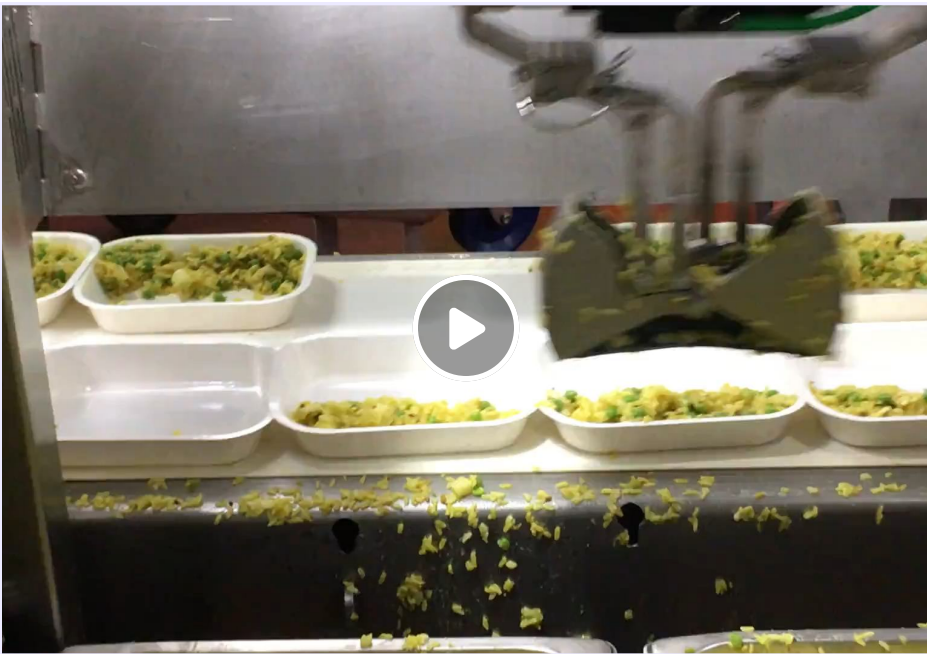
Consistency and giveaway Study for Ingredients deposited before and after Chef



* Consistency is defined by weight acceptance rate, which is the percentage of deposits within the desired weight ranges. Weight Acceptance Rate = Green Area / Blue Area.



Better Placement Accuracy and Aesthetics



With Chef, Amy’s Kitchen has been able to accurately place food into specific quadrants, and achieve placement aesthetics much better than traditional automation solutions. For example, in the lemon rice placement video, rice in the top lane was placed by human workers and rice in the bottom lane was placed by Chef. You can see that rice deposited by Chef looked aesthetically pleasing and were placed accurately at the required location within the bowl.

Video of Chef Placing Lemon Rice

No CapEx

There was no CapEx for Amy’s Kitchen to integrate Chef. Amy’s Kitchen didn’t have to retrofit their lines or buy new infrastructure. This allowed Chef to create value from Day 1.

Higher Data / Visibility into Production Operations

Via Chef’s sensor suite and manager dashboard, Amy’s Kitchen now has data on every single deposit made by Chef from anywhere in the world. Amy’s has been able to receive live feedback on the operation status, and quickly adjust the deposit weight and placement positions on the fly. Amy’s has also been able to track historical deposit data via Chef manager dashboard.

Production:

3.5M

Servings In Production By Chef*

↓ 30%

Less Human-Hours Required To Run A Line

↑ 25%

More Consistent In Deposit Weight Than Humans

↑ 17%

Higher Throughput Than Humans

Let's work together to transform your business

Chef Robotics leads transformation in food companies by increasing production volume with flexible robotics and machine learning.

Learn more at chefrobotics.ai

Chef Has A Strong Technical And Product Team With Experience From:

cruise • Google • **nuro** • **WAYMO** • **TESLA**

vicarious • **VERB SURGICAL** • **ZOOX** • **fetch robotics**

KITTYHAWK • **THIRD WAVE™ AUTOMATION** • **strateos**

BUILT ROBOTICS • **LOCKHEED MARTIN** • **yelp** • **THINK SURGICAL**

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LET'S TRANSFORM TOGETHER

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