

SPIRAL SEPARATORS - A Close Look At How They Work

A - What type of products can be run on a Spiral Separator ?

Spiral separators will SEPARATE

If set up Properly - ROUND ... from... UNROUND products

Question? What would we expect to separate from Soybeans
Dust & small foreign material
Unround Seed (shrivels ... etc)
Split Seed

Question? What about Steel Shot
Steel dust & small pieces of steel or foreign material
Unround Shot

Question? What about something like Alfalfa
Will separate Alfalfa from ... Round grass seeds etc

WHERE DO WE START

The very first thing we need is a clear understanding of how a Round object acts ... or ... The Path it Draws ... so to speak when the round object ... Rolls Down a Spiral Flighting

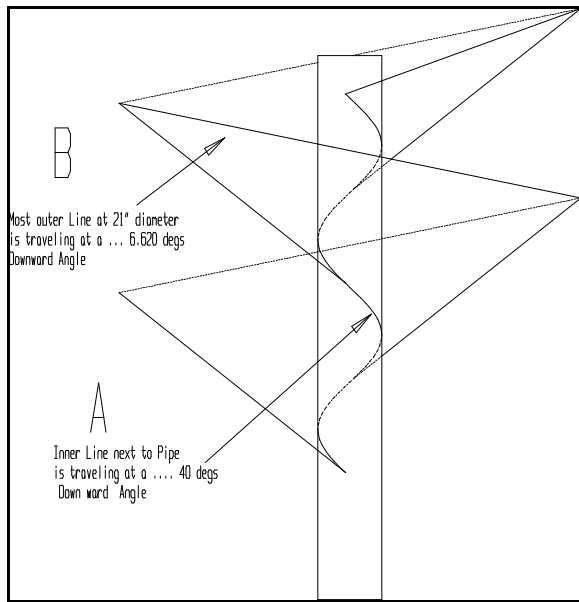


FIG 1

Look very carefully at a side profile of a Single Spiral Flight wrapped around a Stem Pipe

The Spiral Flighting has a (1) Fixed - Banking Angle and “ Here is the catch “ a ***Large Variety*** of Downward Angles

Why a Large variety of Downward Angles?

Because Angle ... A (Path traveled next to Pipe) is a 40 deg Down Angle

Angle ... B (Outside Edge of the Flighting) is a 6.620 deg Down Angle

Stem Pipe Diameter = 2.9045 inches

Total over all Diameter of Spiral = 21 inches

Drop per Revolution = 7.656 inches

What Does This All Mean ... Or Better Yet How Does This Angle Change Affect A Rolling Round Object When Dropped At The Top Of The Flighting Up Next To The Stem Pipe

It means as the Spiral Flighting Diameter Increases
(with all things remaining the same)

The Downward Angle Decreases

Now we all know that as the Downward Angle Decreases the
rolling object will **SLOW DOWN**

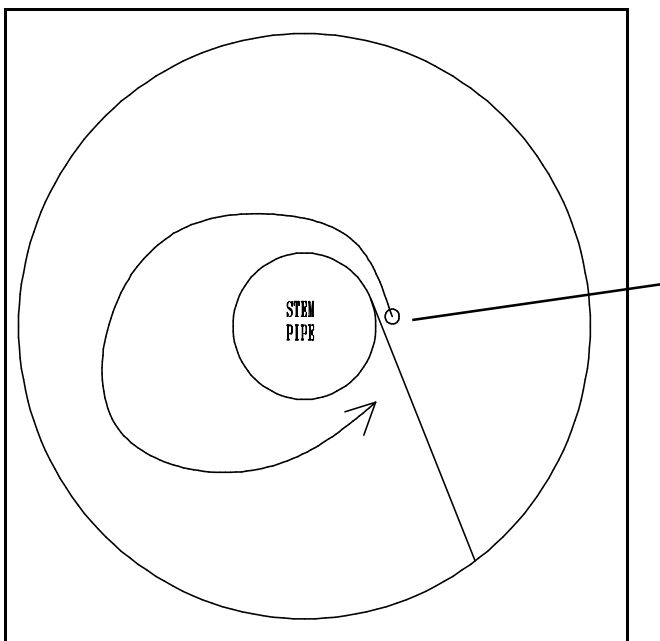


FIG 2

Now look at the Top Down view
Fig.2 A Single flight Spiral
Separator

The round object represents the
Starting Point (SP) at the Top of
the flighting & up next to the
Stem Pipe

The line coming off the round
object with an arrow at the end

represents an example path the round object will make.

What happens is that as the round object travels out to a larger diameter “ it slows down” because ... the Downward Angle Decreases ... the round object loses energy and tries to fall back to the center of the stem pipe. Although it will not actually hit the stem pipe as other forces are working to prevent this.

It (round) will reach a Low Point @ 1 revolution down from
the SP = (perigee point 1)

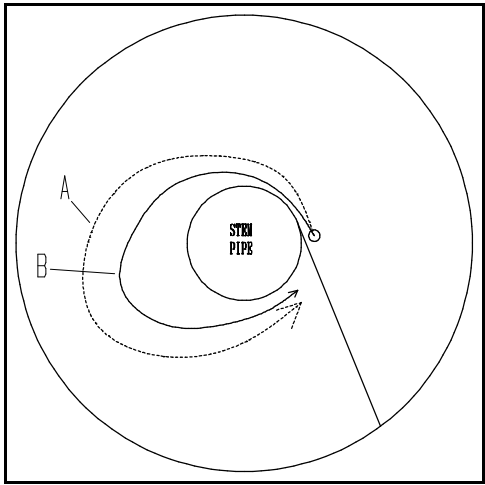


FIG 3

Now let's look at the path of an object that is Less Round - Path B
Fig 3

Will look similar to path ... A
except ... won't travel as far out

Unround is ... less energetic

Ok the Paths will look similar on the next level .. Down ...on the spiral fighting But will ... travel out to a Larger Diameter (UP TO A POINT)

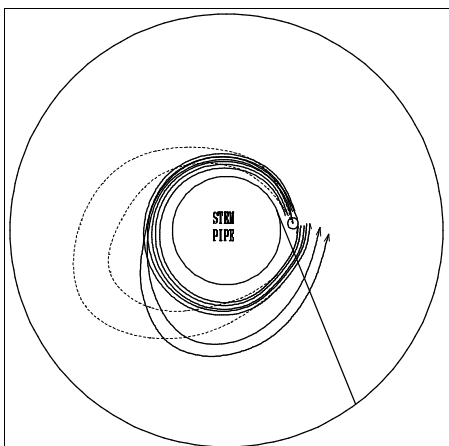
IMPORTANT!

All the paths ... High points & Low points will ... Stay close to the same locations relative to the SP (starting point) no matter how many levels or revolutions the spiral has.

**OK ! NOW THAT WE KNOW WHY THIS PATH IS FORMED
BY .. ROUND & LESS ROUND OBJECTS**

LETS GET TO THE ... TEST /// “ NOT SO FAST “

Let's look at a bunch of ... Rounds, Not so Round and plain old Unround stuff going down the fighting at the same time - FIG 4



It will take a little longer for the Rounds to gain speed enough to break
free of the .. Main Mass .. & when it does Rounds will ..Swing Out .. Less

Notice Previous Paths - dotted lines

**OH YES! THE QUESTION HAS TO COME UP
HOW MUCH YOU FEED IN THE FLIGHTING AT ANY
MOMENT IS VERY IMPORTANT!**

If you feed to much ... called **Overfeeding** .. the Rounds might NEVER break Free and if it breaks free the Swing Out will be Very Small - “ In other Words - No Separation “
THE KEY WORD HERE IS “ **S E P A R A T I O N** “

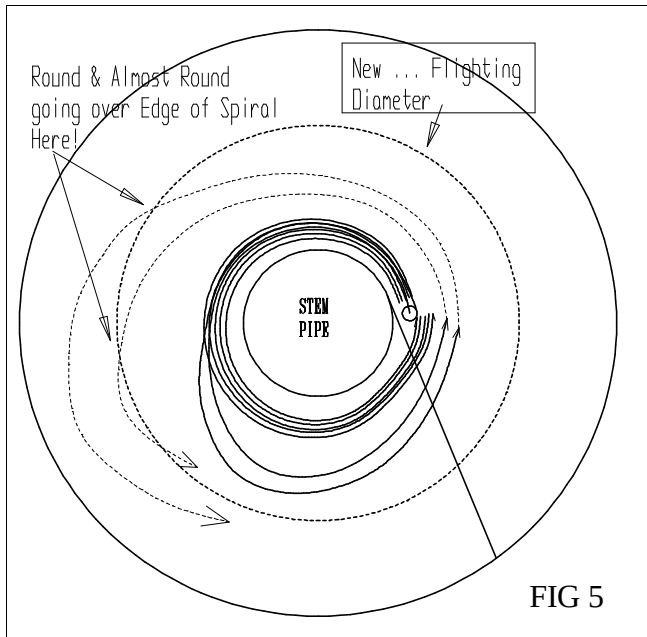
In other words we need room for the Material we are running to get up to their Natural speed .. Unhindered by other material rubbing up against each other *with the exception of dust etc* Sliding up ... or almost next to the stem pipe.
This fast running Track so to speak will allow Rounds to build up speed & separate from Unrounds to the Maximum.

We have toHave ... SEPARATION as we have to set a **DIAMETER** For the Spiral Flighting.

The diameter is DETERMINED by what the User is trying to remove from the Round Product or VICE VERSA
SOMETIMES THE ROUND PRODUCT = BAD
& UNROUND = GOOD PRODUCT

In Fig 5 the (2) Rounds that have made Swing Outs ... Leave the Main part of the Mass at a certain Diameter. If the User wants to keep This - (2) Rounds a Diameter will be set at the
... DOTTED CIRCLE ...

*You - Tester - wants to make sure you are determining this
Diameter on a ... Second or Third Level down from .. Start Point*



Although Very Unrounds tend to Not keep Gaining Altitude up the Spiral Flighting. (Very small unrounds can't get up enough speed) In other words ... Dust etc sort of reaches a Terminal Velocity

The **LENGTH** of the Spiral flighting needs to be enough so all the Rounds have a chance to break free of the Unrounds & Swing Out over the Edge of the *Set Diameter* we have worked out It's a question of Feed Flow Amount

OK - GOING BACK OVER THIS INFORMATION

- 1 - Banking Angle - Derivative of Downward Angle as defined going around the Stem Pipe
- 2 - Downward AngleDecreases as diameter gets Larger
- 3 - Feed Flow very Important - Material has to have Separation
- 4 - Diameter of Spiral is determined by Swing out of Rounds
- 5 - Length of spiral flighting is determined - after everything else by Feed Flow Amount

Now on to the Test

Now we need the right Tester to run our sample down & a Feed system that will deliver just the ... Right amount of Feed & we run our Test

H & T uses a variety of Single Flight cores 24 inches in Diameter along with a Seed Splitter system

(for getting the feed flow right)

We take Samples at different Diameters & Levels at *Swing out point* of the Product

By taking Samples this will more closely tell us where to

“ Set the Diameter of the Flighting “

We make observations of the terminal altitude of the unrounds & this will let us determine length.

*ONCE DIAMETER & LENGTH ARE DECIDED UPON
A WORKING CORE CAN BE MADE*

Note!

**We can not take a sample with the above 24 inch diameter
Testers to send to a customer**

These testers only give the information (Tester Sample)we need to make a working Spiral Separator.

However we do have Premade test spirals for this purpose !

MAKING THE CORE

Once the information we need to make a core is derived from our testers **we can figure also how many flights that can be attached to the stem pipe.**

After the core is built we have to take into account that ... Each Flight is of different ...**Lengths**

Being of different lengths makes all the ... Starting Points (SP) different. This if you remember will make all of the flights have different points where the Rounds Swing Out (Apogee)

This problem is solved with placing ... *Factory installed equalizer Dams* at the shortest flights Starting Point (SP)

As more flights are added they are in effect no longer than the Shortest #1 Flight

These Equalizers not only cause all flights to have the same Apogee points but will also let the Slide gate at the bottom of the core for Fine Tuning work like it should.

The following page shows a diagram of an - 8 flight core and how # 2 - # 8 flight is Longer than the #1 flight

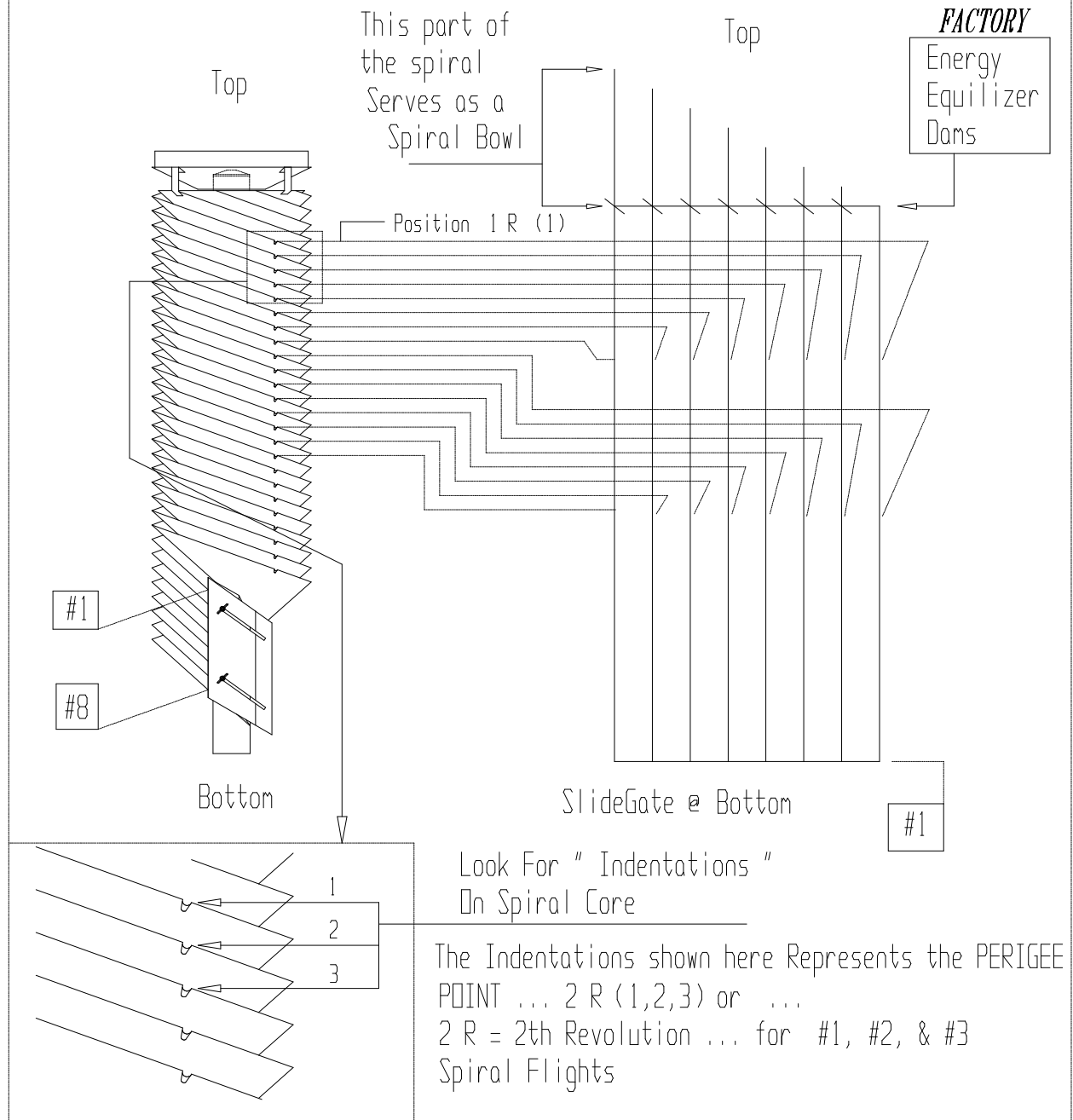
You can see how this problem is solved with “Factory Installed Equalizers”

These simply block the flow on flights 2-8 and make every thing start all over again giving these 7 flights the same energy as #1.

The Indentation marks are simply “Reference Marks” so user can know where he is so to speak Energy wise

These are placed at the “Swing in “ points (Perigee) for all flights

Explanation of Energy Levels *Use as Guide for Placement of " STEEL " Seed Dams*

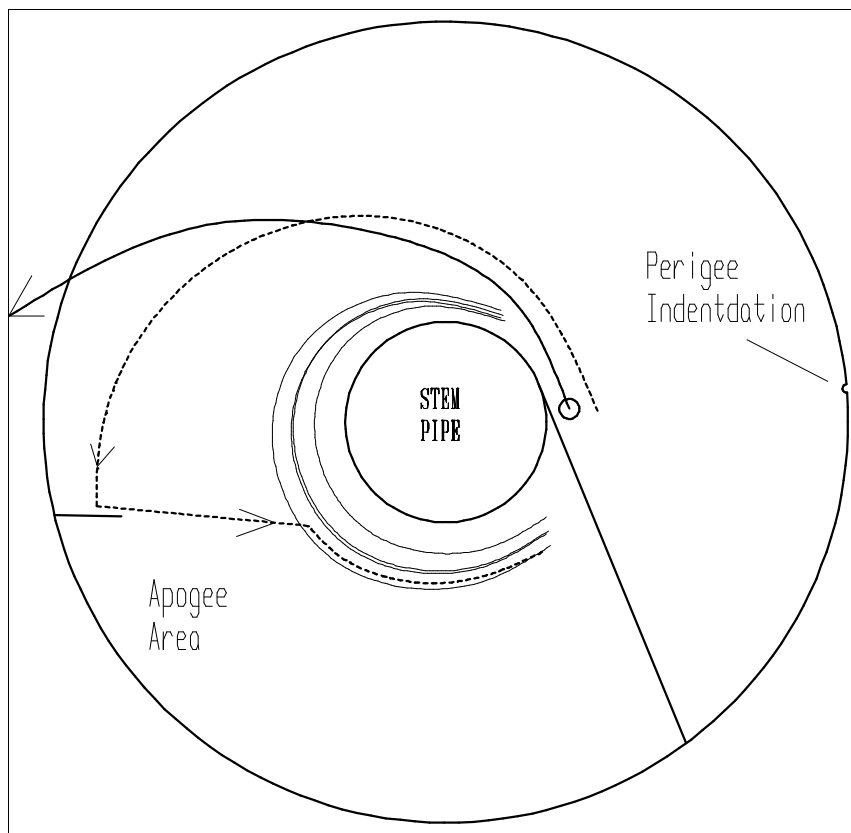


" I N D E N T A T I O N S " ARE USED AS ... ENERGY REFERENCE POINTS

REMOVABLE or MOVEABLE - SEED DAMS

Sometimes the user of the spiral separators might not want some of the stuff that is going over the edge of the separator.

In other words user needs the spiral to be Bigger in Diameter That is sometimes not reasonable so the next best thing we can do is to use Blockers or SEED DAMS



A seed Dam used here to deflect an almost Round back down into Main Mass.

This object is not wanted with the Rounds

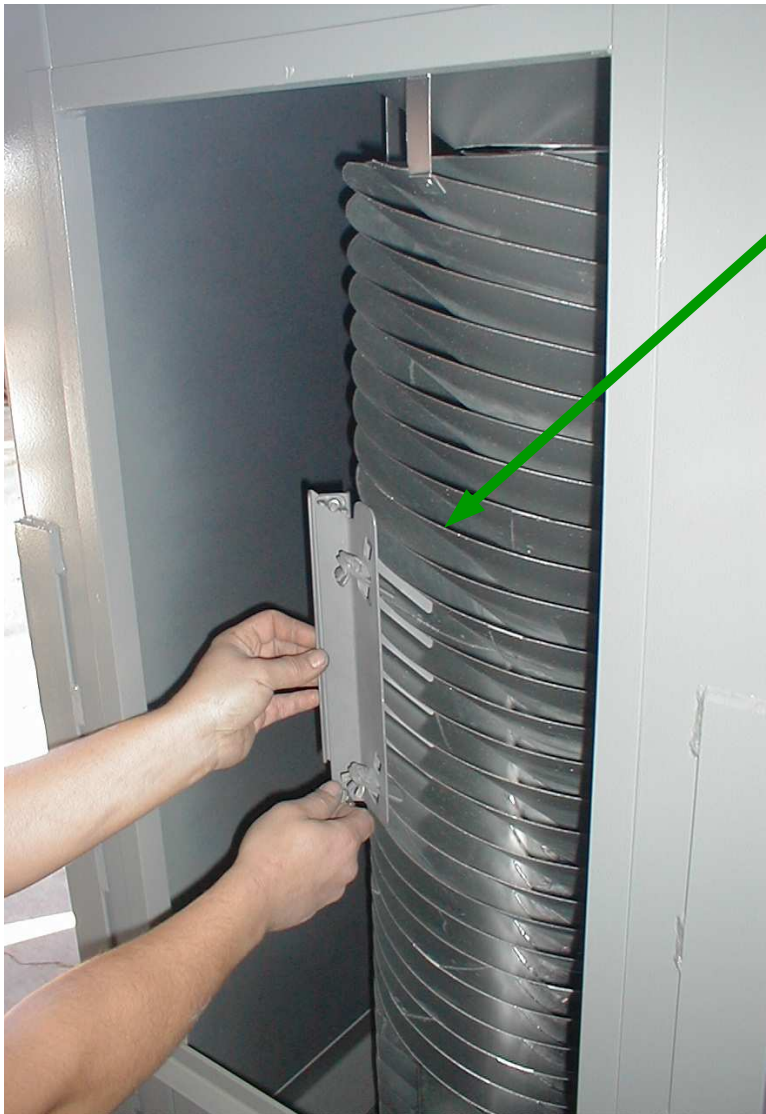
Notice that the location of the Dam will be located ... up hill and Left of the Perigee Indentation notch.

Remember once you have found the Location for one flight you have found it for ALL

The following pictures shows 14 ga. Black Iron Metal Seed Blockers (Seed Dams) being clamped down at the Perigee Point - 2 revolutions down from the SP of # 1 flight. *These Metal dams are made especially for H & T Spiral Cores But can be **Custom made** for any Core Cartridge* This Dam set has (8) Fingers all held in place at the correct deflection Angle by ... 2 Wing Nuts. This placement is an Example Location Placement. *A more realistic placement would be right after the ... Apogee (Swing out) of the ... Round Product.* In other words To the Left of Perigee Point



TIGHTING THE WING NUTS



Movable Steel
Seed Dams
being Installed