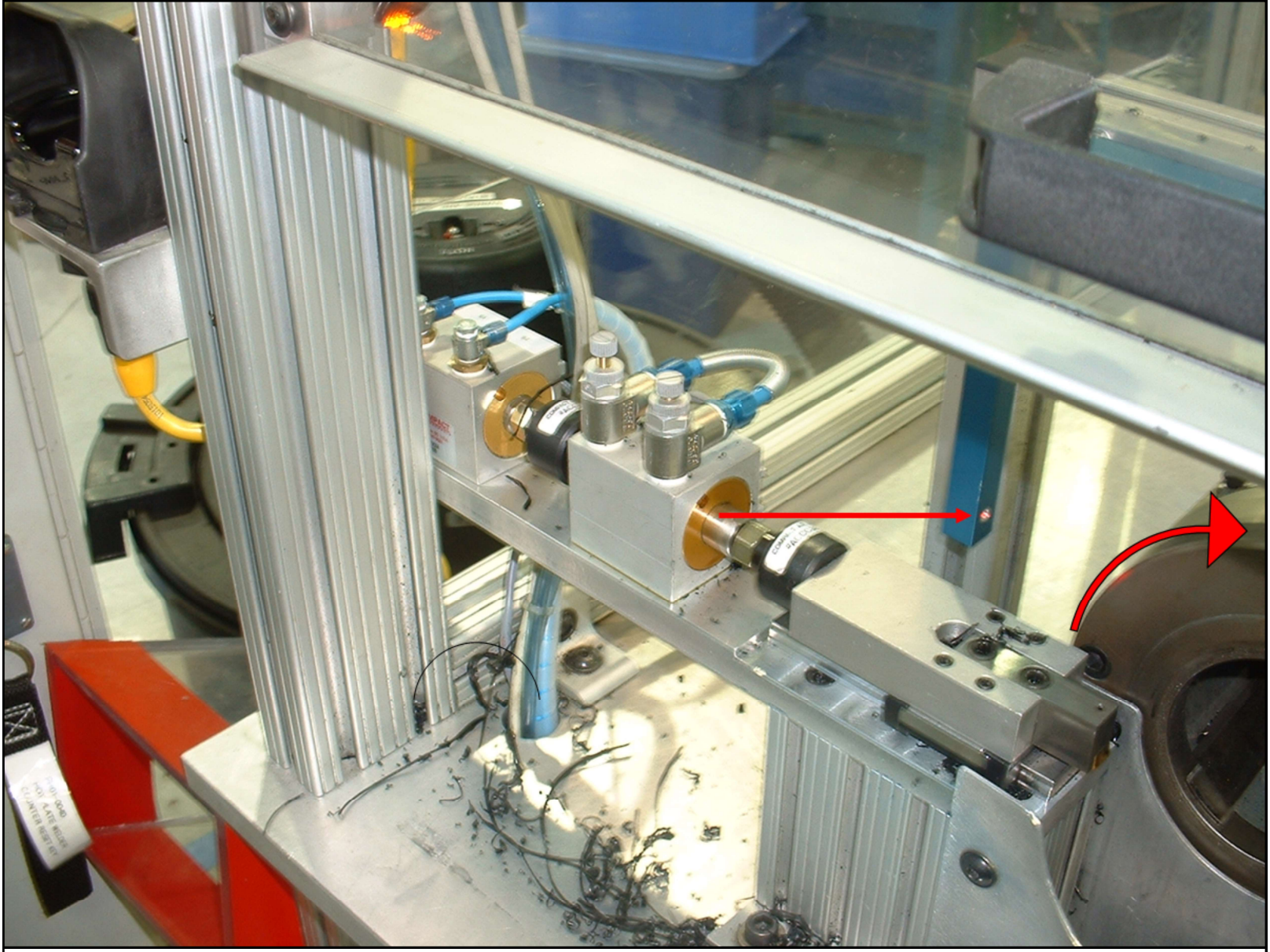
Problem here was a machine that was used to trim excess plastic from a flange of a gas filler nozzle neck for a well known luxury car manufacturer after a vulcanizing process.

The trim tool feed rate was very difficult to control the air cylinder extension speed resulting in jams and tool and product damage. I solved this problem by adopting an air-over-oil configuration using an another identical air cylinder mounted and connected to the through piston rod of the air feed cylinder.

The additional cylinder I filled with hydraulic oil and looped the extension and retraction ports with air hose using compression fillings to prevent leaks. I had to make a new longer mounting bracket too.

This modification allowed the speed of the extending tool to cut and trim into the product surface with a much improved uniform feed rate and far greater rigidity, no ‘bouncing’ of the cutting tool.



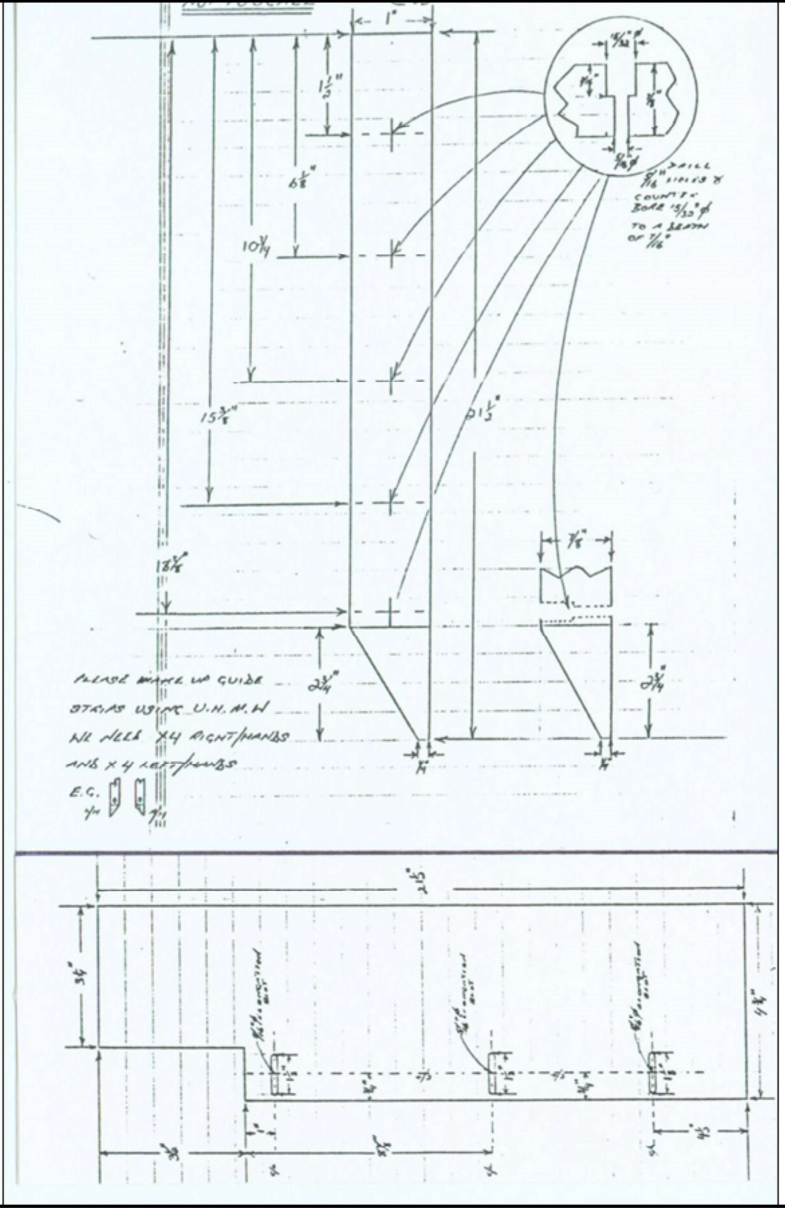
Final configuration showing the full assembly of the tandem arrangement of air-over-oil. Another modification I had to make was the installation of a fixed alignment through-beam sensor mounted over the part clamping chuck - see arrowed.

This very fine through beam was used as a mistake proofing over check to make sure the part to be trimmed was fully inserted into the part clamping chuck. The sensor was programmed into the PLC in a manner that would not allow the machine to start if the part was not inserted all the way into the clamp chuck and would stop the machine during operation if the part became dislodged.

This is a vertical guide rail for a product conveyor tray. The guide would wear out quickly, so much so that the product tray would have enough lateral play on the right hand side and left hand side that jamming of the product conveyor tray happened often.

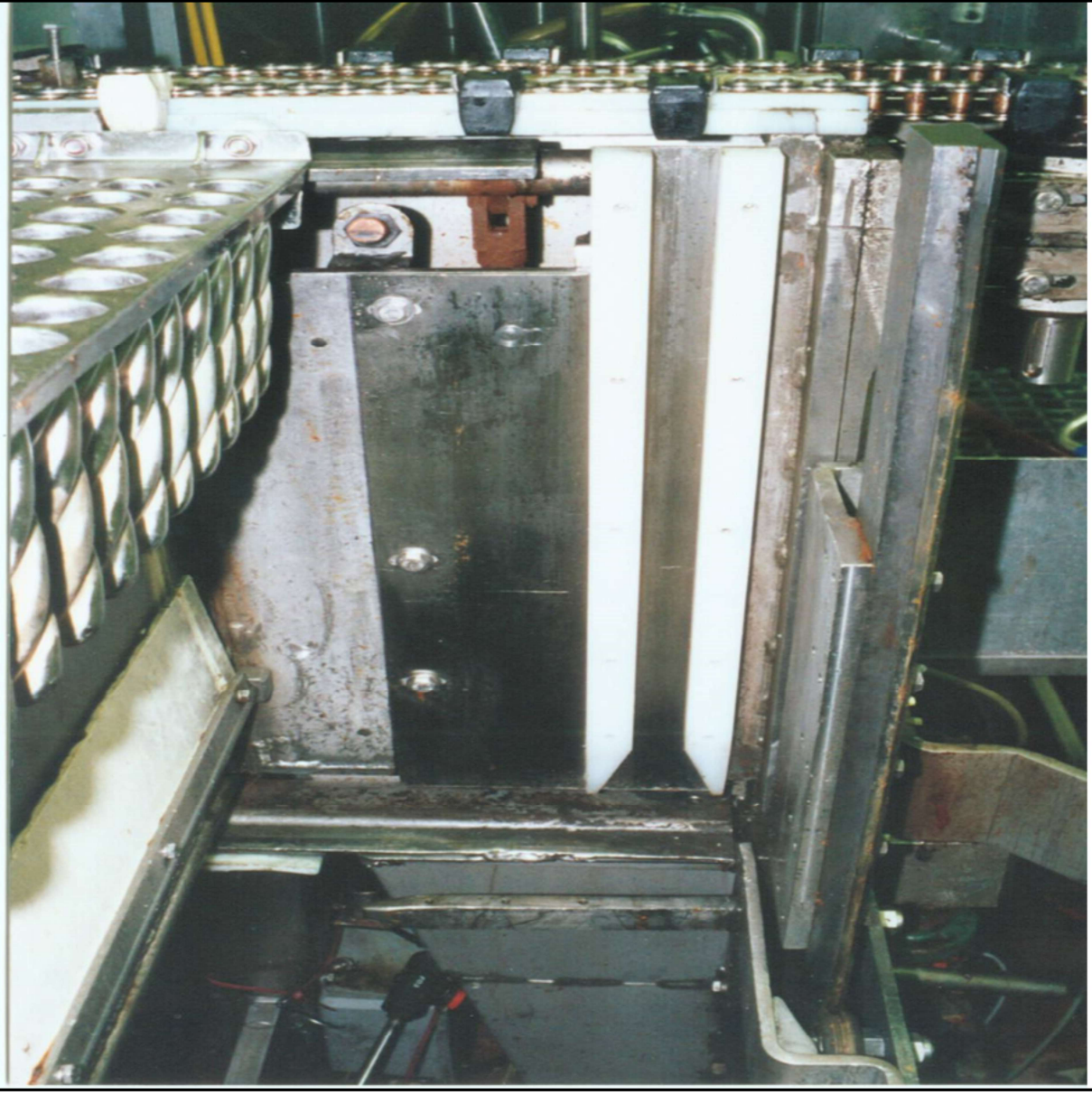
To rectify this weakness in design I redesigned the guide rail with a mounting metal plate to attach the guide rail to and changed the material that it was made from nylon to UHMW.

This significantly increased the service life of guide rail and replacement was made simpler.

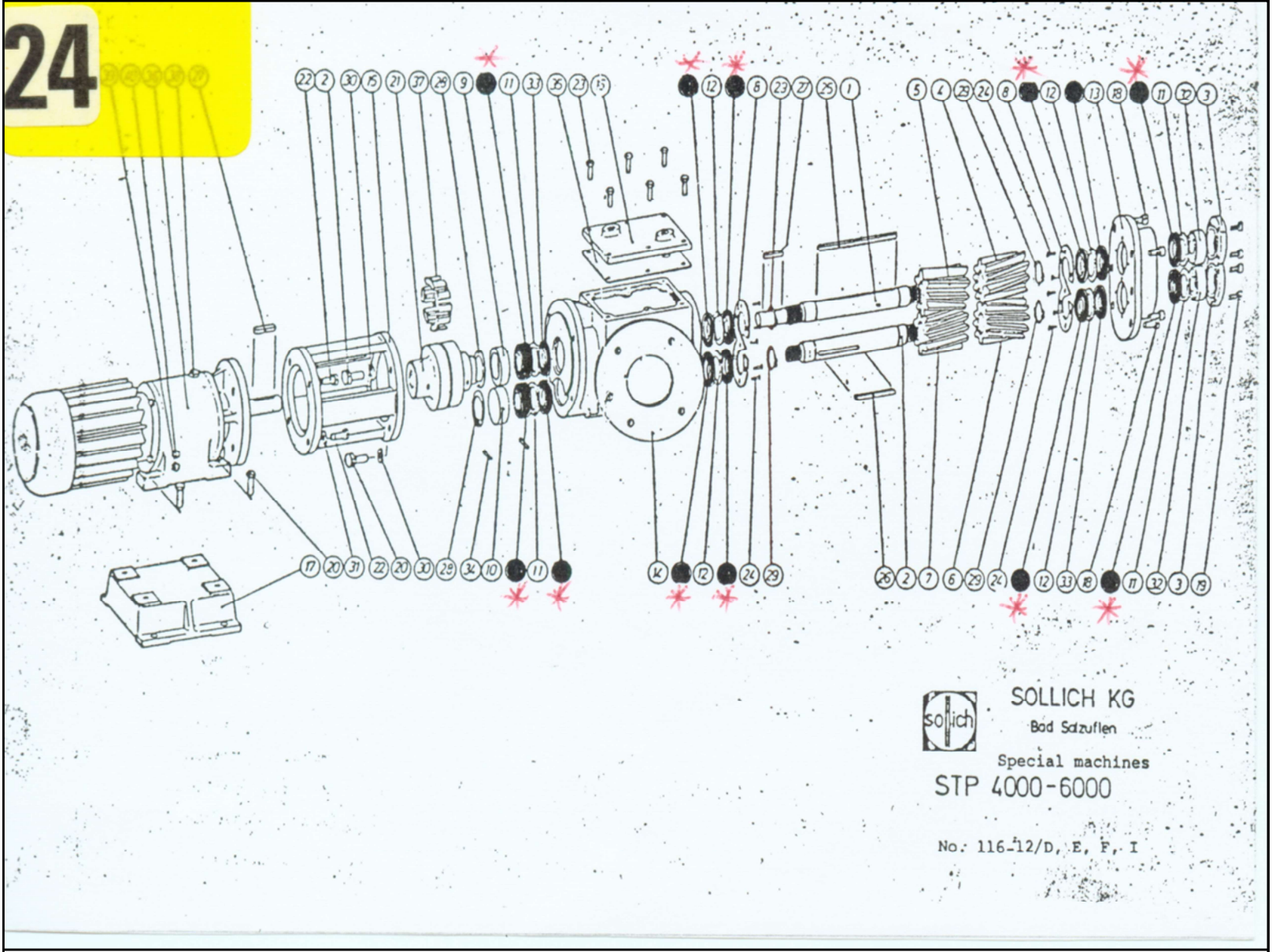


Drawing that I made showing the re-designed vertical guide rail with mounting plate.

Pictured right is the old design of the vertical guide rail and the shown left is my re-designed improvement.



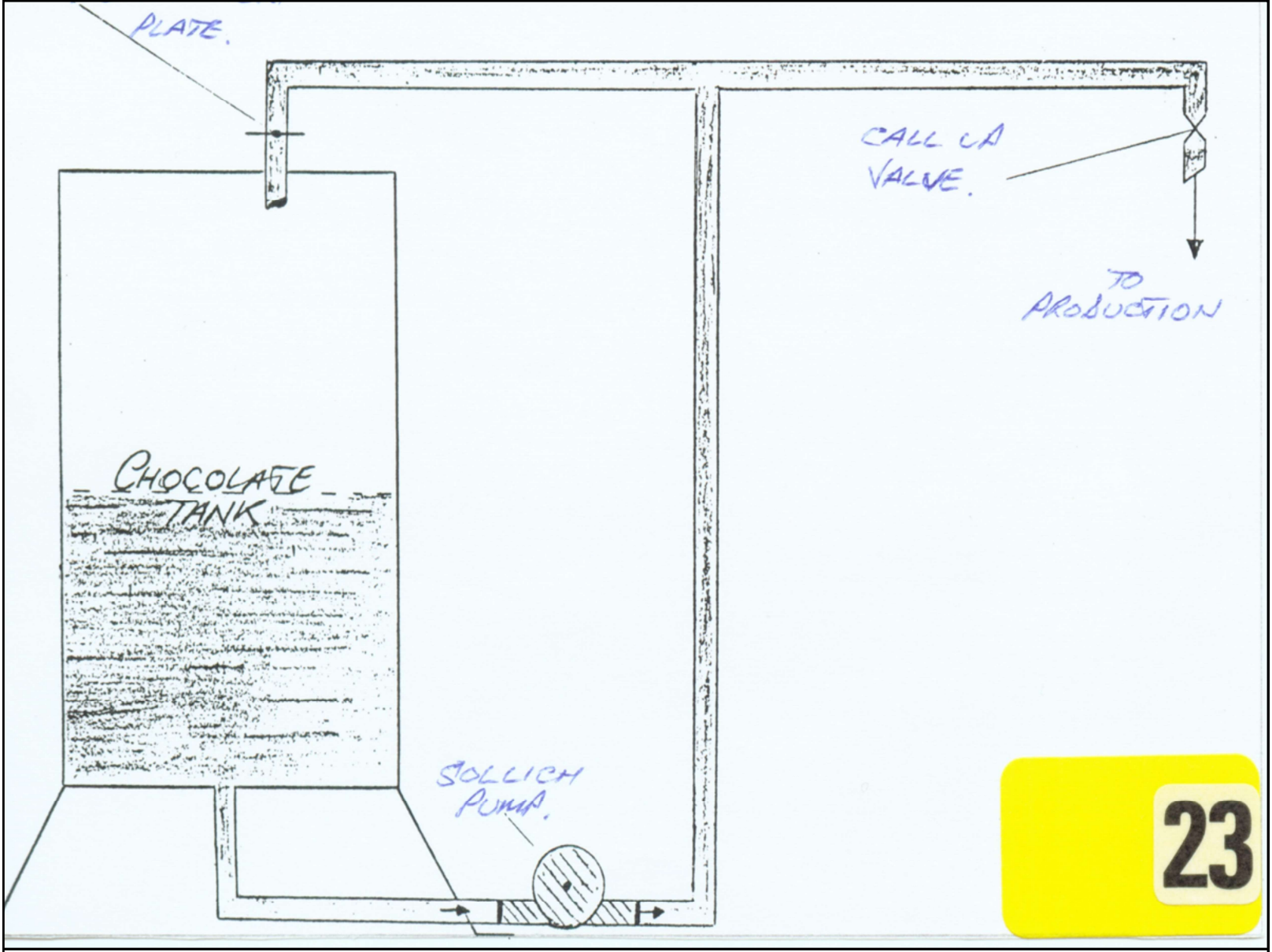
Photograph showing my re-designed vertical guide rail installed in the machine.



This is an exploded diagram of a ‘Sollich’ food grade gear pump used to pump chocolate from a storage silo to an intermediate production vat.

It was a routine PM that this pump be changed out once a week as the failure rate was less than that. I had to question ‘how’ and ‘why’ it failed so often, what was the failed state, the failure mode, mean-time between failure, how long it took to replace it and associated costs in labor and materials.

During a examination of the pump in detail chocolate was entering the gear shafts bearings and forcing out the sealed-in food grade lubrication grease and quickly embittering the inner and outer races of the bearings leading to seizure.

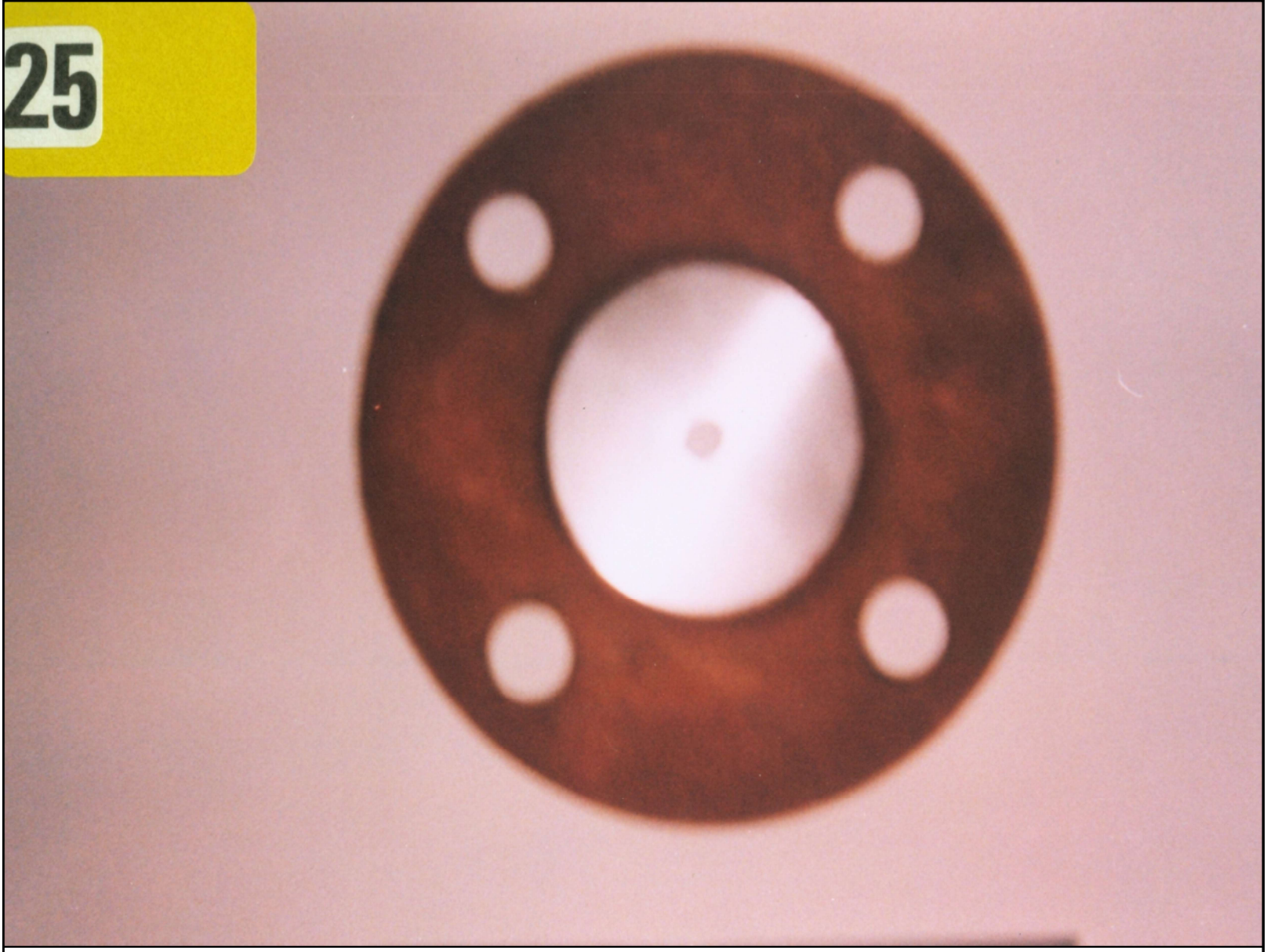


During my surveying of the system, it was important for me to understand the principles of operations any standards, interacting elements and then quantify the differences. During the interval periods when chocolate was not required the chocolate would be circulated from the bottom of storage silo to the top. I discovered that in order for production to have an immediate supply of chocolate when they needed it a restriction plate had been installed in the return pipe at the top of the silo. The plate had only a ½" Ø diameter hole made in it.

I found out that this plate was installed years ago as production had complained that the supply of chocolate took too long to reach them as it had to be redirected from the circulation loop to travel some 80 feet of pipe and throughput was low.

The pump during circulation was basically deadhead as the pump was rated at 30 gallons a minute such a throughput could not possibly flow through a ½" Ø diameter hole in the restriction plate. I also took a measure of the pressure output and it was 235 psi, 135 psi above the manufacturer's upper specification performance limit.

This excess pressure was forcing the chocolate into the bearing seals and accelerating their deterioration – premature failure.



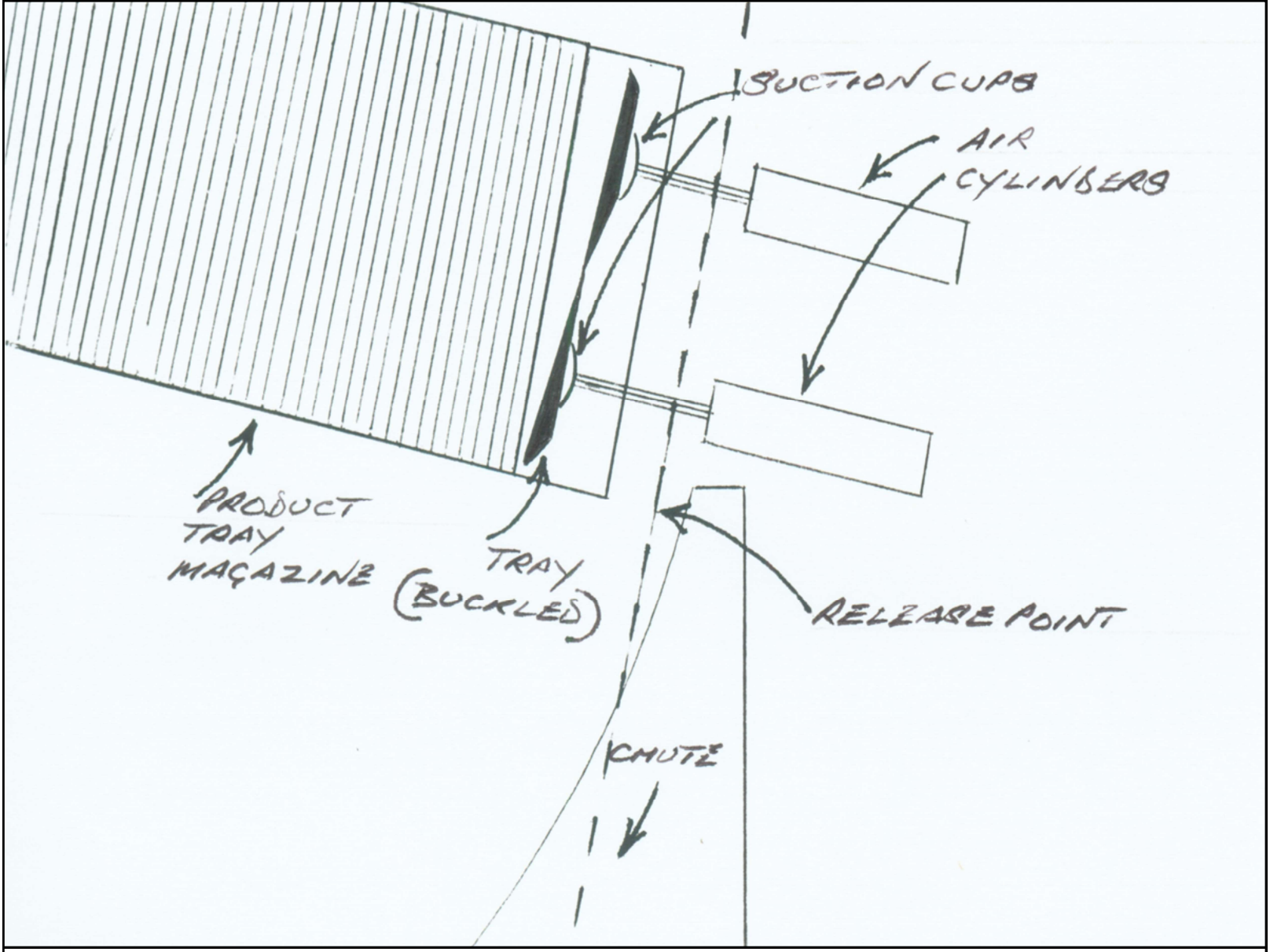
Picture showing the restriction plate with the ½” Ø diameter hole that was installed in a flange coupling on the return pipe.

This is what I contrived to rectify the problem: I removed the restriction plate and in its place I installed a used, but in clean working condition a food grade pneumatically actuated gate valve.

To keep the cost of modification down I simply ran a 80 feet length of pneumatic tubing to a call-up 3/1 palm operated port valve close to the production chocolate storage vat. I had to install a guard around the palm button in such a manner to prevent it from being held in by some mechanical invention of our production colleagues not wanting to stand there holding the palm button in...

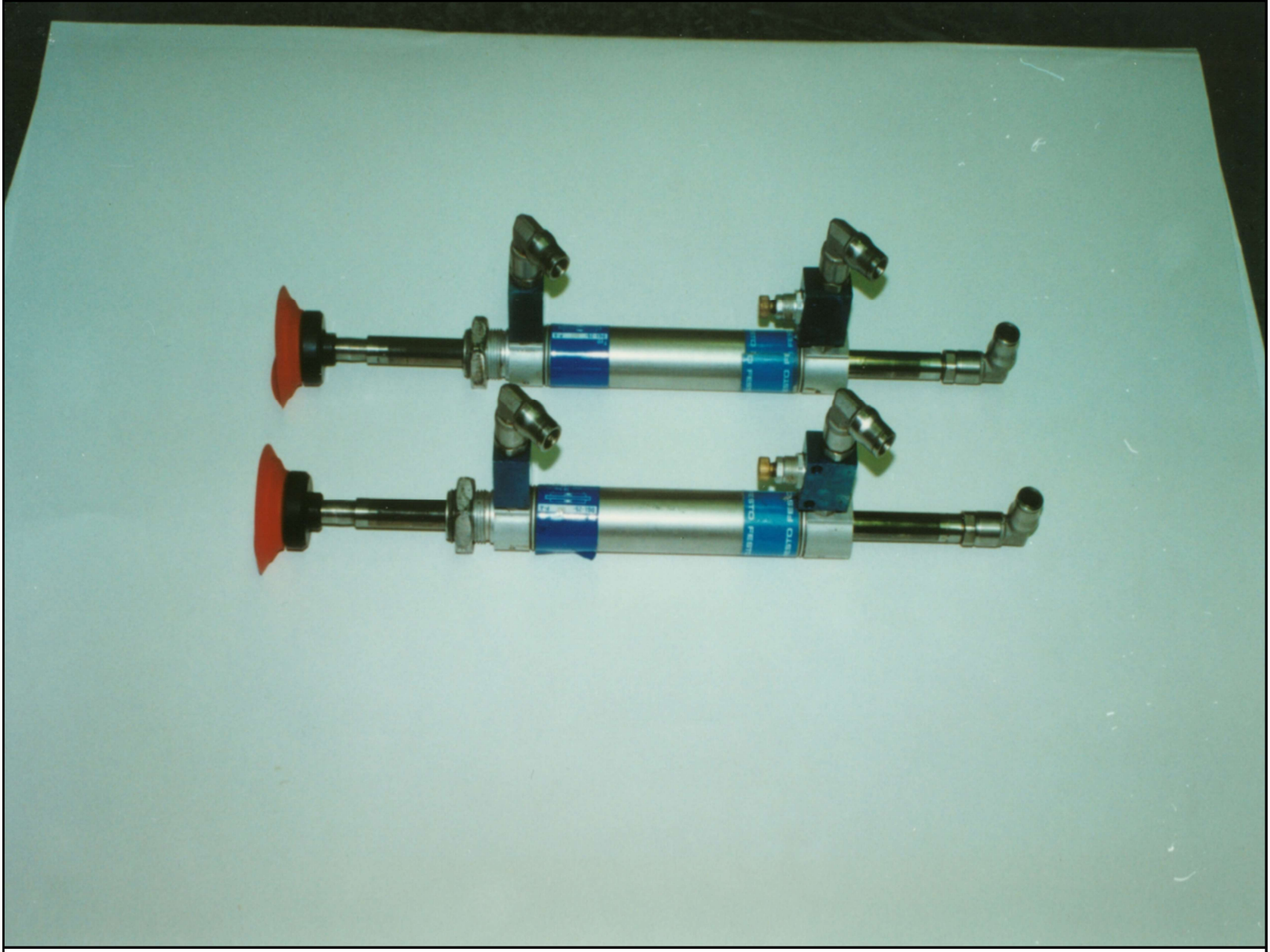
I made a deal with production because they would have stand there holding the palm button in and wait about 15 seconds for the chocolate to re-direct from the circulation loop pipe to the delivery line pipe. I cited that waiting 15 seconds is preferable to waiting 2 hours should the pump fail and need replacing between PM replacement.

This eliminated the problem and the PM task was removed from the PM schedule and there was no need to have resources to re-build pumps nor have so many on hand plus there was a savings in the cost of materials, not to mention downtime stoppages costs…



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.

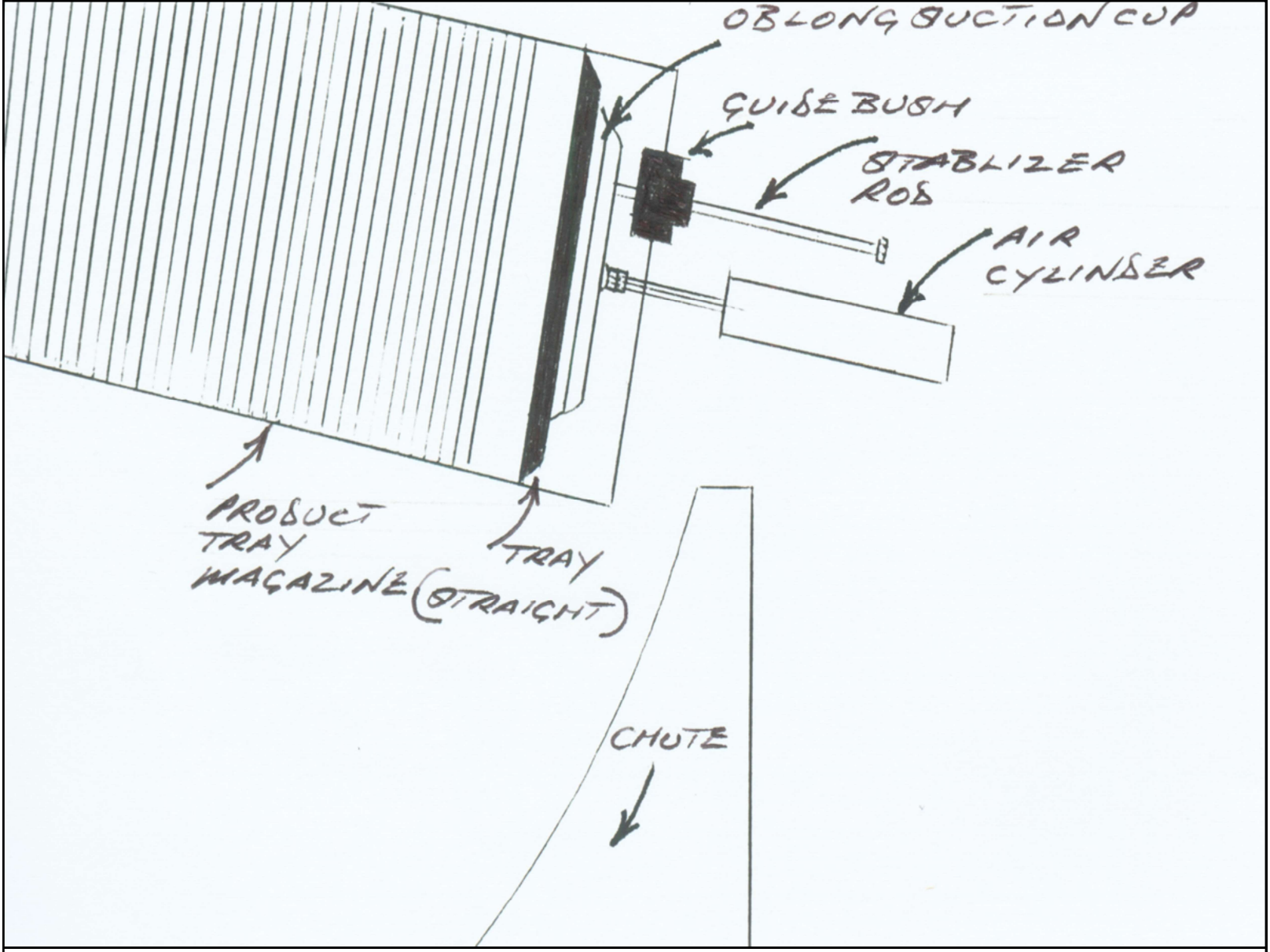
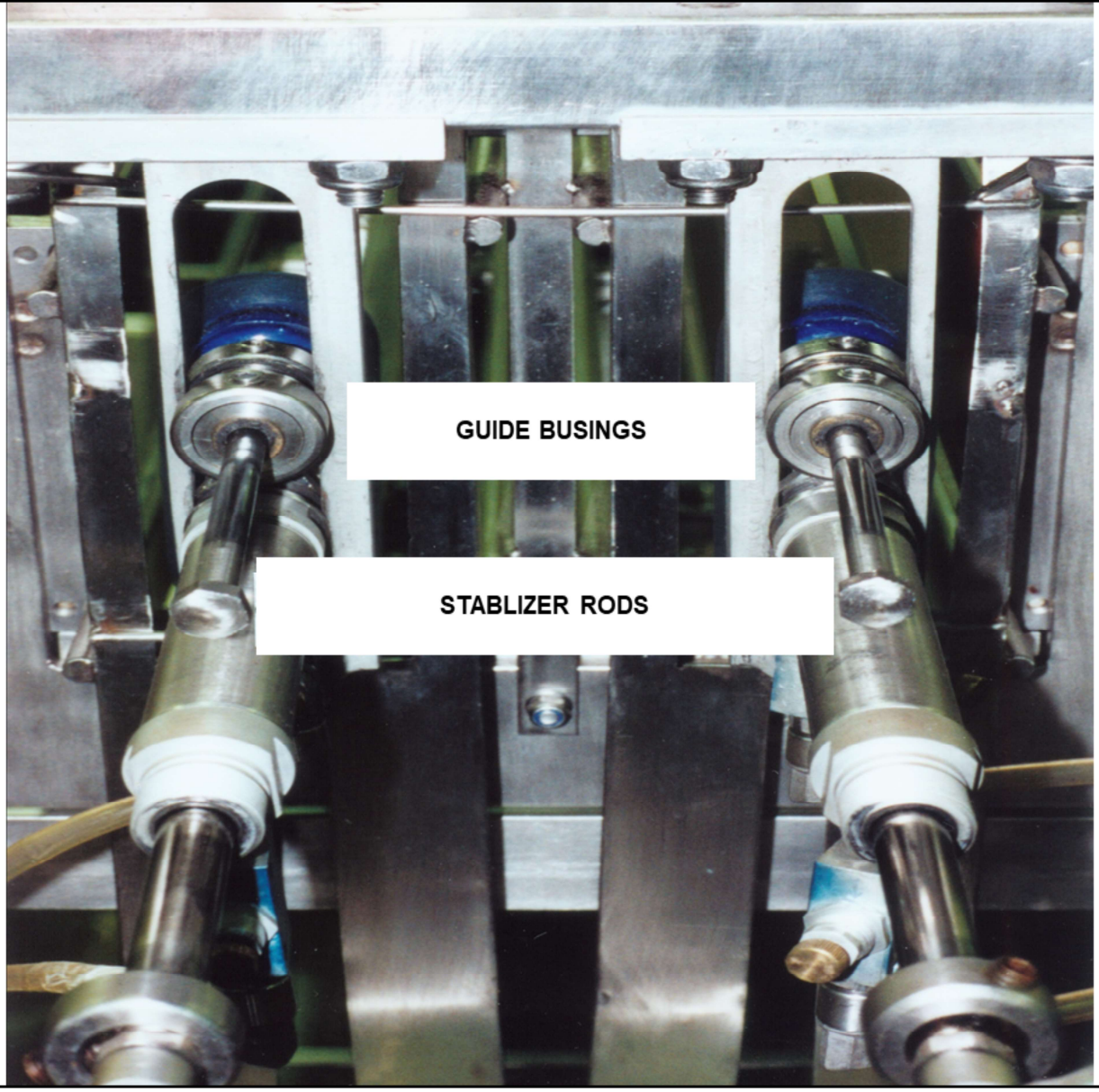
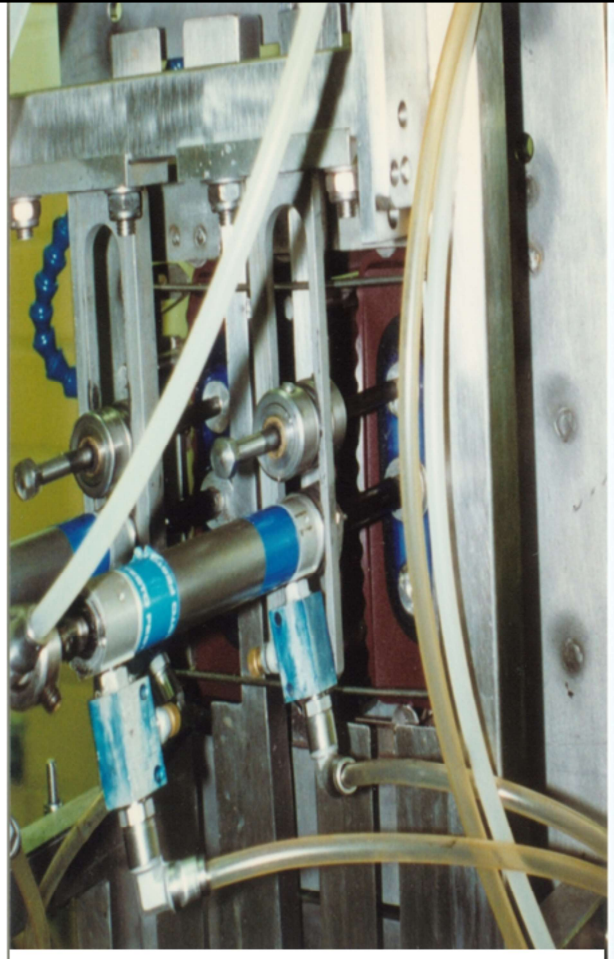


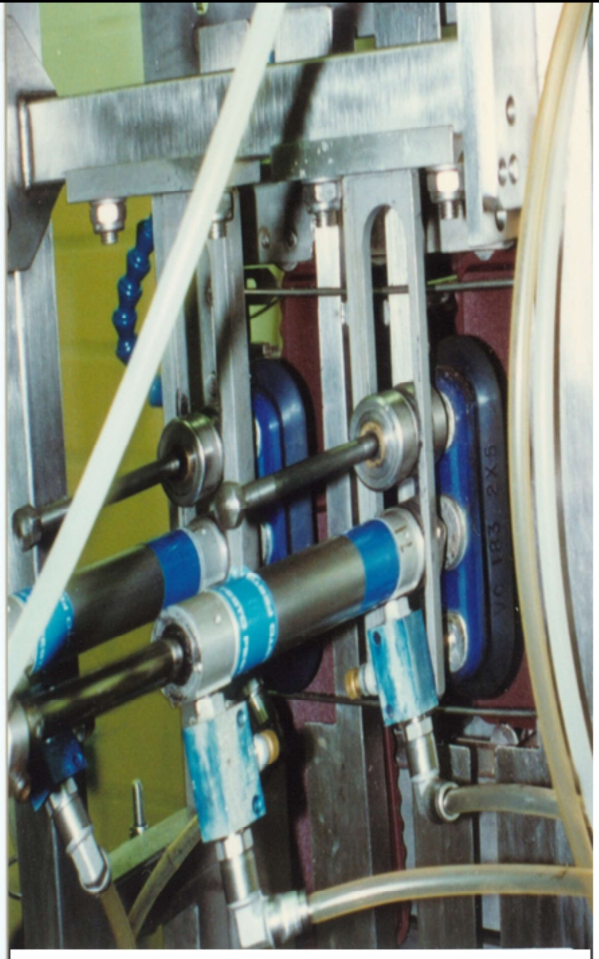
Diagram showing the modified method of single air cylinder use with the oblong suction cup to select pick and place the product tray from the storage magazine to the chute.



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.