Pictured is an electrically heated hot date stamp with pneumatic actuator. Repeated breakdowns with all machines that used this device accounted for 2 occurrences a month in which the process line would suffer an hour of interruption to production. The problem description was ‘date stamp not heating up’.

Again I used the P-M Analysis method to deal with this chronic problem for years before I joined the company. Upon investigation I found ‘how’ the failure occurred was ‘incomplete electrical continuity to heater elements to pass electrical current’.

Now the ‘why’ it occurred, quite simply the wrong type of coiled heater element wire was being used. It was not designed for tight coils and dynamic changes of state and in this case the movement of extension and retraction of the pneumatic actuator.

I conducted some research to alternative heater elements with specialized connector wires that could withstand tight coils and contraction and extension movement along the coil axis. I eventually found the wire I needed to eliminate this problem and had the wire custom manufactured to the heater element terminals.

Extension of pneumatic actuator.

Pictured is the original heater element and connecting wires.

Improvement heater elements with specialized connector wires that could withstand tight coils and contraction and extension movement along the coil axis.

Mean time between failure - infinity…

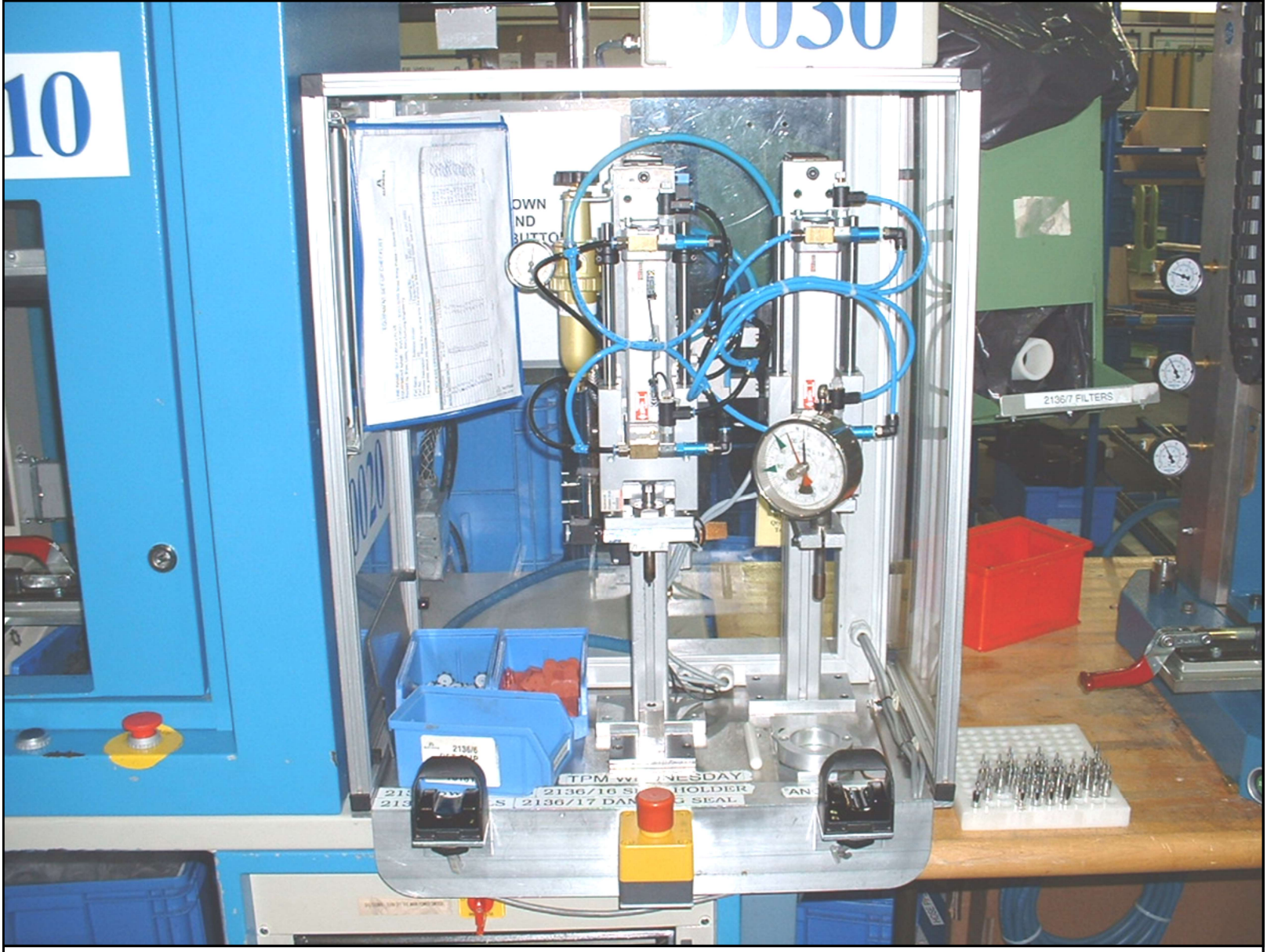
I left the company 2 years after this improvement and all re-fitted date stamps actuators never had a single failure in that time.

As I have mentioned before wasteful activities or processes need to be either eliminated, reduced simplified or incorporated. I have had many people ask me what do you mean when you say incorporated, so I will show an engineering example of where I have taken a non-value added process of testing and incorporated it with a value-added process of assembly which by definition increases the market value by changing the fit, form and function of the part. Testing a part after a process fundamentally is waste as it adds no value - for those of you familiar with PFMEAs, what that means is you don't trust your process… Autonomation…

What you are seeing here is a picture of a small machine process work station that installs a small retaining snap ring onto the armature pin of a solenoid to a gas tank emissions control device. The snap ring secures the armature pin to the inner body of the solenoid.

After the snap ring install process work station the part is removed from that tool nest and placed in a testing jig tool nest which is a force gauge affixed to an arbor press. The operator would pull down on the arbor press arm which extended the force gauge push rod down into the inner body of the solenoid to make contact with the solenoid armature pin and exact a downward force on its axis to test that the retaining snap ring holds. Kind of boarders on destructive testing doesn't…?

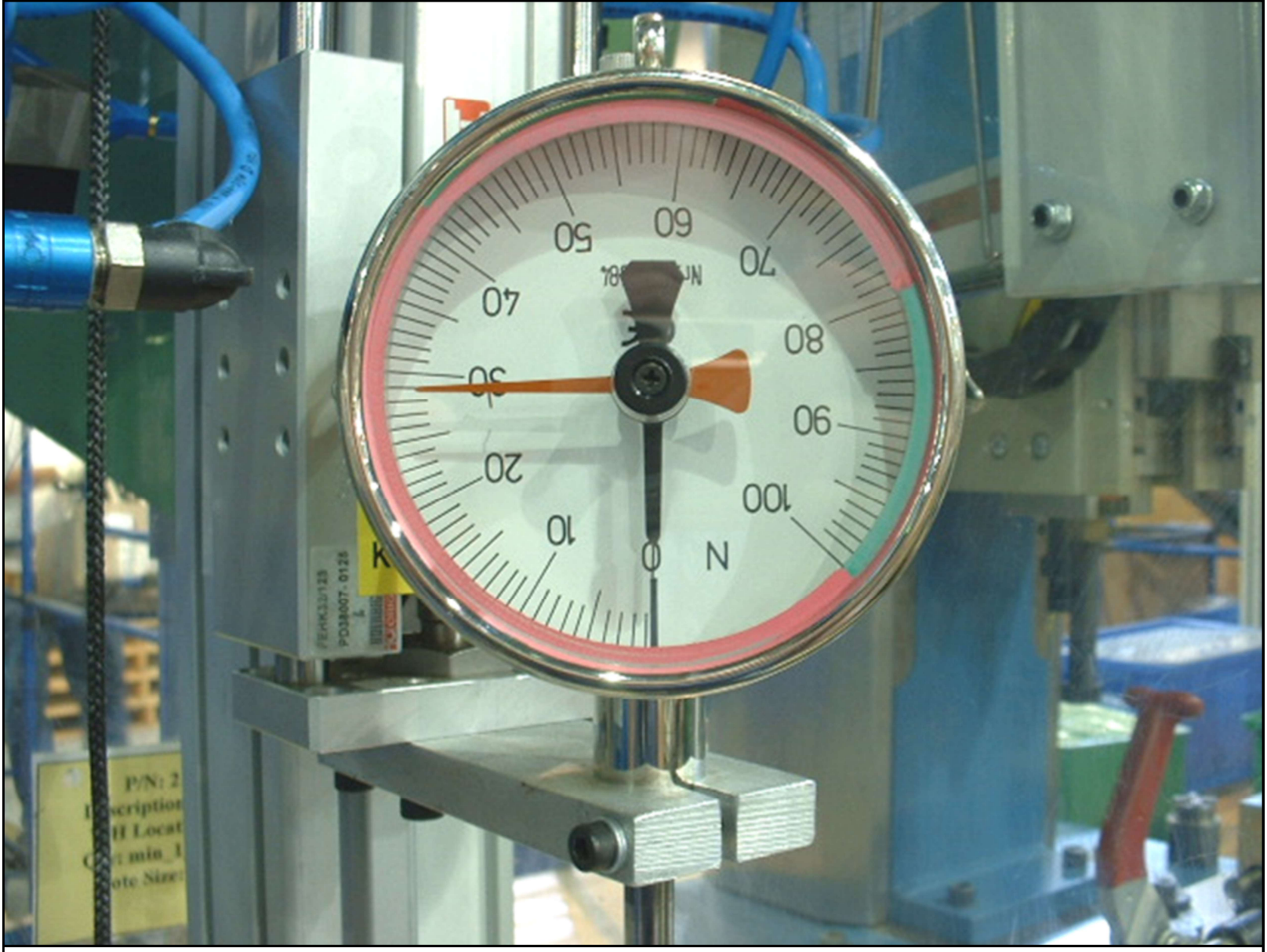
The test force gauge is set up in such a manner by adjustment in the stroke of the arbor press as to limit its force of 90 Newtons upon the snap ring. If the part passed the test the operator would remove the part and move it to the next step in the manufacturing process.



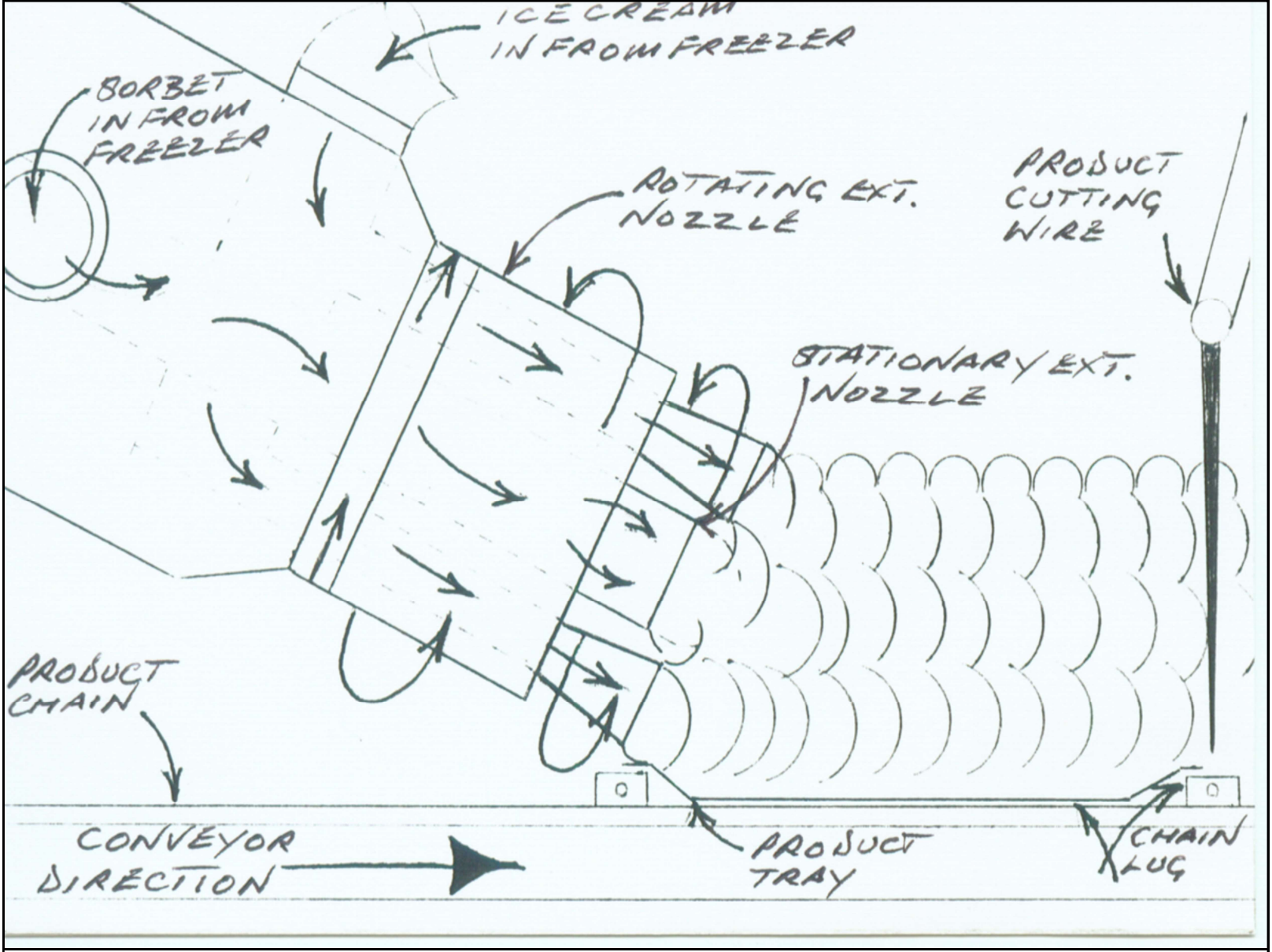
To incorporate the non-value added process of testing with the value added process of assembly I did away with the arbor press and I really just made a facsimile of the snap ring install station mechanics: air cylinder, directional control valves, mounting base, aluminum profile, air hose and air line fittings. I had to fabricate a bracket to hold the test gauge.

The process test station was connected to the pneumatic power supply of the snap ring install station and now both operate in tandem. The cost of this improvement was small, I used a spare air cylinder and directional control valve, off-cuts of aluminum profile and stock items such as air hose and air fittings.

This reduced lot delays by reducing cycle time as now two - assembly and testing - operations are carried out at the same time. This is a good example of incorporation albeit an engineering one…



Close up picture of the bracket that I made for the force gauge now affixed to an air cylinder.

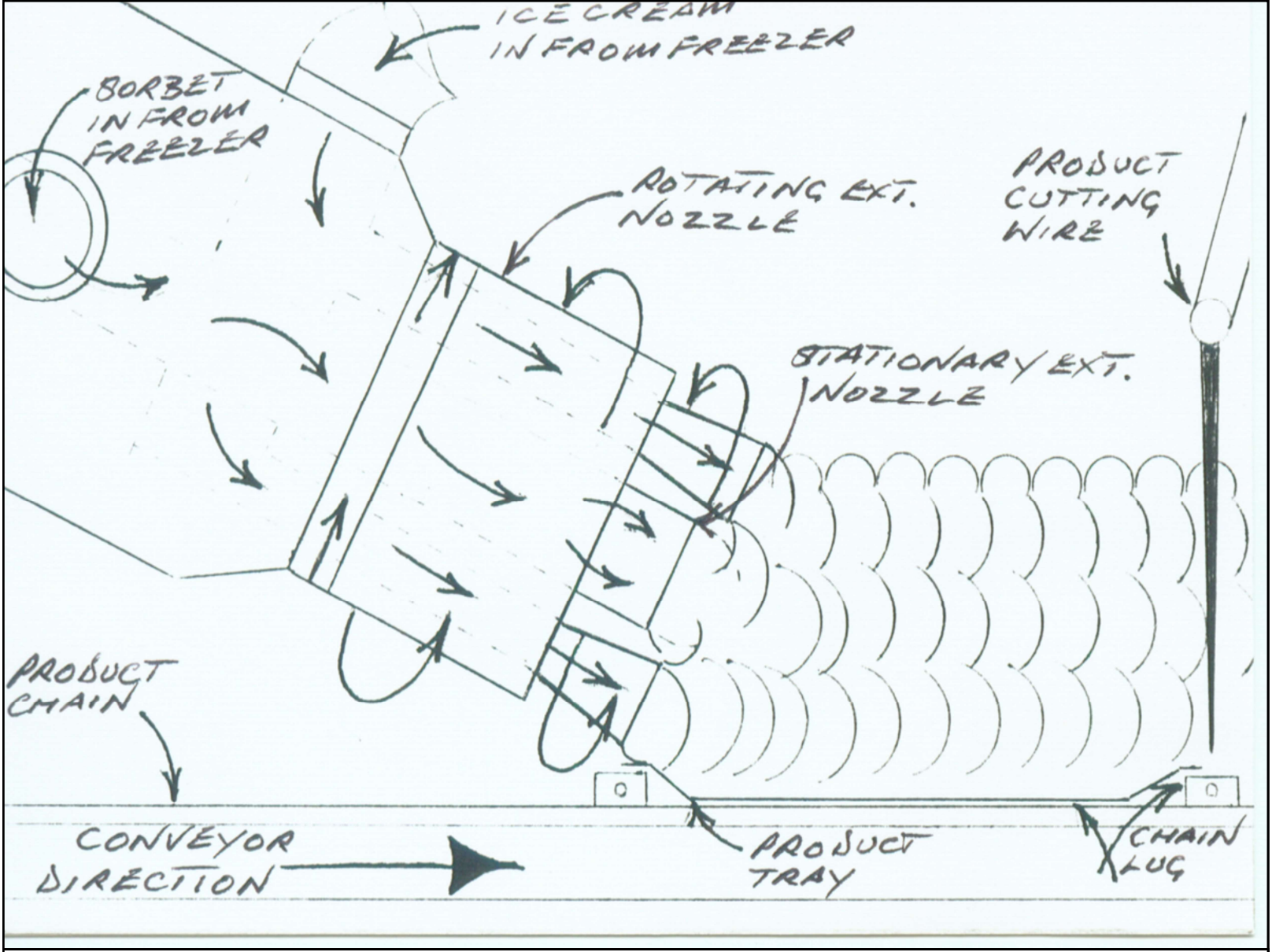


Circa 1986. This is my drawing of an ice cream extrusion nozzle. This particular dynamic extrusion nozzle was used to make an ice cream product call ‘Chrissima’. It consisted of raspberry sorbet enveloped in fluted white Italian ice cream.

This extrusion nozzle was unique in that it had three parts, one extrusion nozzle that was stationary in which the sorbet was piped and the other two nozzles rotated concentrically around the stationary nozzle in which the white Italian ice cream was piped.

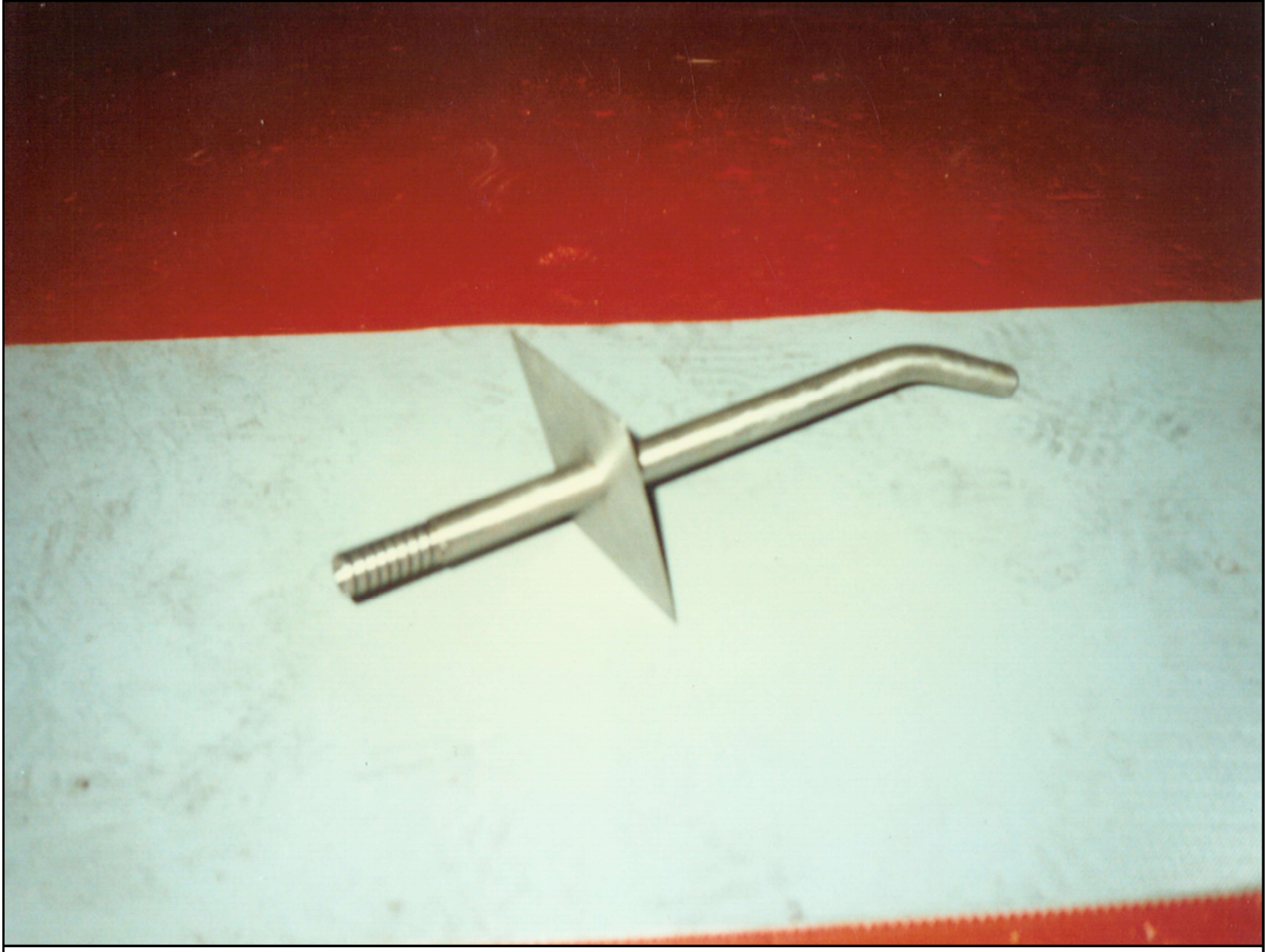
During the start up to stable production or any minor stoppages and idling during production the two ingredients would extrude and fall into a rework churn/barrel and when that rework churn/barrel was full it would be quickly pulled aside and another empty rework churn/barrel put in its place until it was full and so on…

The full rework churns/barrels would be sent to the mix department for disposal. During an average run of this product many churns/barrels of mixed product would be produced during the shift start ups and any minor stoppages and idling during production.



This was a complete loss as once the sorbet and ice cream had mixed together they could not be separated afterwards to be reworked, it was scraped off. The ice cream industry is a bit like the plastics thermo-forming industry in that it would be economically prohibitive if you couldn't claim back 40% percent of your rework or as it is said in the plastic industry regrind, you can't absorb that kind of loss…

So, I set about designing and making a separation device that could be used during start up to stable production and any minor stoppages and idling during production and I came up with what you see on the next slide…

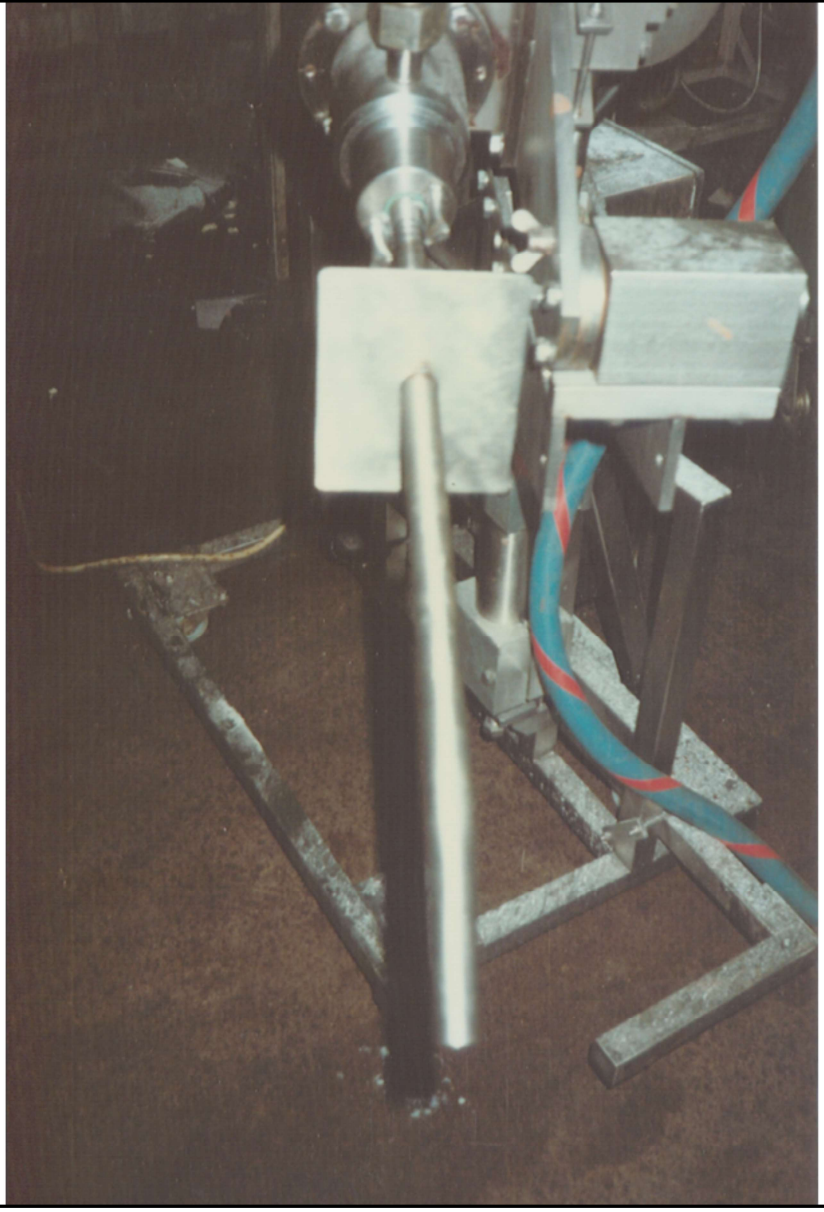


This is it, the separator device. The series of ‘o’rings provided the transitional fit and sealing into the inner diameter of the stationary extruder nozzle. The operator of the machine would insert the separator into the stationary extruder nozzle. The separator now re-directed the two ingredients sorbet and ice cream into separate rework churns/barrels.

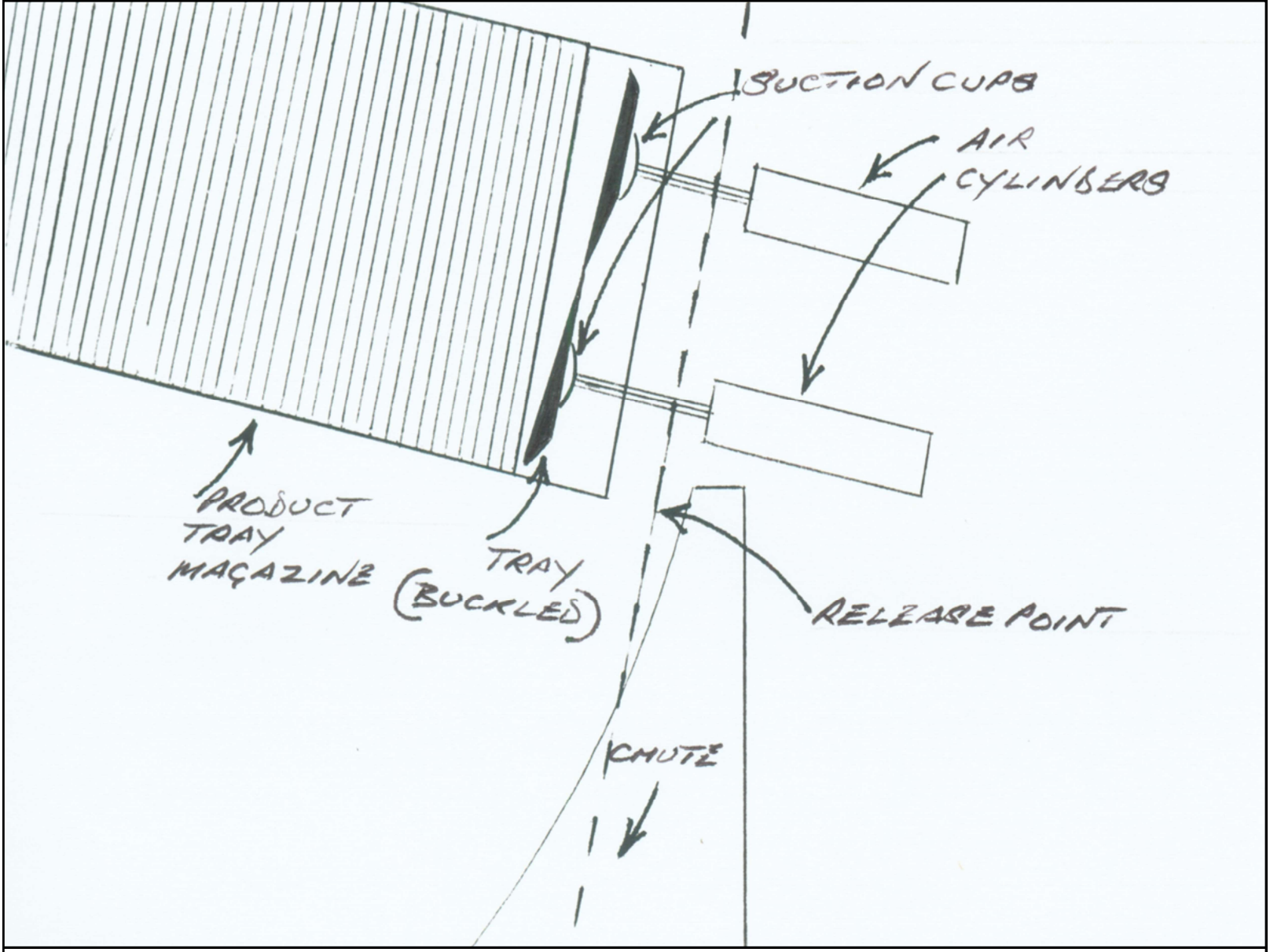
The sorbet would flow down the separator pipe and fall into one rework churn/barrel and the ice cream extruding out the other two rotating extruder nozzles would deflect off the attached plate and fall into another rework churn/barrel. This now made it possible to rework the product because both ingredients are now separated from one another.

When the operator was ready to begin making product the separator device was simply pulled out from the stationary extruder nozzle. It could be re-inserted at any time for minor stoppages and idling during production.

This reduced the amount of ice cream scrapped ice cream to reworked ice cream from 5 thousand gallons to 500 hundred gallons per year yielding a cost savings of $47,000.00.

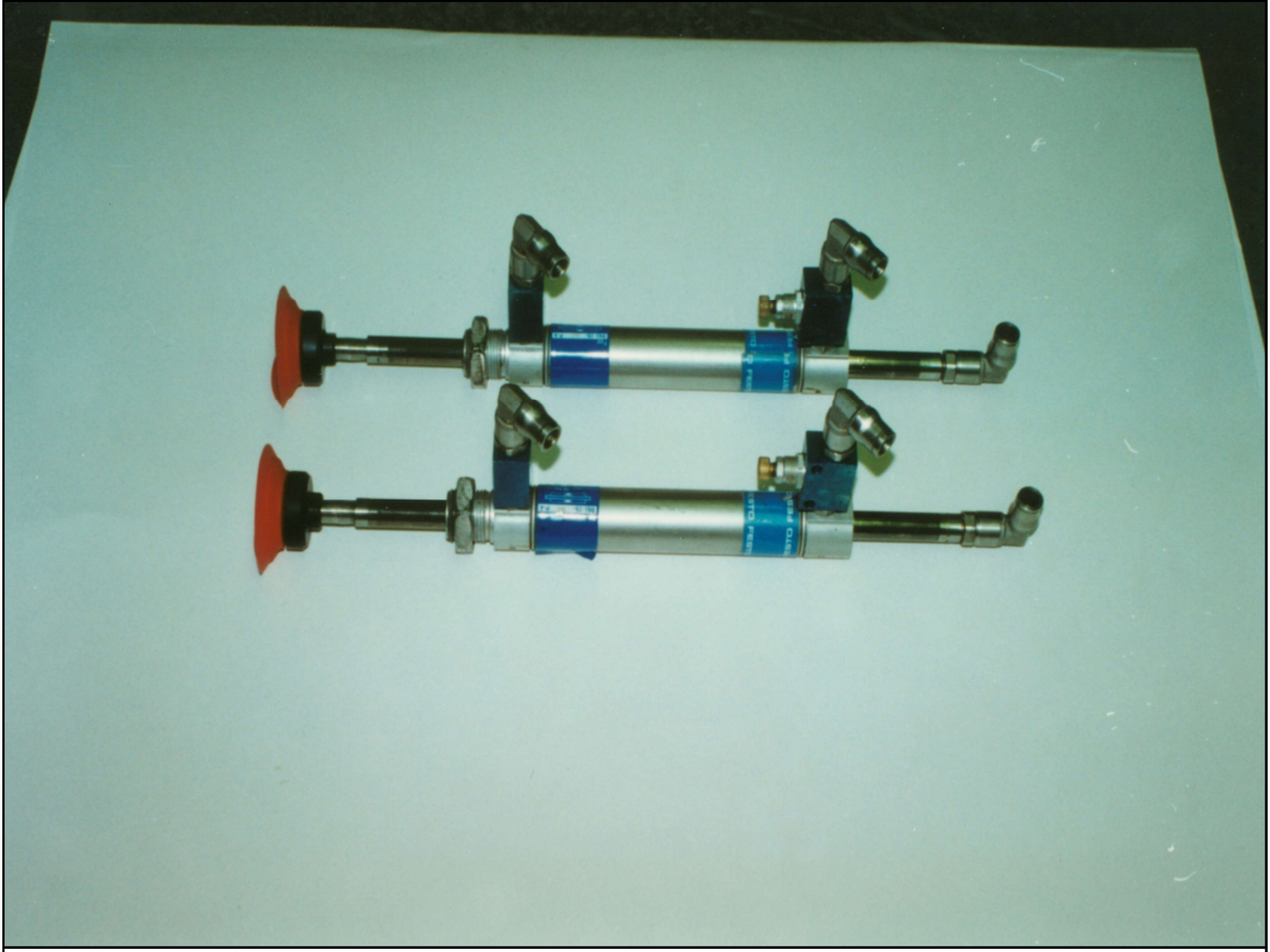


Picture showing the separator installed.



This drawing is an illustration of a product tray dispenser. Problems with pick and place selection were encountered as air cylinder in/out and vacuum on/off timing had to be in perfect unison with this original two air cylinder configuration.

These miss-selections were causing jams resulting in minor stoppages and idling and some product scraping.



To rectify this problem I replaced the two air cylinder configuration with a single air cylinder and with an oblong suction cup shown on next side.

Picture here showing the oblong suction cup and using only one of the two original air cylinders.

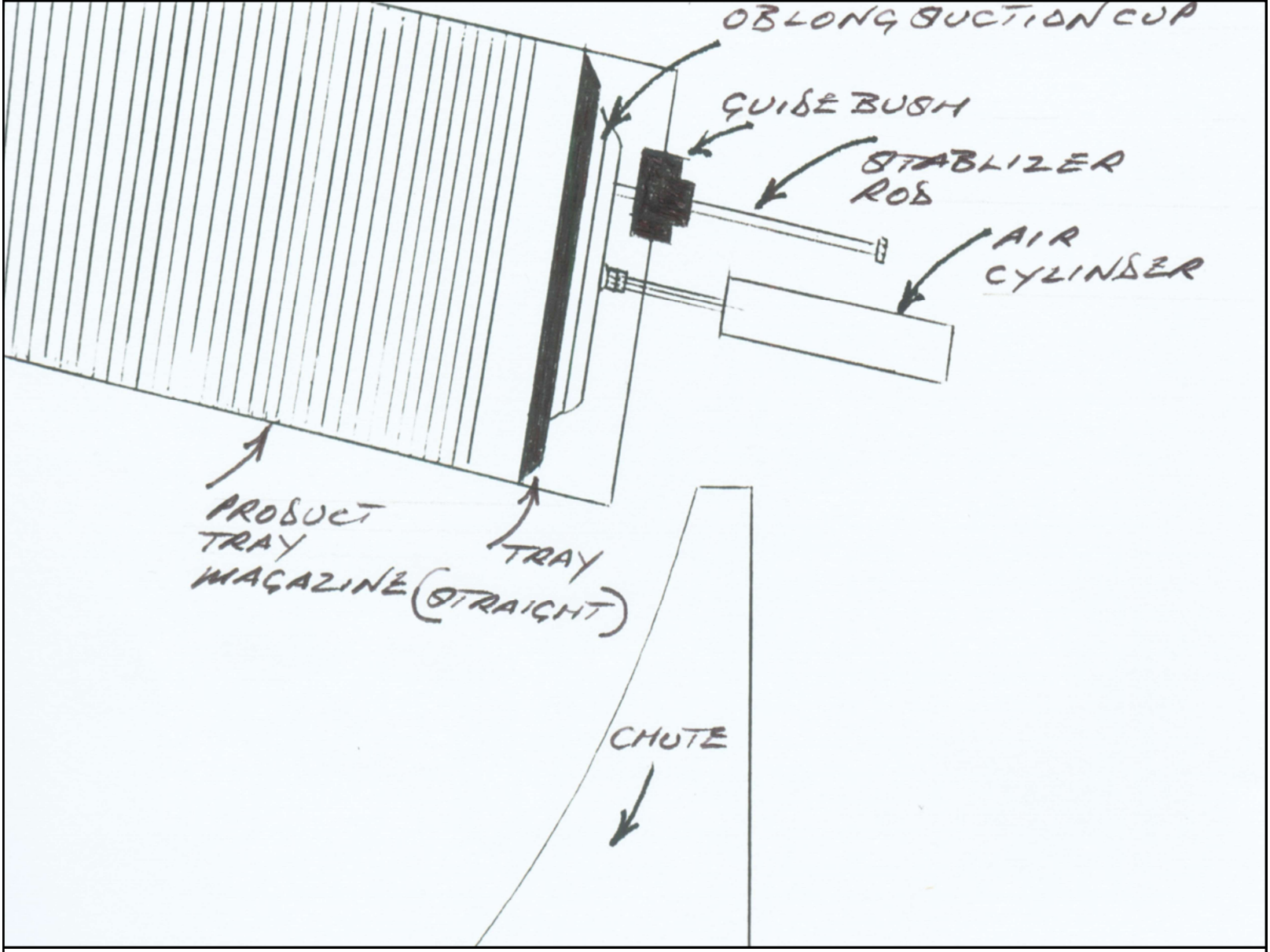
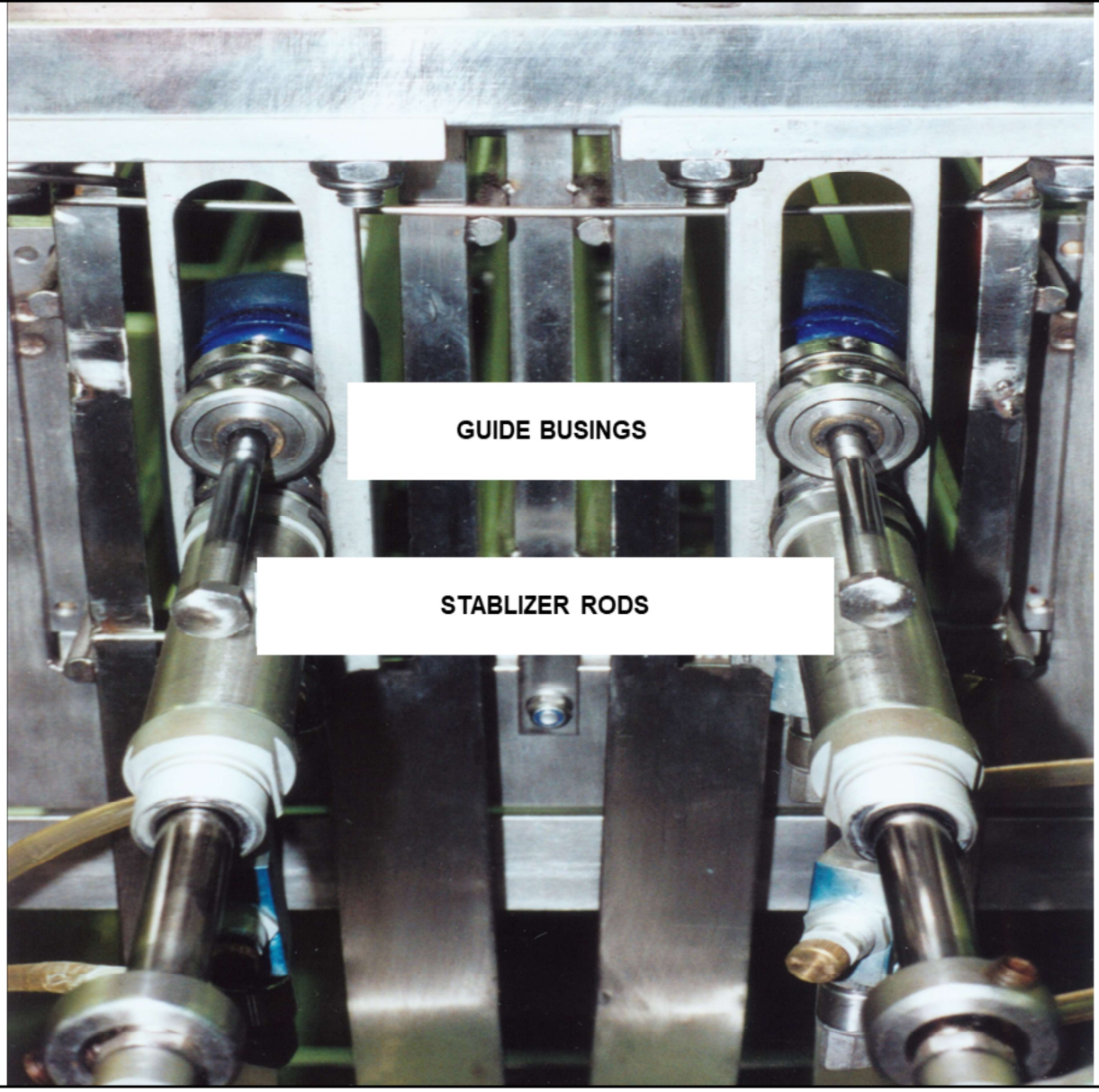
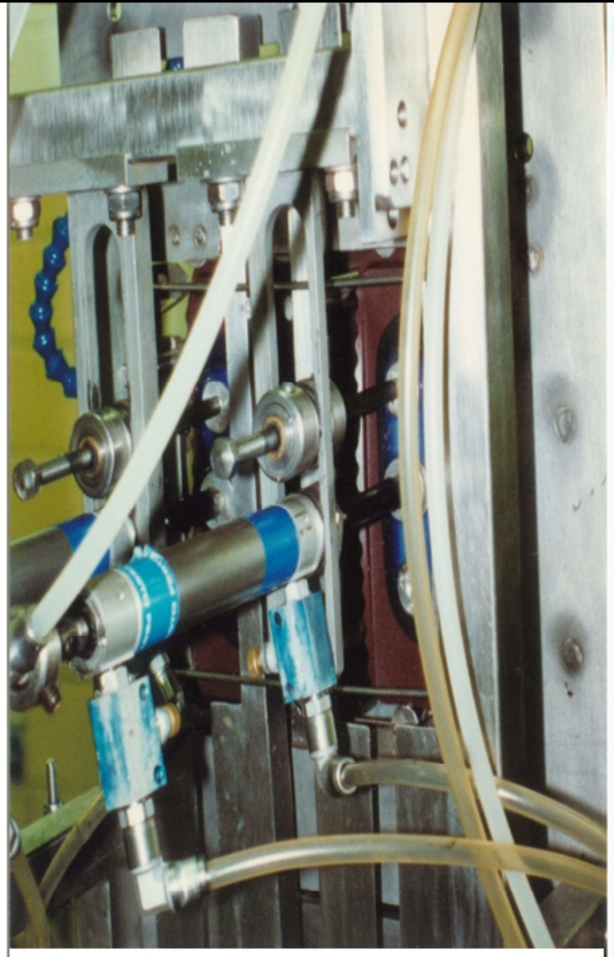


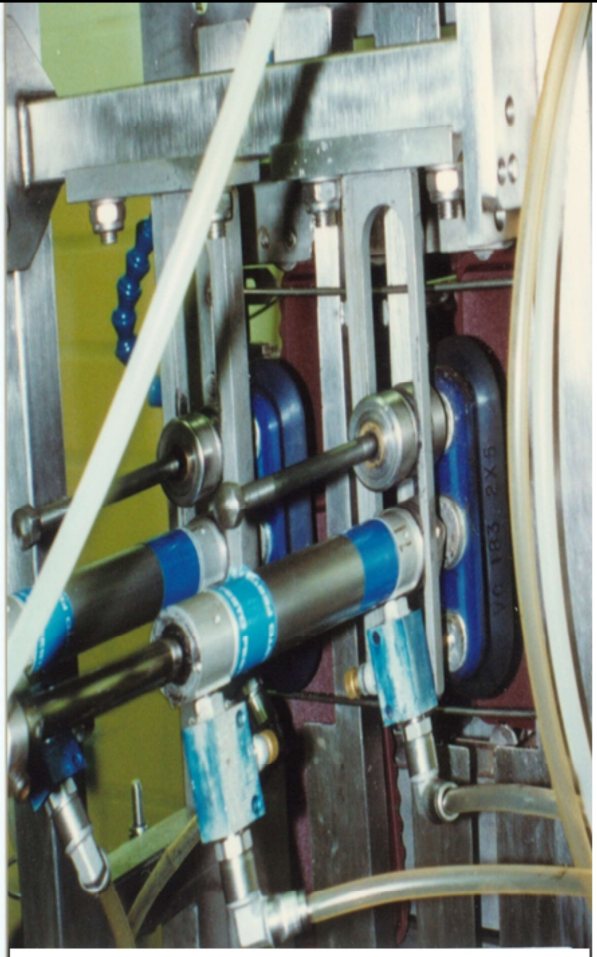
Diagram showing the modified method of single air cylinder use with the oblong suction cup to select pick and place the product tray from the storage magazine to the chute.



I had to fabricate stabilizer rods and guide bushings to prevent the now oblong suction cup from rotating on the axis of the air cylinder piston rod, thus keeping it in a vertical attitude.



AIR CYLINDER EXTENDED SELECTING
(VACUUM ON)



AIR CYLINDER RETRACTED RELEASING
(VACUUM OFF)

Final picture showing the improvement in action.