INDEX
ENCAPSULATION EQUIPMENT, LLC

Index K Series Encapsulator

Set Up and Maintenance Manual

INDEX
ENCAPSULATION EQUIPMENT, LLC

Table of Contents

Safety Guidelines ..... page 2
Contact Information ..... page 3
Introduction ..... page 4
Machine Description ..... page 5
Set Up Procedure ..... page 7
Disassembly for Cleaning ..... page 10
Maintenance Before Re-setting the Encapsulator ..... page 11
Trouble Shooting Guide ..... page 13
- Sorting Stations ..... page 14
- Powder Section ..... page 20
- Faulty Capsule Ejection Station ..... page 26
- Closing Station ..... page 29
- Ejection Station ..... page 33
- Cleaning Station ..... page 35

Maintenance Schedule ..... page 37
Maintenance for Main Shaft Components ..... page 39
Top Cam of Segment Turret ..... page 42
Recommended Spare Parts ..... page 43

For Your Safety!

Do not bypass the guard interlocks.

Be aware of where the Emergency Stop Button is located.

Disconnect and lockout the electrical supply when working inside the electrical panel.

Turn off the air supply when working on the pneumatics.

Do not reach into the machine while it is in Jog mode.

Be aware of the location of other personnel and warn them when the machine will be started.

INDEX
ENCAPSULATION EQUIPMENT, LLC

For technical assistance contact:

Tom Reilly – Service Manager
908-399-5185

For parts sales contact:

Brendan Kelly – Sales Representative
267-387-3000

The purpose of this manual is to give the operators and mechanics that perform work on the Index K series encapsulator a comprehensive overview of the set up settings, routine maintenance, and trouble-shooting.

It is designed to ensure optimum machine performance and minimum down-time.

Each section of the encapsulator will be addressed in detail followed by a general trouble-shooting guide.

Machine Description

The K Series encapsulator is a high speed machine designed to separate, fill with powder or pellets, and re-close gelatin capsules at an output of 1500 to 2000 capsules per minute.

There are twelve steps involved in the process of separation, filling, and closing. Each step is controlled by a series of mechanical cams and arms, which are driven by a main electrical motor.

The capsules are carried through the different steps in segment blocks that are specific to the size of capsule being produced. Size of the capsules can range from #000 which is the largest to #5 which is the smallest.

The machine operates in an intermittent motion. That is, the segment blocks index around the machine, stopping momentarily at each of the twelve positions. At each position, a specific action occurs and then the segments index to the next position. The indexing continues until all twelve steps have been completed.

Because of the cam drive mechanism, each step is independent of the others.

However, mis-adjustment or improper set up of a particular station can effect the production of the capsules.

The twelve steps involved in the process are:

1. Sorting and separation – outside row of capsules in the segments.
2. Sorting and separation – inside row of capsules in the segments.
3. Rise and retraction of the upper segment.
4. Pellet feeder station before powder, if equipped.
5. Powder filling.
6. Pellet feeder station after powder, if equipped.
7. Faulty capsule ejection.
8. Segment inspection.
9. Fall and extension of upper segment.
10. Capsule closing.
11. Capsule ejection.
12. Segment cleaning.

Refer to diagram # 1.

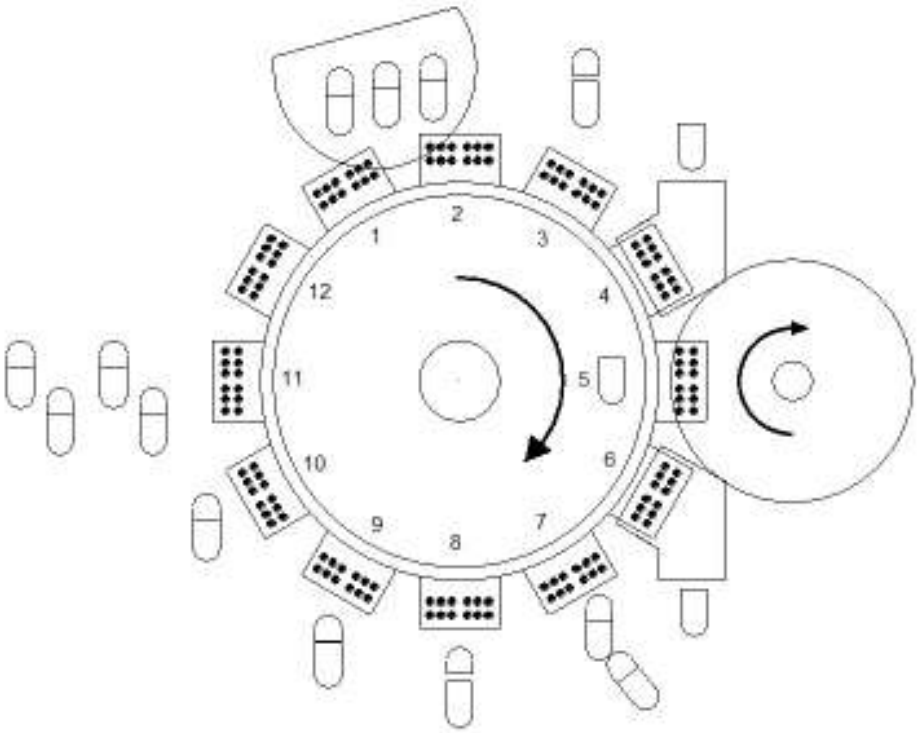

Diagram # 1

Setting Up the Index for Production

Each person will have a different method or procedure for setting the encapsulator up for production. There may be differences in how far the machine was disassembled for cleaning purposes or for routine maintenance.

Following is a step-by-step instructional guide for installing the capsule handling and powder feeding parts. This guide is used when the machine is clean and the segment turret is assembled. There will be additional instructions on assembling the segment turret later on in this manual.

CAUTION!

Be aware of the location of other personnel around the machine. Use the motor hand wheel if uncertain about a setting!

1. It is best to install the sorting station parts before the capsule segments are put on. There is more room in this area to work with at this point
2. Install the horizontal sorting fingers. Be certain that the size number that is stamped on the part faces up. The fingers are self-aligning having no adjustment.
3. Install the sorting block. There are dowel pins on the magazine housing that align the sorting block. It might be necessary to move the sorting fingers back before putting the block on.
4. Install the capsule magazines. There is a left and a right side magazine determined by the position of the capsule actuator roller. Some magazines are self aligning being installed onto fixed studs while others need to be aligned before the screws are tightened.
5. Install the two small capsule hoppers. There is a left and a right side hopper. The top hole in each hopper must be in line with the hole in the large capsule hopper. Make certain that the capsule magazine does not rub on the inside of the hopper!
6. **It is recommended at this time to rotate the machine using the hand wheel to check for proper set up of the sorting stations.**
7. Install the capsule segments. Install all twelve lower segments. **Secure each segment using the two screws before the next segment is put on.** If the closing and ejection pins are already installed, all twelve lower segments may be put on. If the pins are not installed, do as follows:
8. Install closing pins. Place the pin assembly onto the closing shaft and loosely secure with a Allen screw. Make certain that the "U" shaped capsule size spacer is under the pin plate.
9. Install the closing pin guide plate. Do not tighten the screws at this time.
10. Install a lower segment at the closing station.
11. Have someone turn the motor **hand wheel** while observing the rise of the closing pins. Since the guide plate and pin assembly are slightly loose, any misalignment can be reset. When the pins have extended through the segment, tighten the two screws of the guide plate. **Using the hand wheel, lower the pins so that the segment block can be removed**. Once the segment block has been removed, turn the hand wheel so

that the closing pins again are up through the guide plate. Tighten the screw securing the pin plate.

12. Repeat this process for the ejection pins.
13. There are three places in which to install the upper segment blocks. They are stations 10, 11, and 12. At these stations, the upper segment is extended out over the lower segment and is in the down position.
14. Loosely secure the upper segment to the segment carrier using two Allen screws.
15. Place a segment alignment pin in opposite corners of the upper segment. Tighten the two screws. Check that the alignment pins fall easily through the segment holes. If not, repeat the process or check for damaged segments or segment carriers.
16. When the three positions are finished, the machine can be indexed to bring the next set of three segments around to stations 10, 11, and 12. Repeat this process until all twelve upper segments are installed.
17. Install the capsule ejection chute and air hoses.
18. Install the counter closing block at station 10. Use the spacers that are stamped with the capsule size # to set the height of the block. The remaining spacers go on top of the shaft.
19. Install the vacuum block onto the closing pin guide plate.
20. Install the cleaning station manifold on the two guideposts at station 12.
21. Install the faulty capsule ejection arm. Using the spacers stamped with the capsule size, set the arm height. The remaining spacers go on top of the arm. **Turn the machine using the hand wheel to ensure that the arm is set correctly!** Install the capsule collection hopper.
22. At this time, all of the capsule handling parts have been installed. The machine may be checked by running empty capsules before going on to set up the powder area.
23. Assemble the powder section. Remove the four screws which hold the tamping head to the tamping columns. Using the removable crank, raise the tamping head.
24. Install the center ring in the tamping ring flange.
25. Install the tamping ring.
26. Secure the powder bowl shield to the dosing disc and then place the dosing disc and bowl onto the dosing shaft. Install, but do not tighten the six hex head bolts in the dosing disc.
27. Install the powder bowl cover plate. Before tightening the two screws which hold the cover, check the height of the wiper block. Raise or lower it accordingly and then tighten the two cover screws.
28. Install the tamping pin guide ring. It may be necessary to raise the tamping columns to be able to fit the guide ring. Tighten the two screws.
29. Lower the tamping columns to their lowest position. This ensures that the tamping head is in its extreme down position and that the dosing disc has stopped rotating.
30. Insert two dosing disc alignment pins through the guide ring. Rotate the dosing disc and bowl until the pins fall easily through the dosing disc holes. Tighten the six hex head bolts. Double-check the alignment.
31. Install the tamping pins. Place the tamping pins through the guide ring holes. **Do not drop the pins as they may damage the brass tamping ring!** At the transfer station, a flat piece of sheet metal must be placed on top of the lower segment that is below that station to prevent the pins from going too far down.

32. Lower the tamping head using the removable crank. The tamping pins at the transfer station will enter the tamping pin holder before the other five stations. Once the pins have fully entered the holder, move the locking slide until the securing clip is in place. Raise the tamping slightly so that the sheet metal piece can be removed from over the lower segment. Lower the tamping head all the way down. Replace the four bolts that hold the head and tighten.
33. At each of the five tamping stations, lower the pin holders using the adjustment screw and secure the locking slide. Raise the holders to their correct height.
34. **AT THIS TIME, TURN THE MACHINE BY MEANS OF THE HAND WHEEL TO CHECK THAT THE PINS ARE SET UP CORRECTLY! TWO OR THREE ROTATIONS OF THE DOSING DISC ARE NECESSARY.**
35. Install the powder hopper. Place the powder auger in the hopper and then slide the parts into the recess of the hopper support. Secure the three bolts that hold up the hopper.
36. Fit the powder auger shaft onto the bayonet fitting of the drive shaft.
37. Lower the hopper assembly into the bowl area.
38. Attach the powder level sensor cable.
39. The encapsulator is now ready for production.

Reverse steps 1. – 38. for disassembling the Index encapsulator.

Disassembling the Encapsulator For Cleaning

The extent of disassembling the encapsulator for cleaning depends on if a new product will be run next, a capsule size change will take place using the same product, or if a new batch of product will be run.

In addition to removing the size parts as previously described, the segment turret top cam will be removed along with the twelve segment carriers and carrier core.

1. **Do not run the encapsulator under power during this process! Use only the motor hand wheel to rotate the machine.**
2. Remove the faulty capsule ejection air manifold from the top cam.
3. Remove the segment carrier safety cam located at segment station # 3. It may be necessary to have the segment carriers half way through an index to be able to lift the safety cam off.
4. Remove the bolts securing the top cam.
5. Carefully lift the top cam off. It may be required to have two people to do this as the cam is very heavy.
6. Remove all twelve segment carriers. It may be required to rotate the turret to remove certain carriers. **Use only the hand wheel!**
7. Remove the four Allen screws which secure the segment carrier bearing core and lift the core off.

The encapsulator is now at a point where a major cleaning can be performed.

Any liquid that is used in the cleaning process must be completely dried to prevent damage to the machine parts.

Maintenance Before Re-setting the Encapsulator

Prior to re-setting the encapsulator up for production, it is recommended that the following maintenance procedures be performed. This will prevent downtime and ensure trouble free set up.

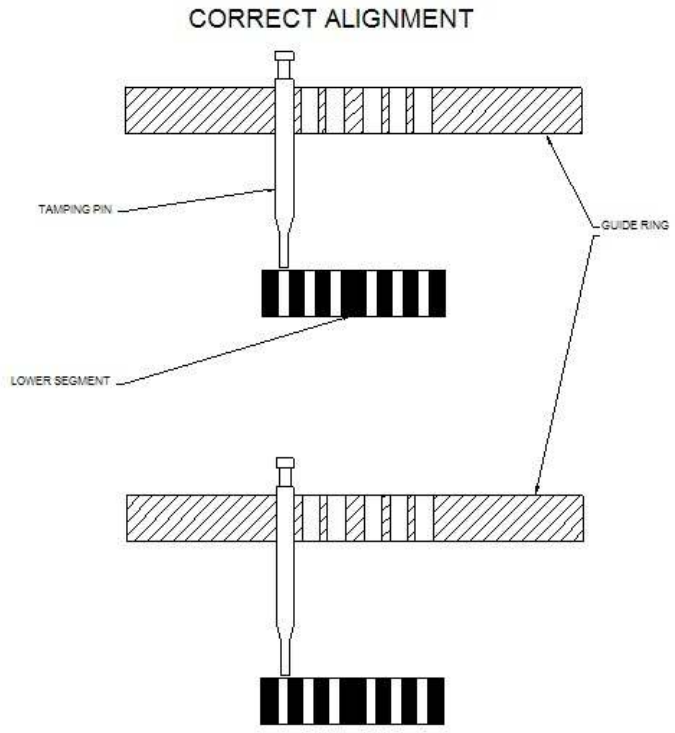

DIAGRAM # 2

- **Refer to diagram # 2**
  Check the position of the segment turret in relation to the powder transfer point. To do this, install only the tamping pin guide ring. The tamping head must be raised far enough to be able to insert a tamping pin through the ring. Install a lower segment – preferably of the smallest capsule size available – directly below the powder transfer point. Rotate the machine by hand so that the tamping pin guide ring is at its lowest position. Insert a tamping pin through the guide ring and check its alignment with the hole in the lower segment. **It must be centered.** If not, there are eight hex head bolts under the segment turret star wheel that secure the turret position. Loosen these bolts and center the segment under the tamping pin. Retighten the eight bolts. This is the only area where the turret can be truly aligned.
- Check to see if there is any play in the drive bevel gears that rotate the segment turret. Turn the machine by hand so that the segment turret is starting to rotate. Apply the motor brake. Grab the turret and try to rock it back and forth. If the gears are secure, the turret should not move. There might be some play in the

drive chain, which is acceptable. If there is excessive play, the gears may not be meshing properly or there may be wear in the indexing drive yoke.

- Repeat the above procedure for checking the powder rotation index.
- Lightly oil the main drive chain.
- Lightly oil the flat guide bearings in the separation housings.
- Grease the bevel gears in the separation housings along with the "U" shaped drive blocks (two in each housing).
- Grease any fittings on the main shaft drives and check the condition of the grease on the cams and main shaft bevel gears.
- Check the condition of all connecting rods and end bearings.
- Check the condition of all actuating arms and their cam followers.
- Clean or replace any dirty vacuum filters.
- Clean and re-grease the segment carrier core.
- Check to ensure that all segment carriers are moving freely.
- Check the condition of the tamping springs in the holders. Replace them if broken.
- Check the height of the tamping ring. Make sure that it is sitting firmly in the flange and not rocking at any point.

Detailed Set Up Instructions
And
Trouble Shooting Guide

The following sections discuss, in detail, the set up procedures for each station in the capsule filling process of the Index. At the end of the sections is a general trouble shooting guide that addresses the most common problems or issues associated with that particular area of the encapsulator.

Sorting Stations

The sorting stations feed the empty capsules from the supply hopper to the capsule segment blocks. During this process, the capsules are oriented such that they enter the segments bottom side first.

The following parts or assemblies make up the sorting stations:

- Vacuum system – This can either be an internally mounted pump or a supply coming from in-house.
- Vacuum shoe – The shoe is s brass or plastic part that goes up against the bottom of the lower segment to apply vacuum when the capsules are being inserted.
- Separation pins – The pins prevent the capsules from being separated prematurely as they enter the segments.
- Sorting block – The sorting block is part of the system that orients the capsules correctly prior to entering the segment.
- Sorting fingers – The fingers push the capsules through the sorting block and rotate the capsules to their correct position.
- Capsule magazine – The magazine channels the capsules down from the hopper and places the capsules into the sorting block.
- Capsule hopper (small) – Above the magazine is a small hopper that holds the capsules. This hopper is fed by a larger hopper.
- Capsule hopper (large) – Above the small hopper is the main capsule hopper in which the capsules are filled by the machine operator.
- Separation cam – This cam activates the movement of the separation pins and vacuum shoes.
- Sorting station cam – This cam activates the movement of the capsule magazines and sorting fingers.

Vacuum system:

The supply of vacuum to the sorting stations is integral to having good separation of capsules. The supply must be adequate and consistent. The recommended supply of vacuum is 40m3/h at 0.5 bar.

The vacuum intake line that connects to the separation shoes must be free. Periodically check that the line is not clogged. Some machines come equipped with an inline filter screen, which prevents broken capsules from going through to the pump. On most machines, there is a pre-filter to collect powder. This filter should be checked and cleaned prior to the start of each shift.

Vacuum shoe:

There are two vacuum shoes – each is mounted below the sorting stations. The shoes are different from station to station. At the first sorting station, the vacuum shoe only has holes that correspond to the number of holes in the segment. The first sorting station inserts the capsules into the outside row of holes in the segment. The vacuum shoe at the second sorting station has holes that correspond to the inside row of holes in the

segment along with a series of grooves. These grooves extend to the outside of the machine and are designed to apply a small amount of vacuum to the capsules that were inserted at sorting station # 1.

Prior to set up, check the condition of the vacuum shoes. They must not have any deep score marks or be damaged in any other way.

The vacuum shoes ride up and down on two guideposts at each station. The guideposts are spring loaded. Check the movement by pressing down on the vacuum shoes. They should go down and return up smoothly. If not, they will not seat firmly against the bottom of the segment. Using mineral oil, place a few drops on the guideposts daily.

After the lower segments have been installed, check the movement of the vacuum shoes. If something is not operating correctly, it is a lot easier at this time to work in the area before the other size parts are installed.

When the vacuum shoes are down, there should be a gap between the top of the vacuum shoes and the bottom of the lower segment. The gap can vary from machine to machine but the important issue is that there be some space between the parts. If not, the segments will hit the shoes or wear them out. Also, the gap should not be too large in that the separation pin plate hits the machine top plate. This will damage the pin plate and also wear the separation cam and cam follower.

Any necessary adjustment is made on the two small connecting rods located on the separation arm. Make certain that the adjustment is the same for each station. If not, the shoes can bind on the guideposts.

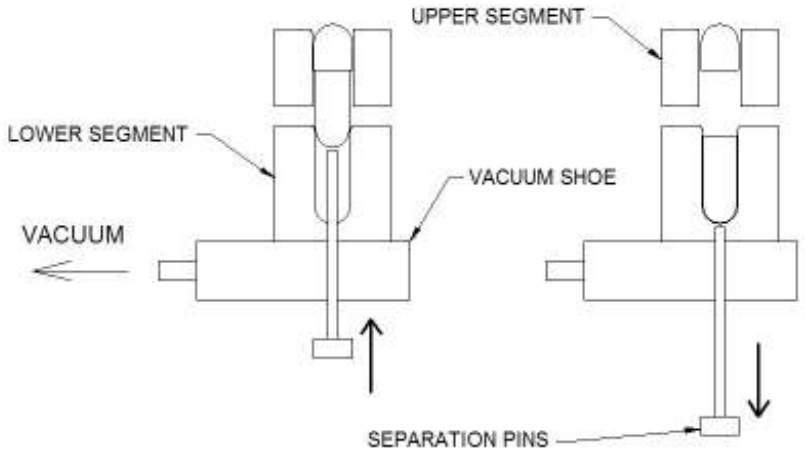

DIAGRAM # 3

Separation pins: Refer to diagram # 3

The separation pins extend up through the vacuum shoes as the shoes seat against the lower segment. They are designed to allow the capsules to “ride” them down as the pins and vacuum shoes move away from the segment. This is to prevent the bottoms of the capsules from being separated prematurely before they have been fully seated into the segment.

The height or how far up the pins extend is adjustable and should be set for each different size of capsule.

On the separation arm is a curved slot in which the pin linkage is connected. Loosening the hex shaft and the outside nut will enable an adjustment. Moving the linkage towards the middle of the machine will shorten the stroke and moving the linkage out will lengthen the stroke.

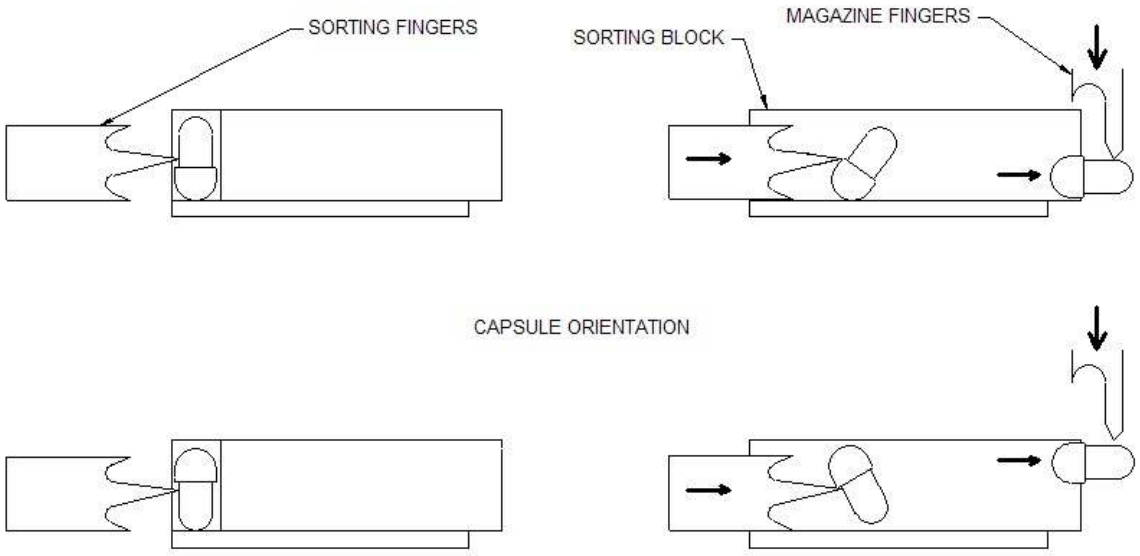

DIAGRAM # 4

Sorting block and sorting fingers: Refer to diagram # 4

The sorting block and sorting fingers are designed for the correct orientation of the capsules. As the capsules are fed into the magazine, it is random in which direction that they are entering. The capsules can be entering bottom first or top first. It is the function of the sorting fingers and sorting block to orient the capsules so that the bottom of the capsules enter the segment first.

When the magazine is in its down position, a gate on the magazine opens and allows one capsule in each channel to release. The capsule falls into the back of the sorting block. As the magazine rises, the sorting fingers start to move forward. The tip of the fingers hits the approximate center of the capsule. Because the top of the capsule is slightly wider in diameter than the bottom of the capsule, the top will drag in the sorting block channel. The channels are sized so that the top of the capsule is somewhat restricted and the bottom of the capsule is free. This causes the capsule to rotate 90 degrees into a horizontal position. If the capsule came down the magazine channel bottom first, the fingers would push the bottom up. If the capsule came down the

magazine channel top first, the fingers would push the bottom down. This action causes all of the capsules to exit the sorting block bottom first.

At the back of the sorting fingers is a slide plate guided by two flat bearings. These bearings should be lubricated daily with a mineral oil.

On top of the slide plate is a "U" shaped block in which the actuating arm is positioned. The block has two slots in it where the mounting screws attach. This block determines the forward position of the fingers, which in turn, determines the position of the capsules as they are pushed out. If the fingers are too far forward, the capsules could fall out of the block before the magazine rotates them again. Or, they might rotate too much by the magazine. If the fingers are too far back, the magazine will not rotate the capsules far enough.

An approximate start setting is to have approximately 2 – 3mm of the top part of the capsule protruding past the front edge of the sorting block.

Capsule magazine:

The capsule magazine collects the empty capsules that are fed down from the hoppers and channels them down into rows. Depending on the machine, each magazine can have either six or eight rows.

The magazines move up and down and are driven by a cam and its linkage. As the magazines lower, capsules fall into the open channels at the top. When the magazines are fully down, a gate opens and the one capsule in each channel falls into the sorting block. As the magazine starts up, the gate closes preventing the capsules from escaping.

The gate actuator is a small roller, which is mounted on the magazine side. Stations # 1 and # 2 have rollers mounted on opposite sides.

The gate activation is controlled by an air cylinder or plunger mounted onto the side of the sorting station housing. This part is adjustable up and down by means of two screws. If the plunger is too low, not all channels in the magazine will release the capsules. If it is too high, the gate will not close in time on the way up and more than one capsule will be released in each channel.

It is very important that the two magazines be set at the same height. Behind each magazine mounting plate is a "U" shaped block. This block has two slots in it where the screws are located. Carefully adjust the magazines to obtain the correct height.

When the capsule magazine are at their most downward position, the bottom surface of the magazine should be as close as possible but not touching the sorting block.

Capsule hopper – small:

A small hopper is mounted above each magazine. This hopper feeds the magazine from capsules in the larger hopper. A slide gate mounted on the hopper front controls the flow of capsules. Adjust the gate for good capsule flow or close it completely to stop the capsules.

Capsule hopper – large:

This hopper is the main source for the capsules. The operator transfers the capsules from the shipping container to this hopper. Some hoppers are fitted with a proximity sensor to alert the operator when the level is low.

There is a slide gate at the rear of the hopper to allow emptying or cleaning.

Separation cam:

The separation cam is an outside track cam that controls the movement if the separation pins and vacuum shoes.

The separation arm rides on the contour of the cam by means of a cam follower bearing. The arm has a tension spring attached to it to keep downward pressure against the cam. This spring action also is used so that the vacuum shoes are not forcibly driven against the bottom of the lower segments.

Timing:

The cam is secured to the machine main shaft by means of pressure plates. Two setscrews tighten against the plates. The cam is infinitely adjustable around the main shaft. The cam is split in two halves for easy replacement.

To adjust the timing of the vacuum shoes and pins, loosen the two setscrews that secure the pressure plates. Just after the segment turret has come to a full stop, the vacuum shoes should start to rise. The shoes will retract just prior to the segment turret starting to rotate.

Sorting cam:

The sorting cam controls the movement of the capsule magazines and sorting fingers. It is an inside track cam.

The sorting arm cam follower rides the cam track and by means of connecting rods lift and lower the capsule magazines. The linkage going to the magazines is also connected to the sorting fingers. Any adjustment to the timing of the cam or to the linkage will affect both magazine and fingers.

Timing:

The cam is secured to the machine main shaft by means of pressure plates. Two setscrews tighten against the plates. The cam is infinitely adjustable around the main shaft. The cam is split in two halves for easy replacement.

To adjust the timing of the magazines, loosen the two setscrews securing the pressure plates. When the separation pins are at their full up position, the magazine should be all of the way down.

Sorting Station Problems:

- Capsule low-level alarm keeps going off when hopper is full.
  - ✓ Adjust sensitivity
  - ✓ Check for damaged cable
- Capsules will not feed into the magazine channels.
  - ✓ Adjust small hopper gate opening
  - ✓ Check opening of channel for damaged capsules
- Capsules will not exit the magazine channels.
  - ✓ Adjust feed plunger higher
  - ✓ Check discharge point for damaged capsules
  - ✓ Check "L" shaped spring on gate for damage
- Capsules are being pushed all of the way out of the sorting block.
  - ✓ Adjust the sorting fingers back
  - ✓ Sorting block worn
  - ✓ Capsules are dried out
- Capsules are not rotating fully at the front of the sorting block.
  - ✓ Sorting fingers are too far back
  - ✓ Magazine fingers are damaged
- Capsules are not entering the segment correctly.
  - ✓ Sorting stations are not in alignment with the segment position
  - ✓ Capsules are not rotating properly
  - ✓ Capsules are too big
    - ➢ Change supply – new lot number
- Capsule tops are falling off.
  - ✓ Vacuum is too strong
  - ✓ Separation pins are too low
  - ✓ Sorting station too far towards center of machine
- Capsules are not separating.
  - ✓ Vacuum not strong enough
  - ✓ Vacuum line is clogged
  - ✓ Vacuum pre-filter is dirty
  - ✓ Vacuum shoes not seating against lower segment body
  - ✓ Vacuum shoes worn or blocked
  - ✓ Magazines are not the same height
  - ✓ Segments not aligned
  - ✓ Segment carrier worn
  - ✓ Vacuum solenoid not functioning
- Separation cam and/or cam follower wearing.
  - Separation pin plate hitting machine top as the pins go down
    - ➢ Adjust linkage

Powder Section

The powder section compacts the product in five steps creating a cylindrical compressed “slug”. The diameter and length of the slug determines its weight. At the last step, the slug is pushed into the empty capsule body.

The following parts or assemblies make up the powder section:

- Tamping ring flange – This part is where the tamping sits in and also the center vacuum ring.
- Tamping ring – The tamping ring supports the bottom of the powder slug as it is being compressed through the five steps.
- Center vacuum ring – This ring helps align the tamping ring and also creates a chamber for drawing off excessive powder build up under the dosing disc.
- Dosing disc – The dosing disc is what determines the fill weight of the capsule. The disc is a size part and in most cases be of the same size as the capsules that are being run.
- Powder bowl – The bowl mounts to the dosing disc and captivates the powder that is fed into the area.
- Powder bowl cover plate – The plate covers the bowl area and contains the wiper block and level sensor.
- Tamping pin guide ring – The guide ring positions the tamping pins correctly for entering the dosing disc.
- Tamping pin holders – The holders support the tamping pins. Five holders are height adjustable for controlling the fill weight. The sixth holder is fixed at the transfer point.
- Tamping pins – The pins compress the product through a series of five steps to create the powder slug. They are size parts and usually match the capsule size that is being run.
- Tamping head – The head holds the tamping pin holders. The head moves up and down to have the pins compress the powder.
- Tamping cam – This is a double track cam. It is larger than the other machine cams. The size and shape are designed to produce adequate force to compress the powder.
- Tamping head lifting mechanism – The device allows the operator to raise the tamping head for cleaning, set up, or maintenance purposes.
- Powder hopper – The hopper is filled with the uncompressed product by the operator. An auger screw feeds the powder into the bowl area. The hopper assembly can be raised for cleaning or maintenance purposes.

Tamping ring flange:

The tamping ring flange supports the tamping ring and houses the center vacuum ring. The dosing disc mounting shaft goes through the middle of the flange.

At five positions around the flange are leveling jacks that determine the clearance between the tamping ring and dosing disc. These jacks have a lock bolt and a very fine threaded stud to precisely raise or lower the jacks. **The tamping ring must be level!** If it is not, there is the possibility of it rubbing against the bottom of the dosing disc or "wobbling" as the tamping pins compress the product.

Normally, the clearance that is set is approximately **0.002" – 0.003".** Smaller clearances can result in damage to the tamping ring and/or dosing disc. Larger clearances can result in excessive powder loss escaping from the disc bottom. However, the clearance must be determined from the nature of the product being run. Fine, fluffier products will require smaller clearances and coarse granulation or stickier products will require a larger gap.

The gap or clearance is measured using a "knife" edge straight edge placed on the surface of the dosing disc shaft and extending over the tamping ring surface. A feeler gauge is positioned under the straight edge and on the ring at each of the five leveling points. Careful adjustment of the leveling jacks will create the proper clearance.

Adjacent to the leveling jack locking bolts are holes in which pipe fittings can be inserted. These five holes, along with one other large hole, can be used to connect a vacuum manifold to pull off any powder that might escape through the gap.

Tamping ring:

The tamping ring is a brass or plastic base that supports the bottom of the powder slug as it goes through the process of being compressed. As mentioned previously, there is a small gap or clearance between it and the bottom of the dosing disc.

At the powder transfer point, the ring is cut away to allow the powder slug to go into the capsule segment.

Directly after the slug transfer point is mounted a spring loaded scraper block. This scraper removes any powder that may have accumulated on the bottom of the dosing disc. Prior to the powder transfer point, a tray can be fitted with a vacuum fitting to draw off excessive product.

Center vacuum ring:

The center vacuum ring serves to keep the tamping ring aligned inside the tamping ring flange and to provide a means of drawing off excessive powder buildup. A large countersunk hole in the ring gathers the powder that is then pulled out by vacuum.

Dosing disc:

The dosing disc determines the weight range of the powder slug. The disc holes are sized for the capsules that are being used. It is possible, in some cases, to use a disc with smaller size holes.

The disc thickness, measured in millimeters, will be the length of the powder slug. This length will not change as long as the same disc is being used. The amount of powder that is compressed or tamped into the hole will determine the slug weight. The thickness

of the disc is usually predetermined for the size capsule and required fill weight. The following chart is a reference only guide for determining the correct size dosing disc.

The disc will allow the operator to adjust the weights within a specific range depending on the amount of tamping pressure that is applied. If the correct fill weight cannot be reached, either too low or too high, then the thickness of the disc has to be changed.

It is important that the disc be handled carefully. There must not be any damage to the bottom surface or to the holes. **If there is, contact Index for repair options.**

The bottom of the disc is fitted with a scraper block. This block pushes any accumulated powder to the countersunk hole in the center vacuum ring. **The block mounting holes are offset.**

Powder bowl:

The bowl is a round shield that attaches to the dosing disc by means of four screws. It captivates the product over the disc as the product is fed.

Powder bowl cover plate:

The cover plate helps keep the powder inside the bowl area and also supports the wiper block and level sensor. It itself has no mounting adjustments. The wiper block is adjustable. The wiper block keeps the loose powder in the bowl away from the slug transfer point. Once the slug has gone through the five compression stages, no more powder should enter the holes in the dosing disc where the slug has finished compression. This allows for only the slug to be transferred to the empty capsule.

The bottom of the wiper block and the top surface of the dosing disc should have a space of approximately 0.003” – 0.005”. There is an adjusting screw above the wiper block on top of the cover plate. **This adjustment must be made prior to tightening the cover plate mounting screws.**

The product level sensor consists of a curved piece of sheet metal and a cable bracket. The sheet metal or shield attaches to the bottom of the cover plate. No adjustment is required for this part. However, care must be taken when removing or installing the cover plate so that the sensor shield and cable bracket are not damaged. **Do not lift the cover plate by the cable bracket!**

Tamping pin guide ring:

The guide ring aligns the tamping pins as they move down into the dosing disc. The ring is attached to the two tamping head columns by means of two bolts. **The guide ring can be mounted only if the columns are raised slightly to avoid interference with the powder bowl cover screws!** There is no mounting adjustment.

Routinely check the wear in the guide holes. If the wear is excessive, the tamping pins will not enter the dosing disc smoothly and they will be damaged along with the disc. Installing bushings can repair the worn holes. **Contact Index for repair options.**

Tamping pin holders:

The holders secure the tamping pins. A moveable slide locks the pins in place. This slide should move freely for ease of assembly and maintenance purposes. A clip mounted on the slide prevents the slide from shifting during machine operation.

Five of the holders have compression springs in them. These five are located at tamping positions 1, 2, 3, 4, and 5. They do the compression of the powder at different stages. The sixth holder, which is located at the slug transfer point, does not have springs. No further compression is done here – only pushing the slug through the disc into the empty capsule. This holder does not have a height adjustment as the others do.

Mounted on the side of the adjustable holders is a small scale, in millimeters, that serves as a guide for setting the tamping pressure.

The tamping head moves up and down compressing the loose powder into the dosing disc holes. After each rise of the head, the dosing disc rotates. The previously tamped powder is again tamped by the next set of pins. This continues until each set of dosing disc holes has been tamped five times. Then, at the sixth station the slug is transferred into the capsule.

There are various methods of setting the tamping pin holder height or tamping pressure. To obtain even compression throughout the slug, it is best to do the tamping at evenly spaced heights of the holders. Tamping station # 5 is usually set so that the ends of the tamping pins are just at the top of the dosing disc. This ensures that the top of the slug is compacted and no loose powder will be accumulated on top of it. Tamping station # 4 is set approximately 2mm deeper than station # 5. Tamping station # 3 is set approximately 2mm deeper than station #4. This method continues to Station # 1. **This is only a starting point.** The capsule weights should be checked and additional adjustments are made if required. Station # 5 should not be adjusted if possible.

There are two different spring sizes available. One is heavier than the other. Care must be taken to ensure that each holder contain the same strength spring. The springs can be different from holder to holder if necessary. Broken springs will affect the fill weight.

Tamping pins:

The tamping pins are size parts that usually match the size capsule that is being run. The pins should be inspected periodically for damage. Worn or damaged tips can damage the dosing disc or produce incorrect fill weights.

Tamping head:

The tamping head secures the tamping pin holders and is cam driven to move up and down. It is mounted to the tamping columns by means of four bolts. There is no adjustment to the head and the head is not removed for cleaning.

Tamping cam:

The tamping cam is the largest of the driven cams on the machine. The size and weight of the cam assist in the force required for tamping the product. It is a double track cam having large cam followers that attach to the lift arms.

Timing:

The timing of the tamping cam is based on the movement of the segments. During operation, the tamping head moves down compressing the product and transferring the finished slugs into the empty capsules. The tamping pins at the transfer point enter the lower segment slightly. The pins the rise out of the segment and pause momentarily. The segments begin to move during this pause. This action wipes any accumulated powder

that might be sticking to the transfer tamping pins. Once the segment has moved a distance equal to half of the spaced holes in it, the tamping head again starts to rise.

Tamping head lift mechanism:

There is a crankshaft on the right side of the machine that accommodates a removable handle. Before the head is raised, the four bolts that secure the head must be removed. Also the powder hopper must be raised and pivoted away from the area. The level sensor cable must be disconnected.

Rotate the crank clockwise to raise the head and counterclockwise to lower it. **Caution! When the head is almost all of the way down, turn the crank slowly to prevent it from jamming at the bottom.**

At the base of the lifting mechanism is a switch that signals when the head is fully lowered. The machine will not run in either jog or run mode if this switch is not activated.

Periodically oil the drive chain and check its tension. Also lubricate the lifting shafts and spindles.

Powder hopper:

The hopper holds the supply of powder above the powder bowl area. It can be loaded either by hand or an overhead feed system. There is a sight glass on the front of the hopper for operator assistance in monitoring the level.

The powder feed auger is placed inside the hopper prior to installation. Three bolts secure the hopper to the drive motor housing directly above it. Once the hopper has been secured, the auger screw is attached to the motor drive shaft by means of a bayonet fitting. The auger screw has a wiper blade that assists in the flow of product towards the screw. The speed of the auger rotation can be adjusted from the control panel if required.

The motor and gearbox require no maintenance.

Dosing Area problems:

- Dosing disc difficult to align.
  - ✓ Tamping pin guide ring worn
  - ✓ Disc has damaged holes
  - ✓ Alignment pins are bent or damaged
  - ✓ Dosing disc shaft is damaged
- Excessive powder coming out from below dosing disc.
  - ✓ Tamping ring too low
  - ✓ Tamping ring not level
- Tamping head difficult to raise/lower.
  - ✓ Damaged or un-lubricated lifting shafts
  - ✓ The bolts securing the guide ring are too long
  - ✓ Check chain tension
  - ✓ Damaged or worn bevel gears on crankshaft
- Tamping pins will not lock in their holders.
  - ✓ Damaged locking slide
- Cannot achieve correct fill weight.
  - ✓ Wrong size dosing disc
  - ✓ Broken springs in tamping pin holder
  - ✓ Powder level in bowl too high/too low
  - ✓ Incorrect settings of tamping pins
- Loose powder on top of segments.
  - ✓ Segment turret not in line with transfer station
  - ✓ Wiper block set too high
  - ✓ Powder level in bowl too high
- Powder is not forming a solid slug.
  - ✓ Not enough tamping – possible disc change required
  - ✓ Properties of product
- Weights can be achieved but vary during run.
  - ✓ Broken tamping spring in holder
  - ✓ Incorrect setting of tamping pin holders
  - ✓ Powder level in bowl not consistent
  - ✓ Properties of product

Faulty Capsule Ejection Station

The faulty capsule ejection station detects any capsules that failed to separate and blows them off into a collection hopper. **Refer to Diagram # 5**

The following parts or assemblies make up the faulty capsule ejection station:

- Faulty capsule ejection arm
- Collection hopper
- Size change spacers
- Guide post
- Faulty capsule ejection cam and arm
- Blow-off manifold

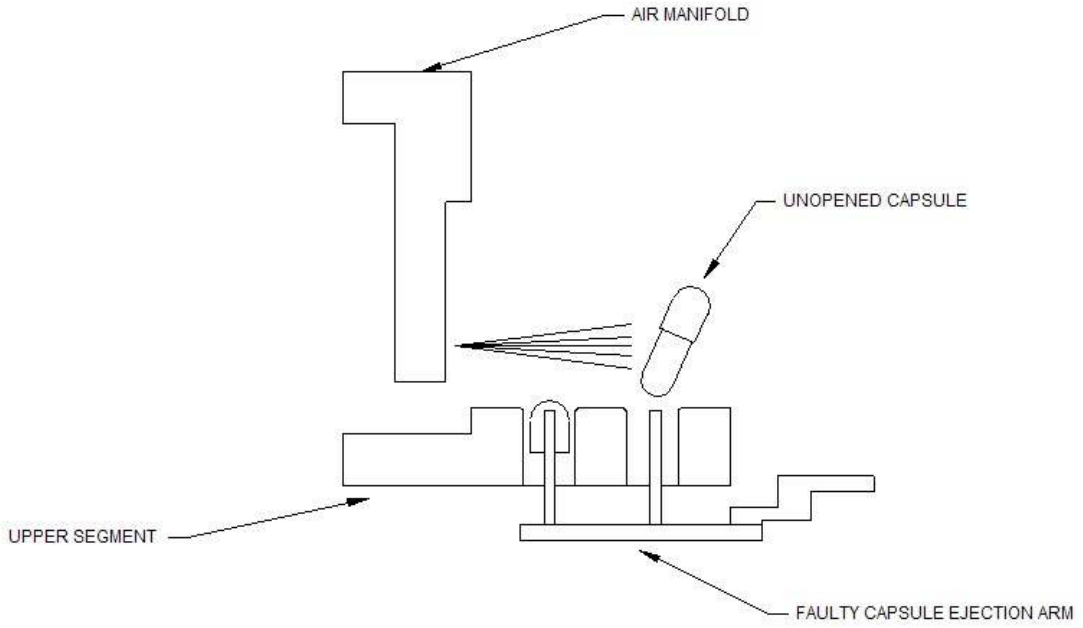

DIAGRAM # 5

Faulty capsule ejection arm:

The arm is an aluminum piece with short pins. It attaches to a vertically moving shaft that is driven from a cam. The pins in the arm enter the bottom of the upper segment at station # 7. If the capsules are separated, the pins go into the capsule top without touching them. If the capsules failed to separate, the capsule bottoms would still be attached and hang below the upper segment. The arm rises and the pins eject the unopened capsules from the segment.

Collection hopper:

Any unopened capsules that are ejected will gather in this hopper. It is secured to the machine top plate by means of one bolt. Locating pins align the hopper.

Size change spacers:

To set the correct height of the ejection arm, a set of spacer washer is provided. The washers have the capsule size stamped onto them. One or more spacer washers may be required to set the correct height of the arm. When the arm is fully up, the pins should be just below the upper surface of the segment.

Guide post:

A guide post at the end of the ejection arm prevents the arm from rotating. The bushing or bearing that the post goes through should be lubricated daily.

Faulty capsule ejection cam and arm:

An internal track cam drives the station. An actuator arm is attached to the vertical lift shaft with a connecting rod.

Timing:

When the segment turret has finished rotating, the faulty capsule ejection shaft should start to rise. The arm will be down when the segment turret starts its rotation.

Blow-off manifold:

The manifold is mounted on the top of the segment turret top cam by means of two screws. An air hose attaches to it and the fitting to the left of the collection hopper.

Faulty Capsule Ejection Station Problems:

- Unopened capsules are not being ejected.
  - ✓ Arm is set too low
  - ✓ Arm is set too high causing bottoms of capsules to hit pins
  - ✓ Air pressure is too low
- Ejection arm breaks.
  - ✓ The arm usually breaks when it is in its down position. Check the clearance by the lower segment mounting screws.
    Some arms require to be machined or filed where the bend is.
  - ✓ Timing not correct
- Tops of opened capsules are being ejected.
  - ✓ Air pressure is too high
  - ✓ Arm is set too high

Closing Station

The closing station reassembles the capsules by pushing the lower bodies up into the capsule tops. This is done with pins that are driven by a drive cam.
Refer to diagram #6

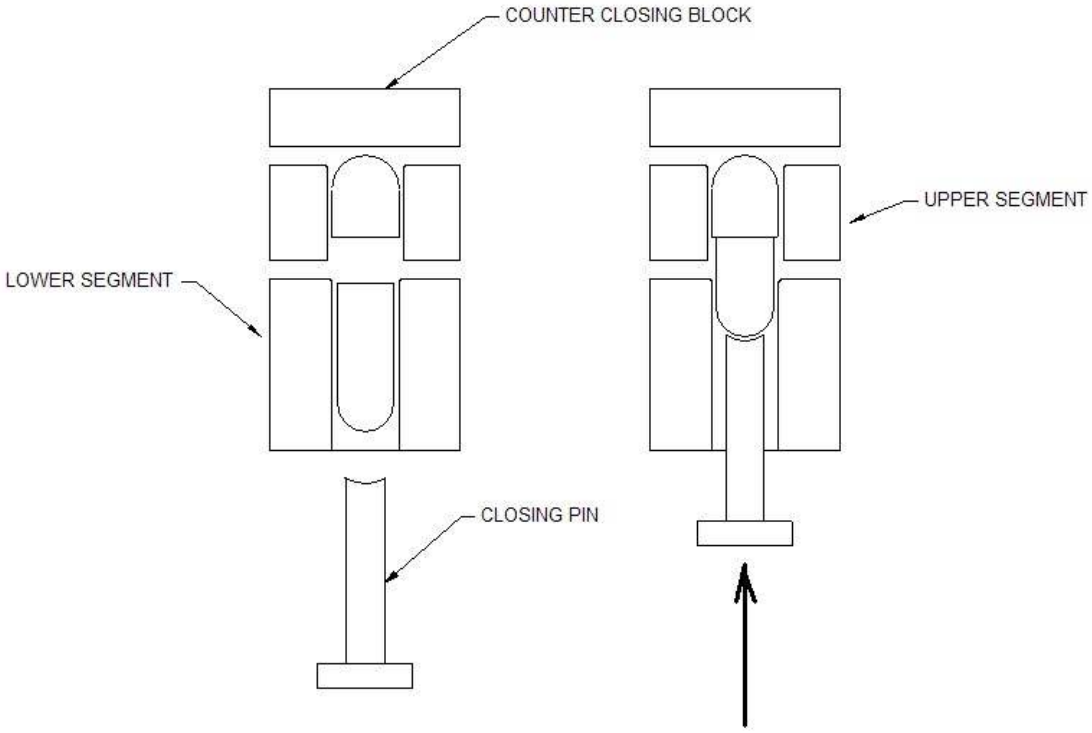

DIAGRAM # 6

The following parts or assemblies make up the closing station:

- Closing pins and pin plate
- Guide plate
- Size spacer
- Vacuum manifold
- Counter closing block
- Counter closing block size spacers
- Lower closing cam and arm
- Counter closing cam and arm

Closing pins and pin plate:

There are various types of closing pins that are mounted onto the closing pin plate. Some are straight pins that have a diameter of 4mm. Others are sized for the capsules that are being run and have different diameters. Some have concave tips that

"cup" the bottom of the capsule as the pins move upward. These prevent dents from occurring. Other types of closing pins are relieved along the body to prevent powder buildup.

The pin mounting plate can also vary in style. Some pins screw directly into the plate while others go through a clearance hole and are secured by means of a washer and nut on the bottom. The plate will be formatted for the capsule count of the segment.

Guide plate:

The guide plate helps align the pins in relationship to the segment holes. It is usually fabricated of brass. If the holes in the plate are worn, misalignment of the pins can damage the pins or segment.

Some machines do not have a guide plate. Instead, a clamp block is fixed to the closing shaft on which the plate self aligns. This clamp block allows for easier set up.

Size spacer:

A "U" shaped spacer that is installed under the pin plate sets the height of the closing pins. It is stamped with the capsule size number. Fine-tuning of the closing is done by adjusting the connecting rod.

Vacuum manifold:

A vacuum manifold is mounted on the closing pin guide plate. This manifold draws of excess powder that accumulates at the closing station. There is no adjustment of the manifold.

Counter closing block:

The counter closing block moves down over the upper segment prior to the upward movement of the closing pins. The block holds the capsule tops in place during the closing process. It has a plastic block underneath that makes contact with the capsules.

Counter closing block size spacers:

The size spacers are stamped with the capsule size # that is being run. One or more of the correct spacers are placed on the shaft below the counter closing block. This sets the correct height of the block. Fine-tuning of the block is done by adjusting the connecting rod.

When the counter closing block is fully down, there should be a small amount of clearance between the block bottom and the top of the capsules. This allows the capsules to rise slightly as the bodies are pushed upward.

Lower closing cam and arm:

The cam is an inside track cam that is driven on the main shaft. An arm is attached to it and the connecting linkage. Due to earlier designs, the linkage connects to two closing shafts. Earlier machines had a pre-closing station. Changes in machine speed required that the pre-closing station be eliminated to smooth out the segment carrier movement at this area. However, the linkage remained part of the drive system.

Timing:

At the ,moment when the segment turret stops rotating, the closing pins should start to rise. The pins should be clear of the segment when the turret starts to rotate again.

Counter closing cam and arm:

The cam is an inside track cam that is driven on the main shaft. An arm is attached to it and the connecting linkage.

Timing:

Just prior to the segment turret starting to rotate, the counter closing block rises. This setting allows the block to be down prior to the closing pins rising.

Closing Station Problems:

- Capsules are not fully closed or locked.
  - ✓ Closing pins are too far down
  - ✓ Counter closing block is too high
  - ✓ Powder slug is too long or too hard
- Capsules have dented bottoms.
  - ✓ Powder has built up on the tips of the closing pins
  - ✓ Closing pins are set too high
  - ✓ Install larger diameter pins with concave tips, if possible
  - ✓ Powder slug is too hard
- Capsules are “splitting” when closed.
  - ✓ Counter closing block is too low
  - ✓ Capsules are too loose in the segments
  - ✓ Worn segment carrier
  - ✓ Segments not aligned
  - ✓ Excessive powder on the capsule body lip area (no slug formation)

Ejection Station

The ejection station is where the finished filled capsules are removed from the encapsulator. Ejection pins push the filled capsules out of the segments and an air blast forces them down an exit chute.

The following parts or assemblies make up the ejection station:

- Ejection pins – These pins push the capsules out of the segment. There is only one size pin for all capsule sizes.
- Ejection pin guide plate – The guide plate helps align the pins as they rise through the segment. Worn holes in the plate can damage the pins and/or the segment. Some machines have a clamp block, which is fixed to the vertical shaft, eliminating the need for the guide plate.
- Ejection chute – The chute attaches to a fixed bracket and has two air lines that blow the capsules down the chute. The chute has a clear plastic cover for viewing the flow of capsules.
- Ejection cam and shaft – There is not any linkage connected to the ejection shaft. The shaft is connected directly to the cam.

  Timing:

  When the segment turret has stopped rotating, the ejection pins start to rise. The pins are retracted and clear of the segment prior to the segment turret starting to rotate.

Ejection Station Problems:

- Capsules are not being ejected down the chute.
  - ✓ Air blast is not strong enough
  - ✓ Air blast is too short

Cleaning Station

The cleaning station utilizes an air blast to clean the upper and lower segments after the capsules have been ejected and prior to the sorting stations.

Some machines are equipped with a moveable manifold that has nozzles attached to it. The manifold nozzles enter the segment and momentarily apply the air blast. Other machines have a fixed manifold assembly that continually blows air up into the segment.

The cleaning station is made up of the following parts or assemblies:

- Air manifold
- Dust collection block
- Drive mechanism

Air manifold:

The air manifold is either a fixed plate that holds the nozzles or a vertically moveable manifold that holds the nozzles.

If it is the fixed plate style, the nozzles continually blow air up into the segment. The nozzles are designed to produce a funnel effect, which helps in the cleaning action. If the manifold is the moveable style, the manifold nozzles enter the segment from the bottom and deliver a timed air blast. The nozzles are sized for the capsule that is being run.

Dust collection block:

The dust collection block slides over two guide posts. There is a height adjustment collar on the left post. Once the collar has been initially set, there is no need for further adjustment.

The block has ports for attaching a vacuum hose to pull off the powder.

Drive mechanism:

If the manifold moves up and down, an arm is attached to the bottom of the drive shaft. This arm extends over to and attaches to the ejection shaft. The ejection pin timing controls the timing of the cleaning station manifold.

Cleaning Station Problems:

- Segments not getting cleaned.
  - ✓ Air blast is not strong enough
  - ✓ Air blast timing is incorrect – adjust at main control panel
  - ✓ Nozzles damaged or clogged

Index K Series Scheduled Maintenance

It is important that the encapsulator be properly maintained on a regular basis.

The following sections point out maintenance schedules and key checkpoints on the machine. These are only guides. Usage and length of production runs will determine the exact scheduling of maintenance.

Type of materials used for lubrication will also vary depending on what is acceptable.

Our recommendations are based on an 8 hour day, 40 hour week.

Preventative Maintenance Schedule

ACTION REQUIRED	MATERIAL	EVERY
VACUUM EXCESS POWDER FROM MACHINE SURFACE		BREAK
CLEAN EXTERNAL VACUUM FILTER		SHIFT
CLEAN INTERNAL VACUUM FILTER		SHIFT
LUBRICATE MAIN DRIVE CHAIN	OIL	DAY
WIPE DOWN PRODUCT CONTACT PARTS (TOOLING, PINS, ETC.)	DENATURED ALCOHOL	BATCH
CHECK TAMPING SPRINGS AND CAPS		BATCH
CHECK SEGMENT TURRET/DOSING STATION ALIGNMENT		BATCH
REMOVE, CLEAN, AND GREASE TOP CAM	FOOD GRADE GREASE	BATCH
LUBRICATE SEPARATION HOUSING BEARINGS	MINERAL OIL	BATCH
CHECK ALL BOLTS, SCREWS, AND TURNBUCKLES FOR TIGHTNESS		WEEK
GREASE ALL GREASE FITTINGS	BEARING GREASE	WEEK
CLEAN AND REGREASE CAM SURFACES	BEARING GREASE	WEEK

CLEAN AND REGREASE STAR WHEELS	BEARING GREASE	WEEK
CLEAN AND REGREASE BEVEL GEARS ON MAIN SHAFT	BEARING GREASE	WEEK
CHECK CONNECTING RODS FOR WEAR		2 WEEKS
CHECK CAM ARMS FOR TIGHTNESS AND WEAR		2 WEEKS
REPLACE VACUUM FILTERS (INTERNAL AND EXTERNAL)	I-15-2141E (1) I-15-2142E (1)	1 MONTH
REPLACE VACUUM PUMP VANES	I-15-2140V (1)	6 MONTHS
REPLACE LINEAR BEARINGS AND SEALS IN SEGMENT CARRIER CORE	I-15-1600 (48) I-15-1802 (24)	6 MONTHS
REPLACE TABLE LINEAR BEARINGS AND SEALS	I-15-1603 (9) I-15-1803 (9)	6 MONTHS
REPLACE SEGMENT CARRIER CAM FOLLOWERS AND BALL BEARINGS	I-15-1622 (12) I-15-1611 (12)	6 MONTHS
REPLACE NEEDLE BEARINGS AND CAM FOLLOWERS ON DRIVE CAM ARMS	I-15-1621 (2) I-15-1624 (6) I-15-1619 (13)	6 MONTHS
REPLACE M10 AND M12 TURNBUCKLE ROD ENDS	I-15-1625 (2) I-15-1626 (2) I-15-1627 (5) I-15-1627 (5)	6 MONTHS
REPLACE VACUUM SHOE GUIDE COLUMN BUSHINGS, SHAFTS, SEALS, AND SPRINGS	I-15-0161-A (4) I-15-0131M (4) I-15-0131N (4) I-15-1807 (12/16)	6 MONTHS
REPLACE ES-5 FLAT BEARINGS IN SORTING STATIONS	I-15-1605 (4)	6 MONTHS
REPLACE AIR TUBING		1 YEAR
REPLACE COMMON WEAR PARTS – VACUUM SHOES, GUIDE PLATES, ETC.		1 YEAR
REPLACE YOKE SHAFT ASSEMBLIES, CAMS, STAR WHEELS, BEVEL GEARS (MAJOR OVERHAUL)		5 YEARS

Maintenance for Main Shaft Components

The main drive shaft of the encapsulator is fitted with seven cams that operate the different stations of the machine. They are:

Separation
Sorting magazines
Tamping pin head
Faulty capsule ejection
Counter closing
Closing pins
Ejection

Each cam has a lift mechanism consisting of either an arm or a shaft. The arms have a cam follower bearing that rides the cam track. Their pivot point has one or more needle bearings.

Also on the main shaft are two drive yokes or Geneva indexing assemblies. One is for the segment turret indexing and the other is for the dosing disc indexing.

A hanging flange that contains a ball bearing supports the main shaft, at the ejection station end.

Grease fittings are located in the two indexing assemblies. All other bearing points on the main shaft areas do not have fittings. These areas require disassembly of the parts to be lubricated or replaced. Keeping these areas free of product buildup will prolong the life of the bearings.

Common Problems in the Main Shaft Areas

- Cam wearing
  This is due to lack of lubrication or a worn cam follower. Normally, the cams have a long life. Check for misalignment of the actuating arms. The cam follower that is attached to the arm must run parallel to the track. Also, the cam follower must not be in the track too deep whereas it rubs against the inner face of the track.

- Arm is loose
  This is due to general wear. It normally has nothing to do with set up or maintenance. The needle bearings in the pivot point cannot be lubricated once they have been installed. The bearings should be replaced at the first sign of wear to prevent further damage.

- End bearing at the ejection station worn
  This bearing cannot be lubricated once it has been installed. When replacing it, remove one of the race seals and check the amount of grease inside. Some bearings do not come with a lot of grease in them.
  It is possible that the end of the main shaft will wear if the bearing is bad. Having the area where the bearing fits turned down to accept a bearing with a smaller ID can save the shaft.
  A plate with a grease fitting mounted to it can be installed onto the hanging bearing flange. The outside race seal is removed to allow grease to flow into the bearing.
  When replacing the bearing be sure that the new bearing has plastic seals and not metal ones. The plastic seals are better for keeping out powder.

- Star wheels have sharp edges on the tracks
  This is due to normal wear **OR** bad bearings on the indexing crank. Check to ensure that the double bearings on the crank are not worn or frozen. When replacing the double bearings make sure that the bearing on the bottom has a spacer shim! This spacer shim prevents the outer race of the bearing from wearing against the crank surface. Lack of the spacer shim will lock up the bearing rapidly.
  If the star wheels do have sharp edges, they can be repaired. Hardened inserts can be fitted in the worn tracks. **Contact Index for repair options.**
  Check to ensure that the star wheel locking arms move freely and are entering the star wheel track smoothly. If not, the timing of the crank bearings will be off causing damage.
  Check to ensure that the star wheels are rotating smoothly. Normally, the segment star wheel moves very easily in that there is no or little restriction. However, the powder star wheel can have a lot of restriction due to maladjustment of the tamping ring or worn bearings in the shaft area.

To check the rotation of either star wheel, the top section of the encapsulator must be free of any restricting parts or assemblies such as pins, which go up through the segments.
Release the spring on the locking arm and move the arm out of the star wheel track. By hand rotate the wheel. It should rotate easily. **Be careful where pinch points are located!**
If the powder star wheel does not rotate freely, most likely the bearings are bad. Call Tom Reilly – 908-399-5185 – for assistance in replacing these.

- Bevel gears are not meshing properly
  The gears are hardened and normally do not wear out. During a major overhaul these will be replaced as a precaution measure.
  It is possible that the gears can move away from their mating gear if the setscrews loosen. When assembled, the main shaft is spot drilled where the screws go in. The setscrews have points on them to dig into the shaft. Most of the time it is the gear that is on the main shaft that moves. Loosen the three setscrews and move the gear towards its mating gear. Retighten the setscrews. There must not be any play between the two gears.

- Play between the indexing crank and bevel gear
  A vertically mounted shaft connects the bevel gear and indexing crank. The ends of the shaft where the gear and crank are fitted have keys in them. Over a period of time or if there have been numerous jams, the keys wear out. When this happens, the timing of the index and when the locking arm enters the star wheel track is off. **Major damage to the machine may occur!**
  If this happens at the powder section, the entire index drive yoke can be removed and repaired without disturbing the rest of the main shaft components.
  If this happens at the segment turret section, the indexing yoke can only be removed for repair by dropping the main shaft. **Call Tom Reilly for assistance with either section – 908-399-5185.**

Top Cam of Segment Turret

The large cam that is mounted on the top of the segment turret serves as the course that the segment carriers take as they move around the twelve stations. It is also referred to as the profile cam.

The cam sits onto the hub of the segment turret center shaft. This shaft is stationary, preventing the top cam from rotating. The shaft goes through the center of the segment turret and extends past the indexing star wheel. On the bottom of the shaft, two dowel pins are pressed in. The pins and a bolt secure the shaft to the stabilizer arm. This arm is what prevents the shaft and top cam from rotating.

If the machine has had a jam, it is possible that the dowel pins could be bent or broken. This will cause the top cam to be out of proper position.

The shaft can be removed with relative ease by releasing the connections under the star wheel. The stabilizer arm, bolts, and snap ring must be removed. **There may be shims on top of the snap ring.**

The top cam is removed and, using two pry bars, the shaft can be pulled upward. **There may be shims under the upper hub of the shaft.**

Replace the pins or shaft and reassemble in the reverse order.

The shims that are on the shaft serve two purposes. The ones that are at the bottom, by the star wheel, make up for any play that might be in the shaft length. The shims at the top control the height of the shaft, which in turn, controls the height of the top cam.

At segment positions # 1, 2, 10, 11, and 12, the upper segment is down and aligned with the lower segment. The distance between the two segments should be approximately 0.5mm. The shims that are under the top hub of the center shaft determine this clearance between the segments.

When installing the top cam, it is easier to align the segment carriers if the carrier bearing is extended out past the profile of the cam. It is easier to push the carrier in versus pulling the carrier out to line up the bearing with the track.

Beware of pinch points when installing the cam! Use two people, if necessary! The cam should drop easily – do not force it down!

Recommended Spare Parts

The following parts are recommended to be on hand in case of wear or breakage on the encapsulator. Not every breakdown can be foreseen. These are the most common parts to wear or to become damaged. The part number and quantity change if the part is specific for a 16 count machine (K120, K150), which have 16 bores in the segments.

Description	12 CT Part #	16 CT Part #	Quantity
Closing Pin (Pin Diam. Sz)	I-15-0116CS-x.x	I-20-0239CS-x.x	12 or 16
Ejection Pin	I-15-0118	I-20-0243	12 or 16
Separation Pin	I-15-0117	I-20-0214	12 or 16
Vacuum / Suction Shoe, Left	I-15-0128L-A	I-20-0218A	1
Vacuum / Suction Shoe, Right	I-15-0127R-A	I-20-0220A	1
Faulty Capsule Ejection Arm	I-15-0132	I-20-0238	1
Segment Carrier Assembly	I-15-0133	I-15-0133	1
Tamping Pin (each size)	I-15-0102-x	I-15-0102-x	12 or 16
Upper Segment (each size)	I-15-0115-x	I-20-0216-x	1
Lower Segment (each size)	I-15-0114-x	I-20-0217-x	1
Linear Bearing, Main Table	I-15-1603	I-15-1603	7
Seal, Main Table	I-15-1803	I-15-1803	6
Cam Follower, Cams	I-15-1624	I-15-1624	6
Cam Follower, Segment Carrier	I-15-1622	I-15-1622	6
Ball Bearing, Segment Carrier	I-15-1611	I-15-1611	6
Ball Bearing, Segment Crank	I-15-1617	I-15-1617	2
Ball Bearing, Powder Crank	I-15-1620	I-15-1620	2
Air Tubes, Cleaning	I-15-1451AT-2	I-15-1451AT-2	12 or 16
Linear Bearing, Seg. Carr. Core	I-15-1600	I-15-1600	4
Spring, Tamping Compression	I-15-0140H	I-15-0140H	12 or 16
Cap / Plunger, Tamping Pin	I-15-0141D	I-15-0141D	12 or 16