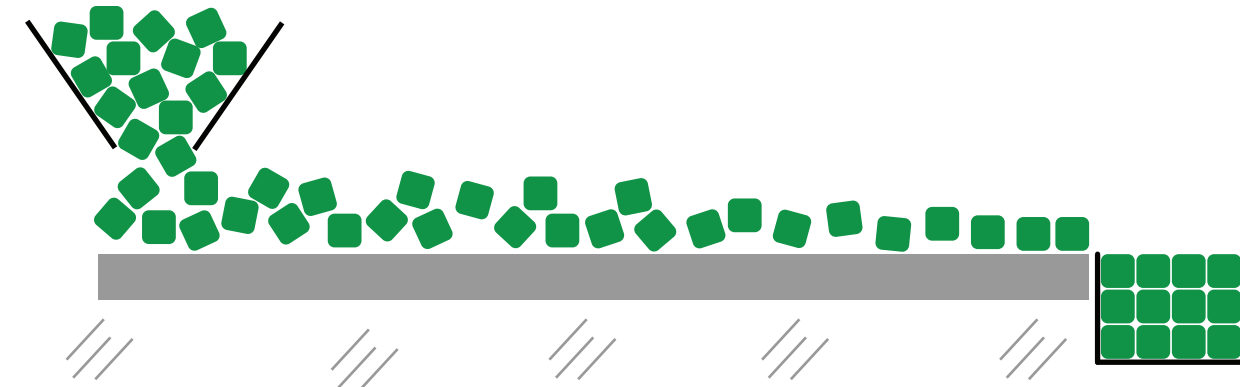
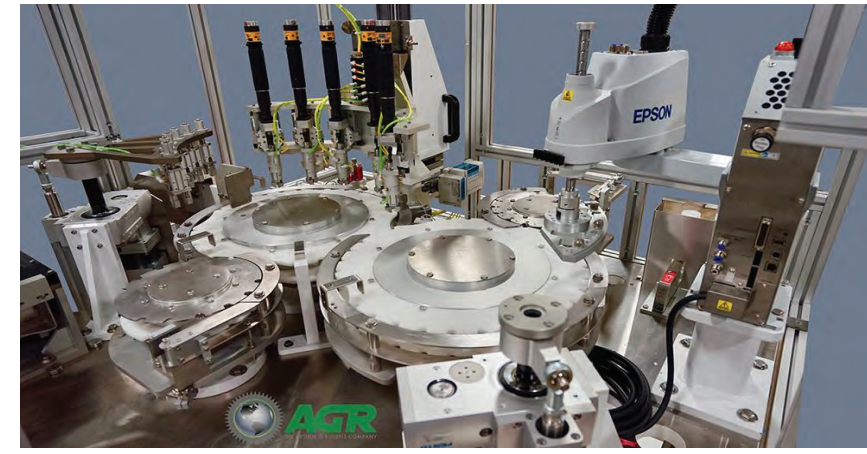


Arthur G. Russell

- AGR is a leader in automated assembly
- Some assembly lines produce 1800 parts / minute
- These parts must be oriented and transported
- Vibratory feeding is an elegant solution



# Multivariable Vibratory Test Platform



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He/Him/His



Alex Li  
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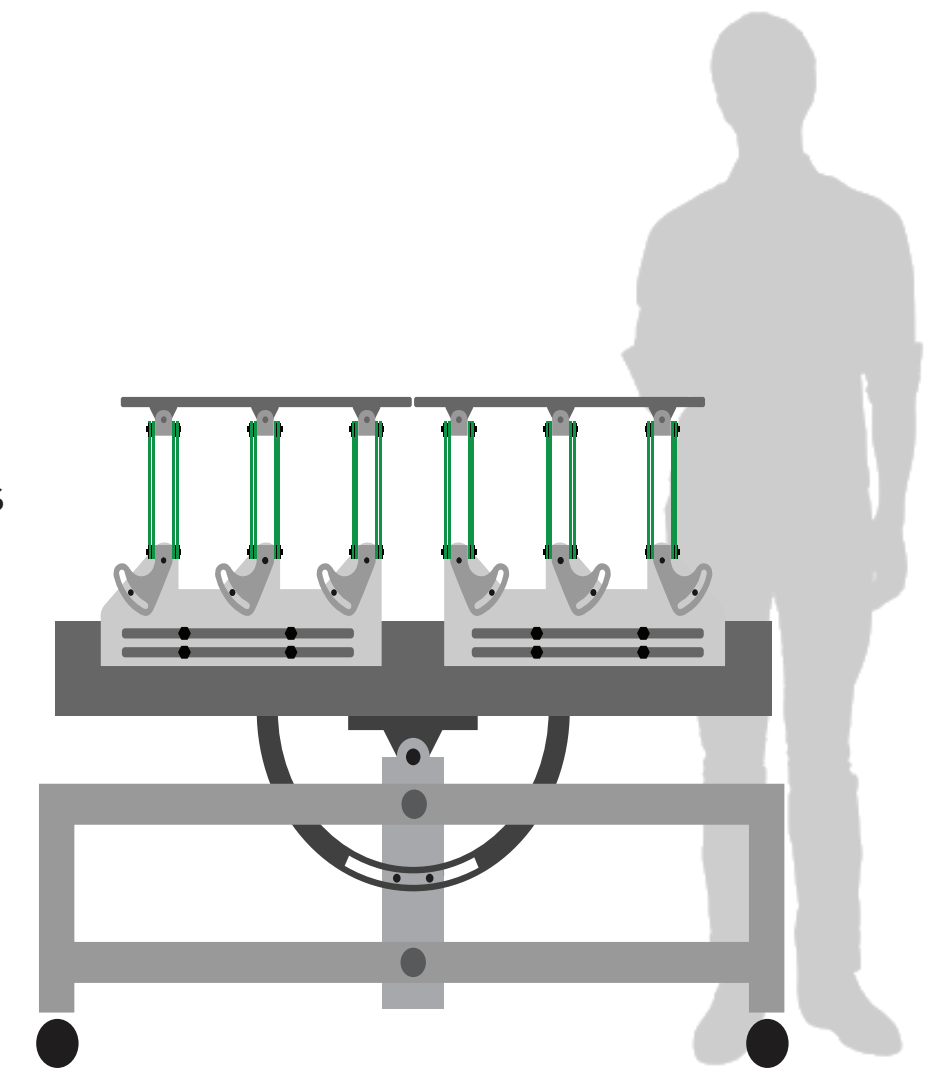
Rowan Sharman  
He/Him/His



Walker Trelease  
He/Him/His

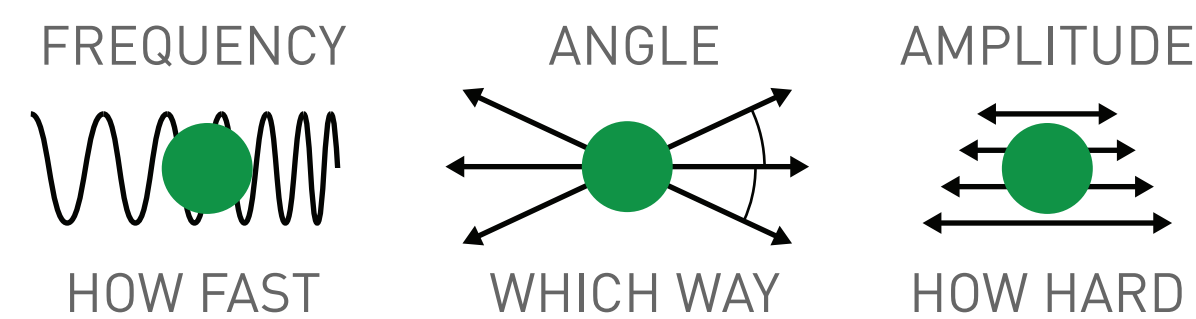
## Platform Overview

- Four vibratory zones
- Flexible for many test set ups
- Full control over relative position & angle of zones
- Rapid parameter adjustment
- Covers full parameter range of vibratory feeders



## Vibratory Feeding

- Operates by vibrating a surface in order to “bounce” parts along it
- Excellent for moving large volumes (hundreds) of parts at once
- The shape of the vibrating surface influences how parts **orient** and **feed**
- The vibration is primarily defined by the three parameters **frequency**, **angle** and **amplitude**

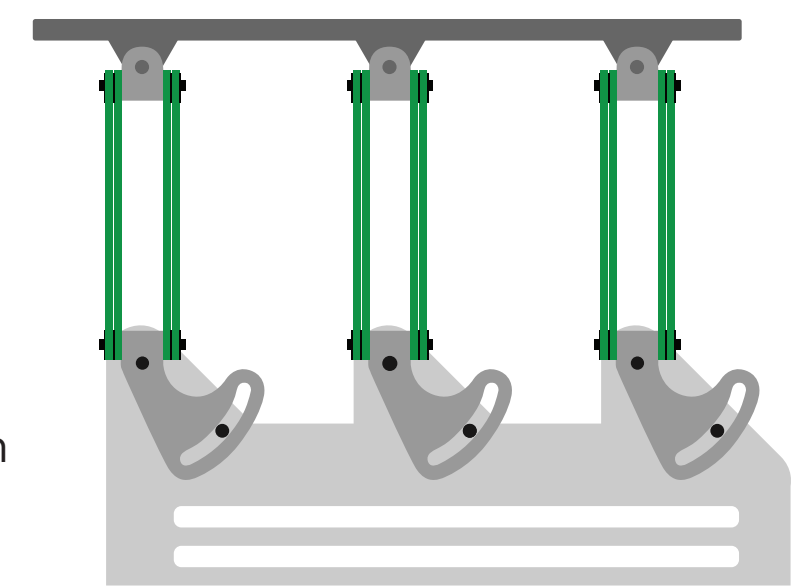


## Challenges

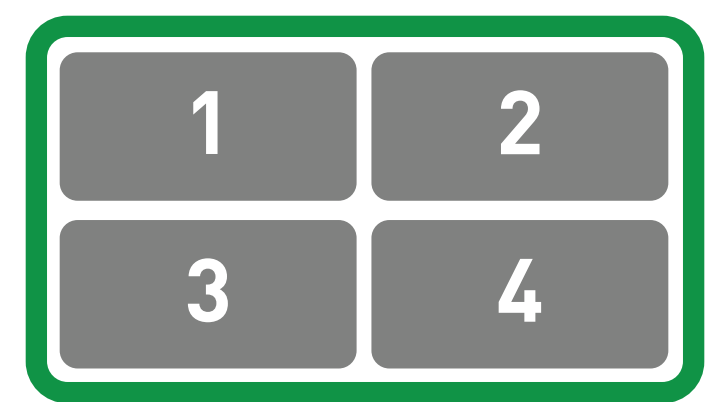
- Vibratory feeding is nearly impossible to model, there are too many chaotic moving parts
- Currently optimized through manual trial and error
- What works for one won't work for all, every new part requires starting from scratch
- High vibrating mass + high frequency = very high force
- High forces require machines to be large, powerful, and rigid
- Large, powerful, rigid machines do not lend well to quick adjustments
- Changing parameters often requires fully rebuilding machines

## How the Platform Operates

- Like pushing a swing, little pushes build up
- At natural frequency, system accumulates momentum
- Adjust natural frequency to match desired frequency
- Four zones in pairs have independent adjustment



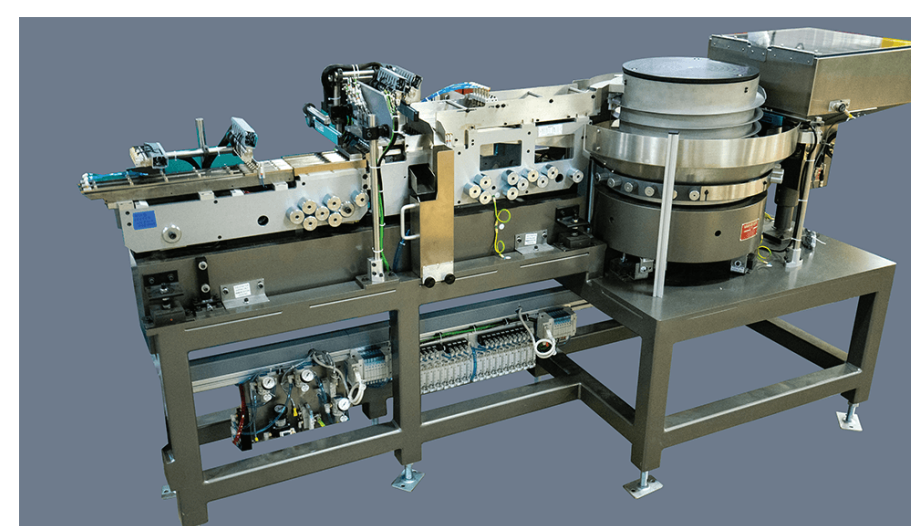
Single Vibratory Zone



Four Zone Layout

## Problem with Current Vibratory Feeding

- Customers want higher volume for the same cost
- Higher volume assembly lines requires faster part feeding
- Part motion is chaotic, can't turn a knob to speed it up
- Must be able to rapidly test different parameters for different parts



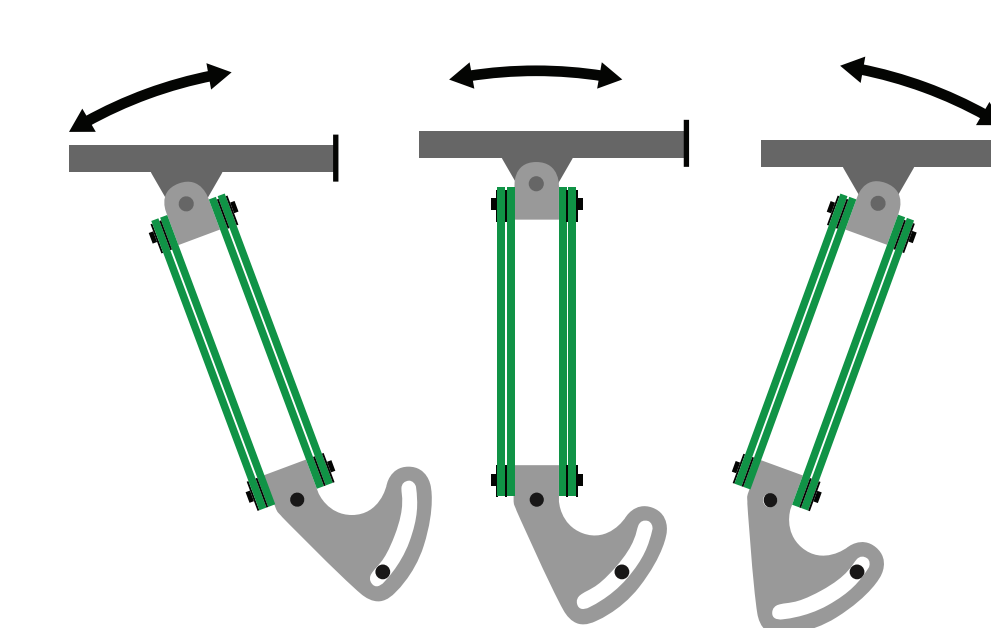
## Conclusion of Project and Impact

- Design of platform is complete and handed off to AGR to be fabricated
- The rapid adjustment made possible by this platform will allow for much broader testing
- This platform will also allow for the testing of new tooling before full systems are built
- The learnings and developments from testing will increase speed and efficiency of feeding
- Improved feeding will contribute to getting **more parts per minute off the line**



## Vibration Angle

Is adjusted by changing spring angle. This is done by loosening 3 bolts on each pack, rotating them all together, and tightening back down.



## Frequency

Is adjusted by changing system stiffness. This can be quickly accomplished by swapping and reconfiguring spring packs.

