INTERPRETING the *54 CYCLE PRINTOUT

You may obtain printed information about every cycle by connecting a printer to your blender controller printer port and turning on the *54 Print flag. 10 or 20 cycles of data can tell a lot about the performance of your blender. The following will help you interpret the data.

A single cycle printout looks like this:
(dashes ---- added for clarity of spacing)

```
            ------------  ------------  ------------  ------------  ------
            **REG   20**  **NATURAL **  **COL 04.0**  **ADD 00.0**   TOTAL

* 11/10/97  *  * 16:17:53 *  RECIPE 0000   **ID#  051**  **WO 000000*  OPR000
FINAL: DISP,%     0.0    .0  1908.3          77.6  4.06     0.0   .00  1985.9
RATE: GR/TIME  18224    976  19993    488  12973 31232   10240 31232      9.9
1ST DISP,TIME     0.0    00  1908.3   469    77.6  1826     0.0    00
```

DEFINITION OF EACH LINE

The TOP-OF-PAGE heading:

```
            ------------  ------------  ------------  ------------  ------
            **REG   20**  **NATURAL **  **COL 04.0**  **ADD 00.0**   TOTAL
```

Prints as a heading to each page, or once every 10 cycles. This serves as a heading over the four columns of material. Thumbwheel settings are shown. If a thumbwheel setting is changed, a new header line will print.

Notice that REG shows a full percentage only, no tenths. The software only accepts full percentage entries for regrind. Tenths are ignored.

TWELVE software will print up to 3 line groups, 4 components per line, printing only those that are currenly turned on.

The CYCLE heading:

```
            ------------  ------------  ------------  ------------  ------
* 11/10/97  *  * 16:17:53 *  RECIPE 0000   **ID#  051**  **WO 000000*  OPR000
```

DATE and TIME this blend cycle was completed. RECIPE, ID, Work Order, and Operator numbers have no bearing on blender operation but aid in identifying this particular blender, and what job was running.

DATA line 1:

```
            ------------  ------------  ------------  ------------  ------
FINAL: DISP,%     0.0   .0   1908.3        77.6    4.06  0.0      .00  1985.9
```

For each material, each column shows the final dispensed weight of that material and its percentage of the blend.

In this example Natural dispensed 1908.3 grams. Percentage for natural is not given since it is not set by the operator and is not pertinent. Color dispense is 77.6 grams, 4.06 percent of the natural dispense, slightly over the 4 percent requested.

The final number, 1985.9 is the total weight of the blend. It equals the sum of the component dispenses.

DATA line 2:

```
            -----------  -----------  -----------  -----------  ------
RATE: GR/TIME  18224   976   19993    488  12973 31232   10240 31232      9.9
```

These numbers show the RATE of dispense for each material. These are the numbers that the software used to calculate how long to open the slide gate or run an auger, in order to dispense the required amount. This is GRAMS per Interrupts; 1822.4 grams dispensed in 976 interrupts, which is 4 seconds.

The final number, 9.9 grams, is the TEAR WEIGHT of the weigh bin displayed just before the cycle began.

DATA line 3:

```
            -----------  -----------  -----------  -----------  ------
1ST DISP,TIME     0.0   00   1908.3   469    77.6  1826     0.0    00
```

This shows the first dispense in grams for each material and the timing of that dispense (in interrupts).

If the first dispense weight, (data line 3), matches the final dispense, (data line 1), then no "retries" occurred. In other words, the first try was accepted by the software. If they do not match, then the first try was short and one or more retries occurred. The second number is the dispense time that the software calculated to be a correct first try for the dispense.

Optional "BAILOUT" line:

```
            -----------  -----------  -----------  -----------  ------
                                              232
```

A 4th data line (not shown in the beginning example) will print if any single dispense goes past its target weight by a certain value, this value set by the BER parameter, normally 200 grams. The example line shown here would indicate COLOR overshoot the target weight after dispensing for only 232 interrupts.

Bailouts are designed to prevent overflows of material when initial software settings, at start up, are entirely inappropriate for the metering device. A larger then normal error correction will occur

after a bailout.

Bailouts errors at any time other then startup, usually indicate either very poor flowing material, or excessive vibration. When a bailout occurs the dispense stops immediately for a weight reading. Using this information, the cycle then continues normally.

WHAT TO CHECK FOR.

TOTAL BATCH WEIGHT: (DATA line 1)

Check the TOTAL batch weight, (DATA line 3), to confirm the blender model. 2000 grams indicates 200 series model.
400, 1000, and 2000 gram totals indicate models that use 3 K load cells, which means output information is in 1/10's of grams.
4000, 9000, and 18000 gram totals indicate larger blenders that report information in full grams. Since some numbers in the printout do not include the decimal point, you will want to know if you are reading full grams or tenths of grams.

TARE WEIGHT. (DATA line 2)

In DATA line 2, tear weights should be consistently within a few grams of each other from cycle to cycle. Large variations in the tare weight numbers may indicate excessive vibration, some mechanical interference with the weigh bin, or a faulty circuit board. Tare weights above or below zero are not a problem as long as they are consistently similar from cycle to cycle. When problems are present, tare numbers may vary by up to 50 grams. Variations of 2 or 3 grams are not a problem.

RETRIES: (DATA line 3 and 1, FIRST and FINAL dispense)

When FIRST time dispense, (DATA line 3), does not equal FINAL dispense, (DATA line 1), one or more retries have occurred. Retries are evidence of a problem that will also cause percentage errors.

Retries may indicate possible problems; perhaps the hopper ran out of material, or the flow rate is so erratic that the first dispense was short for no good reason. Parameters _RT and _RP determine what shortage error is necessary to force a retry.

FLOW RATE NUMBERS: (DATA line 2)

Check the RATE numbers, (DATA line 2), to determine each dispense device.

In the example above:
In the REGRIND column, 18224 and 976 translates to 1822.4 grams in 4 seconds (244 interrupts = 1 sec). This is 455.6 grams per second, typical for a regrind flowing through 3" round or 2"x3" dispense valves.

In the NATURAL column, 19993 and 488 indicate 1999.3 grams in 2

seconds, or 999.6 grams per second flow rate. This is a heavy natural material, not polyethylene. Perhaps lexan or a glass filled material.

In the COLOR column, 12973 and 31232 indicate 1297.3 grams per 31232 interrupts, or 128 seconds, for a flow rate of 9.99 grams per second. This is a 1 inch auger feeder, from which we would typically expect about 8 grams per second. More recent auger feeders use faster motors delivering about 16 grams per second.

In the ADDITIVE column, 10240 and 31232 indicate a flow rate of 8 grams per second EXACTLY. Since it is exact, and since these two numbers are, in fact, the "default" settings from when the blender was first installed, we know that "Additive" has never been run on this blender, or at least not since the last "CLEAR ALL" was performed.

DATA line 3 dispense weight of 0.0 for additive, and the TOP-OF-PAGE heading showing Additive set to 00.0 percent also confirm that Additive is not being run.

The following information will help you determine what devices in place on a blender.

Devices:	Approximate grams per second:
1/2 inch augers, micro pulse valves	1/2 to 2
1 inch augers, 60 RPM motors	6 to 10
1 inch augers, 120 RPM motors	12 to 20
100 series valves dispense	250 to 450
3" round and 2x3 inch valves	500 to 900
900 and 1800 series large 3x6 valves	3000 to 5000
3" round and 2x3 valves with flow restrictors	50 to 100

Regrinds are always lower then naturals. Bulk density will also cause wide variations in flow rates.

ERROR CORRECTIONS: RATE NUMBERS. (DATA line 2)

The RATE numbers are used by the software, each cycle, to calculate material dispense times. They are adjusted every cycle until flow rates stabilize. When a significant error is detected, the software adjusts the RATE numbers.

The GRAM number is adjusted first. The TIME number (interrupts) is changed only if the GRAM number goes below 16,000 or above 32,000 (approximately). In this event both GRAM and TIME numbers are doubled or halved to bring the GRAM number back to between 16,000 and 32,000.

This serves to keep all numbers as large as possible allowing for the most accurate math, but not so large as to overflow the registers.

Only the GRAM number changes from cycle to cycle, except under the conditions noted above.

Check the GRAM number for a series of consecutive cycles. If it remains unchanged, then the dispenses are accurate enough to not trigger error corrections. Another possibility is that the parameters (MI and NC) that determine when error corrections occur are somehow out

of range preventing corrections that should be occurring.

The PRC parameter limits adjustments to 10 percent. Do not expect any single GRAM number change larger then 10 percent.

A gradual decrease in the GRAM number indicates a slowing rate, a hopper that is becoming empty for example. A jump in rate (increased GRAM number) occurs when the hopper is refilled.

If Errors are occurring, but the GRAM number is NOT adjusting, check the NC parameter and the MI parameter. These control weather or not error corrections occur. Both are set and adjusted automatically by the software. MI is set after each start up, after 10 cycles have run without retries. MI will be set to indicate 50 percent of normal dispense rate expressed as grams per second.

NC adjusts slowly over extended periods of running. NC indicates, in grams, the upper limit of the error in 60 percent of the dispenses. A high number usually indicates poor flowing material. Vibration or drifting load cells are other possibilities.

DISPENSE TIMING: (DATA line 3)

The second number is the number of interrupts calculated to dispense the material. If these times are consistent but the weight of the first dispense varies, then the material does not flow well, or consistently. Another possibility is excessive vibration or interference with the weigh bin.

Excess vibration, particularly on small dispenses, may cause incorrect weight readings even though the weight dispensed was, in fact, correct.

If the timing number is very small, 10, 20, 30 interrupts, perhaps this is asking too much from a slide valve. Very short times mean you want small amounts, but are using a high rate dispense valve to do the job. An auger, a vertical valve, a horizontal valve with a flow restrictor, or a smaller valve would help to improve accuracy and control.

If the timing number is below 5, you are operating in a range were it is difficult for the blender to perform well.

The LAG time parameter adds time to every dispense. This is to compensate for the time at the beginning of a dispense when the solenoid valve shifts and air pressure builds, before the valve starts to move. LAG times are always set slightly longer then the necessary minimum. If a calculated dispense time is very short, the Lag time that is added, while small, may interfere with accuracy, and cause an over dispense.

PERCENTAGE ERRORS: (DATA line 1)

When looking at errors of percentage of color or additive dispensed, look further.

1. First, look for indications of "retries". Retries are evidence of

a problem that will also cause percentage errors.

When FIRST time dispense, (DATA line 3), does not equal FINAL dispense, (DATA line 1), one or more retries have occurred. This means the hopper ran out of material, or the flow rate is so erratic that the first dispense was short for no good reason. Parameters _RT and _RP determine what shortage error is necessary to force a retry.

Inconsistent loading resulting in large variations in hopper material level can cause retries.

Excessive vibration can also cause bad weight readings, which can cause unwarranted retries. If the BAILOUT line is printing occasionally, then vibration is most likely causing this. Increasing the BAILOUT parameter should fix this.

A LAG time set too high may cause retries to overshoot their mark resulting in over dispensing.

2. Second, look at ACTUAL weight dispensed (DATA line 1).

   Color, for example, is a percentage of the natural. In the example above, Natural is 1908.3 grams, so color, at 4 percent of Natural, is targeted to be 76.3 grams. In fact, 77.6 was dispensed. The error is 1.3 grams, well within the expected accuracy of a 1 inch auger feeder.

   The actual GRAM error of a dispense is more meaningful then the percentage error. Mechanical devices are not perfect. The most we can expect from them is to operate within a reasonable range of accuracy. This range is better defined by an error expressed in grams, rather them percentage.

3. Third, look at the dispense TIME (DATA line 3).

   Very short times (10, 20, 30 interrupts) indicate dispense devices not well matched to the task. Accuracy on a percentage basis, cycle to cycle, will suffer. This may very well be acceptable as long as overall usage percentages are still accurate.

BAILOUT: (line 4)

If bailouts occur, vibration is usually the cause and these bailouts may be causing other problems. Raise the value of the BAL parameter to 200 or 300 grams to reduce or eliminate unnecessary bailouts.

Vibration may also cause throughput rates to suffer due to the added time requiring to obtain acceptable weight readings. Increase the WDF parameter to 2 or 3 grams, (WDF 00003) or (WDF 00030), or more if necessary.