Technical bulletins available from BMC

#1 The importance of parison programming systems
Why don't the profile points go where you expect? How can the programmer reduce cycle time? When do you change the interpolation setting? The importance of calibration. A tribute to Denes Hunkar, a true visionary, the inventor of the electronic parison programmer - and much more.

#2 How Pressure Decay leak testers work
Or don't! Choosing seal materials, cycle time versus sensitivity and stability, how container temperature affects sensitivity.

#3 Automatic Parison Length control
Overcoming stability problems, correct settings for optimal performance. How systems have improved with microprocessor control.

#4 Why are servo valves so much trouble?
Dirt, heat and people - the enemies of servo valves ?
Are 'better' valves available? How the valve can cause weight variation.

#5 Automation in blow moulding
Machine layout, container packing methods (trays, bags, deep boxes). Full or partial automation, robotics.

#6 On-line top load testing and correlation to lab testing
Does on-line testing really work? Although offered as an option, how many leak tester manufacturers have done extensive testing on the comparison of top-load testing from hot to cold containers. Does a 15 second test really correlate to a stack test?

#7 Vision Systems
Are these systems really any good for contamination detection, neck thread finish, condensation and flow lines?
Why are 90% of these systems abandoned within 6 months of purchase?
Why would you want to use a vision system for cavity number recognition or flash detection?

#8 Automatic Weight Control
How systems work, potential savings, improving quality control.

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Technical Bulletin #8

Improving Blow Moulding Using Automatic Weight Correction

What is AUTOMATIC WEIGHT CORRECTION?

AWC is the control process of weighing a moulding, comparing it to the desired weight and if necessary, making a correction to keep the weight within acceptable limits.
It's very similar to having a person weighing every moulding and making machine adjustments.

Why do we need AWC?

It's fair to assume that to achieve total repeatability of any production process none of the things that can affect the process should vary.
In blow moulding this may not be possible. Variations in the incoming raw material, the variable properties of regrind, the variation in ambient temperature and humidity, and changes in the moulding machine can all conspire to cause mouldings to drift outside the desired specification.

How does AWC work ?

Controversially - that's how!
Many clever and experienced people have argued not just over the need for ***AWC***, but even the fundamental principles of ***AWC***.
In many cases, 'experts' opinions are based on the experience of systems produced before microprocessor technology was commonplace.
Because of the complex calculations that are needed to make AWC work properly, it as inevitable that these early systems failed to give the promised results.
It is quite wrong to say "We tried this years ago and it didn't work then so it won't work now" when there have been so many changes in the available technology.

For now, lets keep this explanation simple:

When the weight of a container changes it is fair to assume that this is because the parisons thickness has changed.
A common cause of this is the variation in ‘draw down’ (parison sag) due to variations in regrind properties.
To correct for the change in thickness the die gap needs to be repositioned to ensure the container weight is held constant.

The first design pre-requisite it that the system must have the ability to weigh containers accurately and not be affected by external factors such as machine vibration or drafts.
It must also learn to avoid using any weight measurements that are ‘faulty’.
This includes accidental weighing with an empty weigh pan, or a container that still has attached flash.
Once a valid container weight is measured this weight signal can be used as part of the automatic weight control process.
Obviously any container that is outside of customer’s limits can be rejected, thus eliminating the possibility of any complaints for container weight.

The next step in improving the quality of shipped products is to reduce the variation in container weight. To do this we look at the trend in container weight, not just an individual container.
If this analysis shows that the weight is ‘trending away’ from the desired weight then a correction can be made to the die gap. Obviously the amount of correction should be proportional to the rate at which the weight is trending away from the desired value.

Correcting the die gap - which is the correct way?

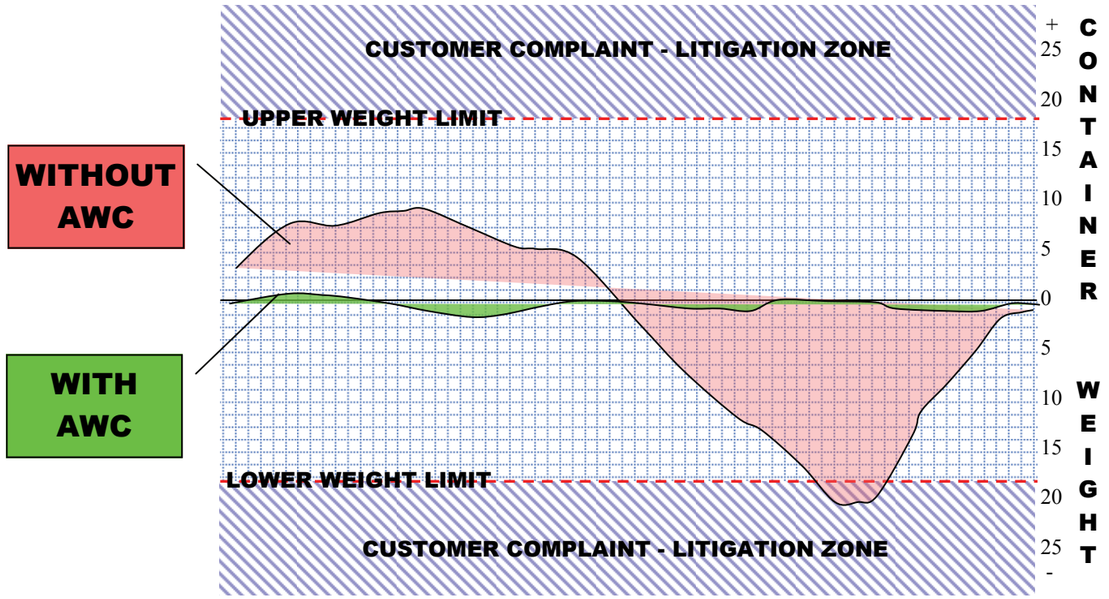
The simplest way of making a correction to the parison thickness is to apply a static correction to the die gap position.
On modern machines this can be done by sending a fixed voltage to the parison control module which is merely added to, or subtracted from, the ‘weight setting’.
Unfortunately, this simple method of weight adjustment does not necessarily produce the correct result!

At this point we need a ‘refresher’ on the function of the ‘Weight’ control and clear up a popular misconception: The weight control makes a **constant** thickness change to the whole parison, but this **does not** necessarily mean that the thickness change is a **constant** percentage.

Why do hot air balloons go up?

Hot air balloons fly because the hot air inside them is lighter than the cold air surrounding the balloon.
When a blow moulded container emerges from the machine the air is warmer inside than the ambient air outside so the whole container will ‘weigh lighter’ until the air inside the container has cooled down to the same as ambient temperature.
In the case of a 220 lt ‘L’ ring drum, it can be as much as 60 grams lighter from hot to cold so if you had set the weight of the drum based on the measurement at the machine a couple of hours later the drum will be 60 grams heavier than you were expecting.

Even if this overweight is acceptable to your customer, you have just given away 60 grams of material ….which is about 15 tons a year.
By measuring the air temperature inside the drum and knowing the volume of the drum enables us to calculate the weight error.
You are welcome to have a copy of our ‘Windows’ program ‘Mass-Calc’ to see for yourself how this works.



Q & A

Is it suitable for any blow moulding machine?
Yes, it has been fitted to continuous extrusion and accumulator head machines.

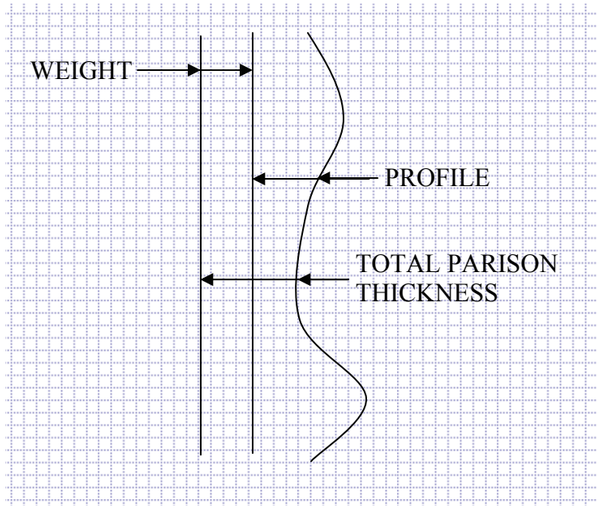
Will it work with multi-head machines?
This depends on the machine type. In some cases it will be necessary to identify the cavity number so that the correct head is adjusted.
We have an optional ‘optical character recognition’ (OCR) feature capable of reading the cavity number.
This was developed for the SPC feature of our leak testers. It enables the analysis of “containers rejected by cavity”.
This feature can show moulders if a particular cavity on a multi-head machine is responsible for the rejection of more faulty containers which is invaluable in locating and correcting the cause of problems

What are the ‘best’ applications?
U.N. containers from 5 lt to 220 lt. have shown good weight savings, and the obvious peace of mind stemming from the knowledge that you can show proof that the containers were produced properly.
Our system of storing all test results is extremely popular in countries where product liability litigation is a popular sport.

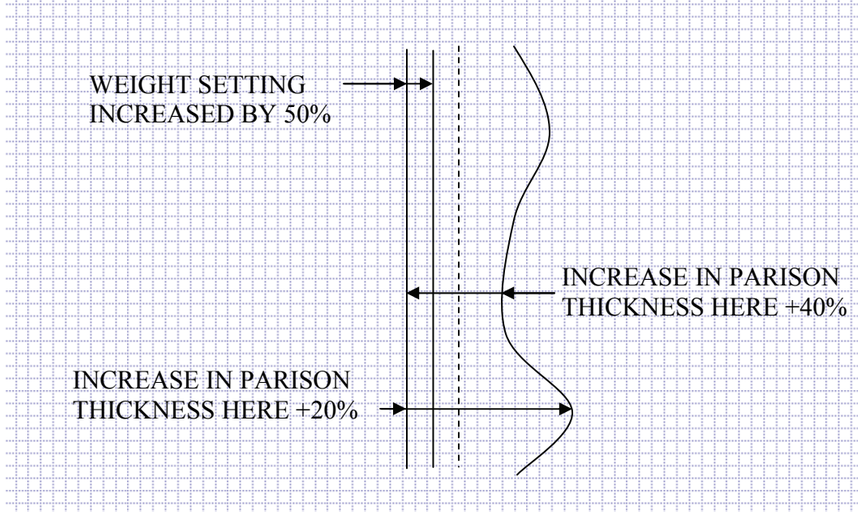
Is this system new?
No, We showed the first AWC at ‘Interplas’ about 15 years ago.
This was part of our Automatic Quality System (AQS)
At that time we were directly connecting our weighing system to the ‘Weight’ control of a Moog 25 point programmer.
This simplified technique was a Krupp-Kautex patent of which we were their sole licensee.

Are there any problems?
Yes, it is not intended to fix a faulty machine or a faulty process.
It was for this reason we declined to supply a system for a machine producing 19 lt P.C. water containers as there were shot-to-shot random weight variations of up to 50 grams. Even with our technique of analyzing the trend we decided this was not a good application.

The diagram below shows how the total thickness of the parison is made up from the setting of the WEIGHT control which is added to the PROFILE system.

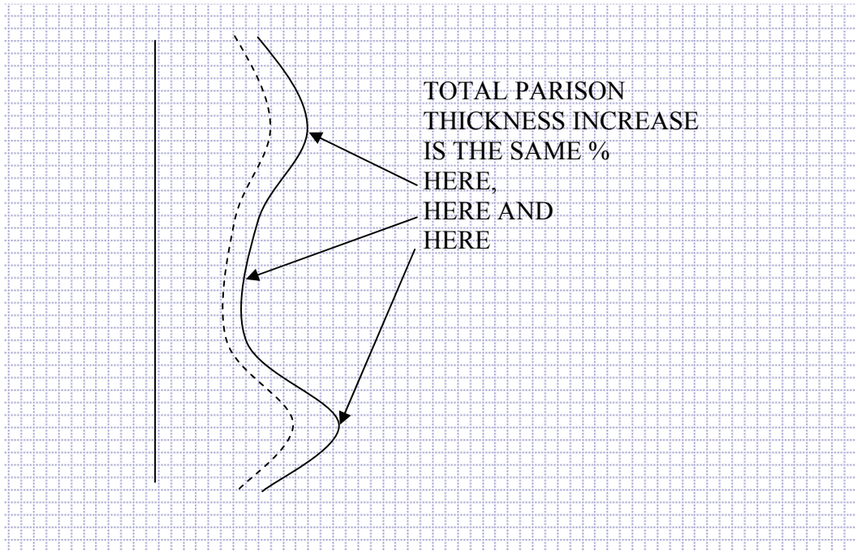


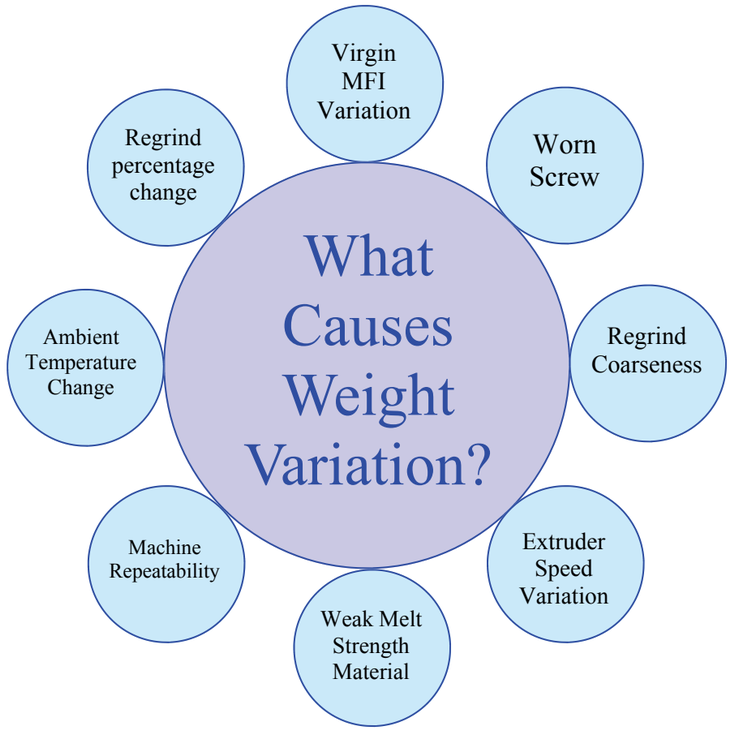
Here's what happens when you increase the ‘Weight’ setting



As can be seen, by increasing the die gap opening by a fixed amount results in different **percentage** increases.
This has the effect of causing the relationship of the original profile that was painstakingly optimized to be changed to one which is not correct which may result in the production of ‘out of specification’ containers.

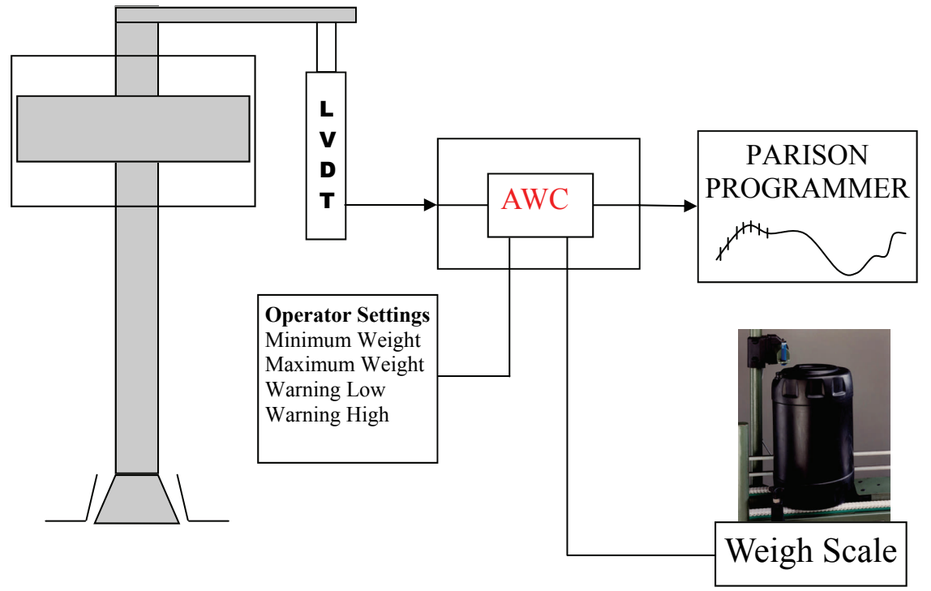
The correct action of the **AWC** system is to change the thickness of the parison by a **constant percentage**. This is only possible if the system can continuously calculate the correct percentage and add this as a varying amount.
The graph shows the correct method of control that maintains the original thickness profile





How do we interface our AWC to the machines parison programmer?

Our patented technique of achieving the dynamic die gap correction is to intercept the LVDT transducer signal, process it and send it on to the machines parison programmer. This simple interface means that there is no need to go into the machine cabinet and make wiring or software changes. It can be completely disconnected in 15 seconds, and the machine functions exactly to its original configuration.



The system is well proven, and the numerous benefits have given 100% payback in just a few months.

1. Perfect for containers that have to meet tight customer specifications, UN containers, Automotive and Technical mouldings
2. By ensuring optimal weight and parison profile distribution, containers will pass crucial factors such as drop and burst tests. Random samples will be as consistent as the QC ‘reference’ container.
3. Eliminate the rejection of a truck load of containers if one container is found to be out of weight specification. The AWC system eliminates this problem by rejecting any containers that fall outside weight specification.
4. By stabilizing the weight of the container you will be able to run nearer to ‘bottom limit’ which will of course lead to **material savings**.