Study of Constant Flow Device for Feed Tanks

By: James C. Halvorson, Paul E. Waibel, Robert W. Berg

Animal Science Department, University of Minnesota

Bulk feed storage tanks and automated feed handling systems provide the turkey grower with an economical and convenient way to supply the flock with feed. Unfortunately, bin feed dynamics can sometimes slow down or stop the flow of feed from the storage tank to the feed handling system. This disruption of feed flow, commonly called bridging, occurs whet, the feed packs together in the cone shaped bottom of the feed tank. Bridging in the feed tank can cause serious management problems such as build-up of stale and/or moldy feed, disruption of the order of diets added sequentially to the tank, incomplete cleanout of medicated feeds, and increased labor costs. Recently a device designed to maintain uniform flow of feed in feed storage tanks was tested at the Rosemount Poultry Research Unit.

Unit Design:

The constant flow device tested In this study was a smooth, tapered, cone shaped object designed to hang near the bottom opening of center draw feed tanks and bins. Three cables attached to the top of the tank support the upward pointing cone (Figure 1). Feed moving down in the tank is directed around the cone towards the discharge opening. Two new 7.4 ton feed tanks, located at the north end of building #410, Rosemount Poultry Research Unit, were used. The east tank was equipped with a constant flow device while the west tank was not. Each tank was connected by flex auger to a line of feeders within the building. Two feeders, one from each tank's flex auger, were placed in each pen of growing turkeys. No preference for feeder location was observed among the turkeys.

Two trials were conducted wherein successive three ton batches or corn-soy turkey growing diets were added to both tanks at the same time as shown in Figures 2 and 3. Each addition of feed was marked with a set amount of colored and sized iron particles (Microtracers F). Microtracers F were included in the feed at 50 grams per ton for Trial 1 and 25 grams per ton for Trial 2. Each successive batch of feed was **marked with a different** color: Batch 1, unmarked. Batch 2, red; Batch 3, blue; Batch 4, natural yellow; Batch 5, green yellow-**,** Batch 6, unmarked. At the. same time each day a half-pound sample of feed was taken from the top of the feeder closest to the entrance of each flex auger line into the building. Each sample was analyzed twice for Microtracers F by the Mason jar Technique as described in "Item L, Quality Assurance with Microtracers F, Detection Procedure" (Micro Tracers, Inc.). Duplicate analyses were averaged and graphed for each day as shown in Figures 2 and 3. (Page 18).

Results:

Visual inspection of the tank with the constant flow device in operation showed that feed remained level as it moved down in the tank. The feed in the tank without the constant flow device displayed bridging which caused a 11 pipe" or "rathole" to be formed; that is, there was a large depression in the center of the feed in the tank.

Figures 2 and 3 show the number and color of microtracer counts from the samples taken each day from the tanks for Trials 1 and 2, respectively. In both Trials 1 and 2 the batch tracer colors came through more quickly in the tank without the constant flow device. Table 1 shows the

average number of days that it took a batch tracer color to appear after the marked feed was added to the tank. The rapid passage of the freshly added feed through the tank indicates that the last feed added was flowing directly through the tank via the "pipe" or "rathole". The degree of batch by-pass that occurred in the tank without the device seemed to depend on the fullness of the tank when a new batch was added. When batches were added close together (red and blue in Trial 1 and yellow and green in Trial 2) more apparent by-passing occurred. A fuller tank probably provides a larger funnel shaped "pipe" or "rathole" for the last batch to by-pass through.

For both Trials I and 2 more batch tracer color reappeared in the samples from the standard tank without the constant flow device. For example, in Trial 1 the red batch tracer in the tank without the constant flow device came through quickly and dropped off, but it kept reappearing in varying amounts for the remainder of the trial. In the tank with the constant flow device the red batch tapered off gradually and then only reappeared two other times in small amounts. This trend was also present in Trial 2 but was not as evident due to more complete emptying of the tank before the next batch was added. Table 2 summarizes the average number of days that a batch tracer color reappeared. The data in Table 2 suggest that feed in the tank without the constant flow device was bridging on the sides of the tank and trickling down slowly over a long period of time.

Both tanks showed some degrees of mixing or "overlap" between consecutive batches. Table 3 shows that the overlap that occurred with the samples from the tank with the constant flow device was not as great as that from the other tank's samples. The mixing that did occur with the constant flow samples followed a more predictable and consistent pattern as compared to the tank without the device. For both Trials 1 and 2 there were more days when three batch trace colors were mixed from the tank without the constant flow device (Table 4).

The sharpness of cut-off between batches was not perfect with either tank: there was always some mixing and reappearance of batch tracer color. The degree and pattern of the mixing and reappearance is the important thing to consider. With the constant flow device consecutive batches did blend or mix slightly but this was consistent from batch to batch. Without the constant flow device in, the tank, feed added at the beginning of the trial was reappearing at the end of the trial in large amounts. This was shown well by the first (red) batch in Trial 1 (Figure 2).

Significance for Turkeys:

Turkey feeding programs are designed to meet the nutritional and health needs of the bird according to age. Young birds need diets that have higher concentrations of nutrients to support their rapid growth. If the turkey starting ration intended for the young bird bridges in the feed tank, after a growing diet is added, then the bird will be missing the nutrients that it needed for maximum growth. Coccidiostats and other medications are often included in turkey rations.

drugs have withdrawal periods and must not be fed to marketable birds. A medicated starter could hang up on the sides of a feed tank and come down with a finishing ration fed after it. Market turkeys consuming this feed would be subject to condemnation with resultant loss to the producer. When feeds are added sequentially to a feed tank it is important for the turkey grower to be sure that the first feed added is the first feed out.

*(Graph continued on page 18).

TABLE 1. Number of days for batch tracer color to appear after batch was added to feed tank.

	TRIALS			
	#1		#2	
Batch Color	Constant Flow	None	Constant Flow	None
1. Red	1	1	7	1
2. Blue	1	1	6	1
3. Yellow	3	1	4	1
4. Green	2	1	6	1
Average	1.75	1.00	5.75	1.0

TABLE 2. Number of days when a batch tracer color reappeared.

	TRIALS			
	#1		#2	
Batch Color	Constant Flow	None	Constant Flow	None
1. Red	2	22	1	2
2. Blue	0	8	0	2
3. Yellow	1	0	0	0
4. Green	0	1	0	0
Average	0.75	7.75	0.25	1.00

TABLE 3. Number of days when batch tracer colors were mixed or overlapped.

	TRIALS			
	#1		#2	
Feed Tank:	Constant Flow	None	Constant Flow	None
Total days	46	46	48	48
Days mixed	23	31	10	13
Percent mixed	50.0	67.4	20.8	27.1

TABLE 4. Number of days when three batch tracer colors were mixed.

	TRIALS			
	#1		#2	
Feed Tank:	Constant Flow	None	Constant Flow	None
	2	6	0	2

April, 1983

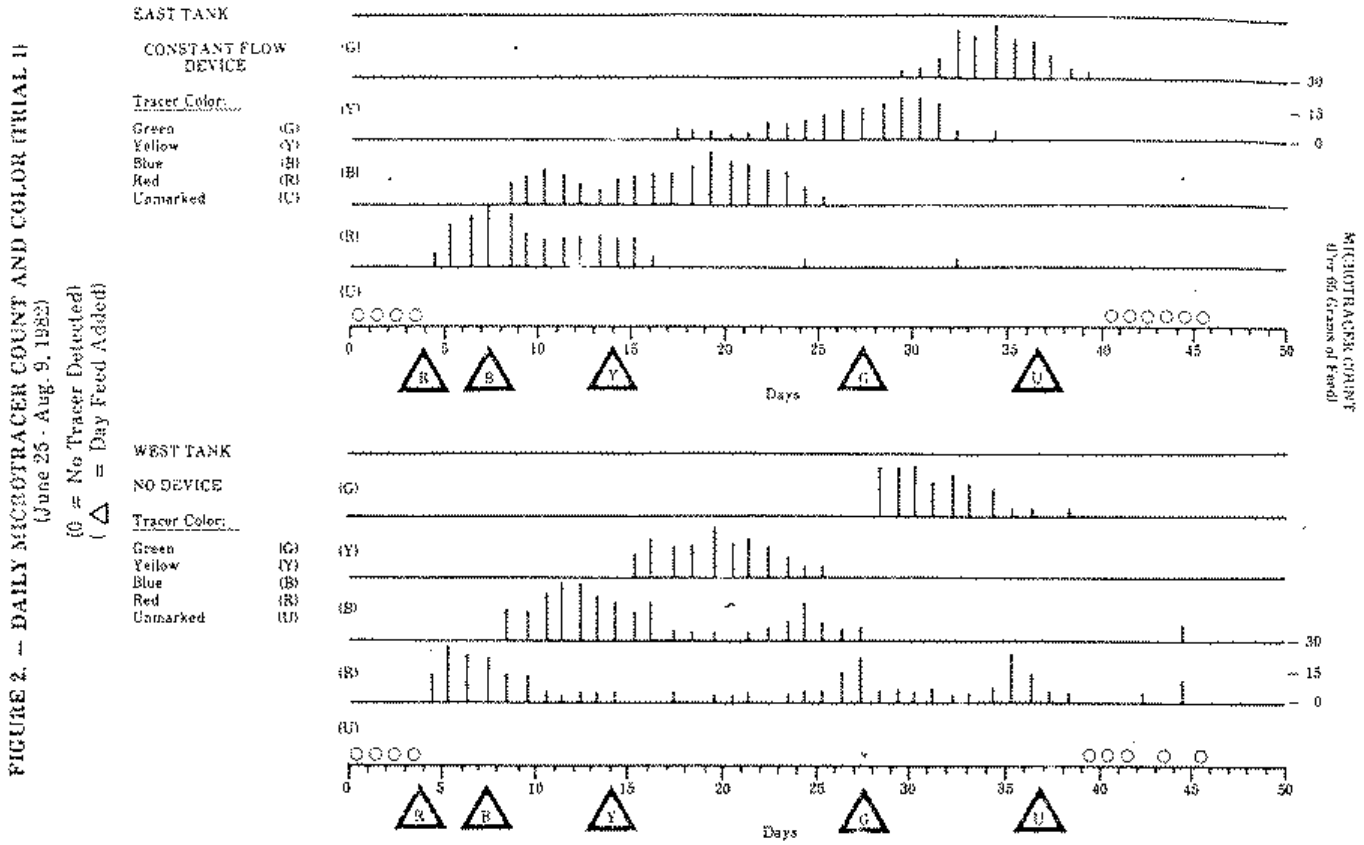

FIGURE 2. — DAILY MICROTRACER COUNT AND COLOR (TRIAL 1)
(June 25 - Aug. 9, 1982)
(0 = No Tracer Detected)
(△ = Day Feed Added)

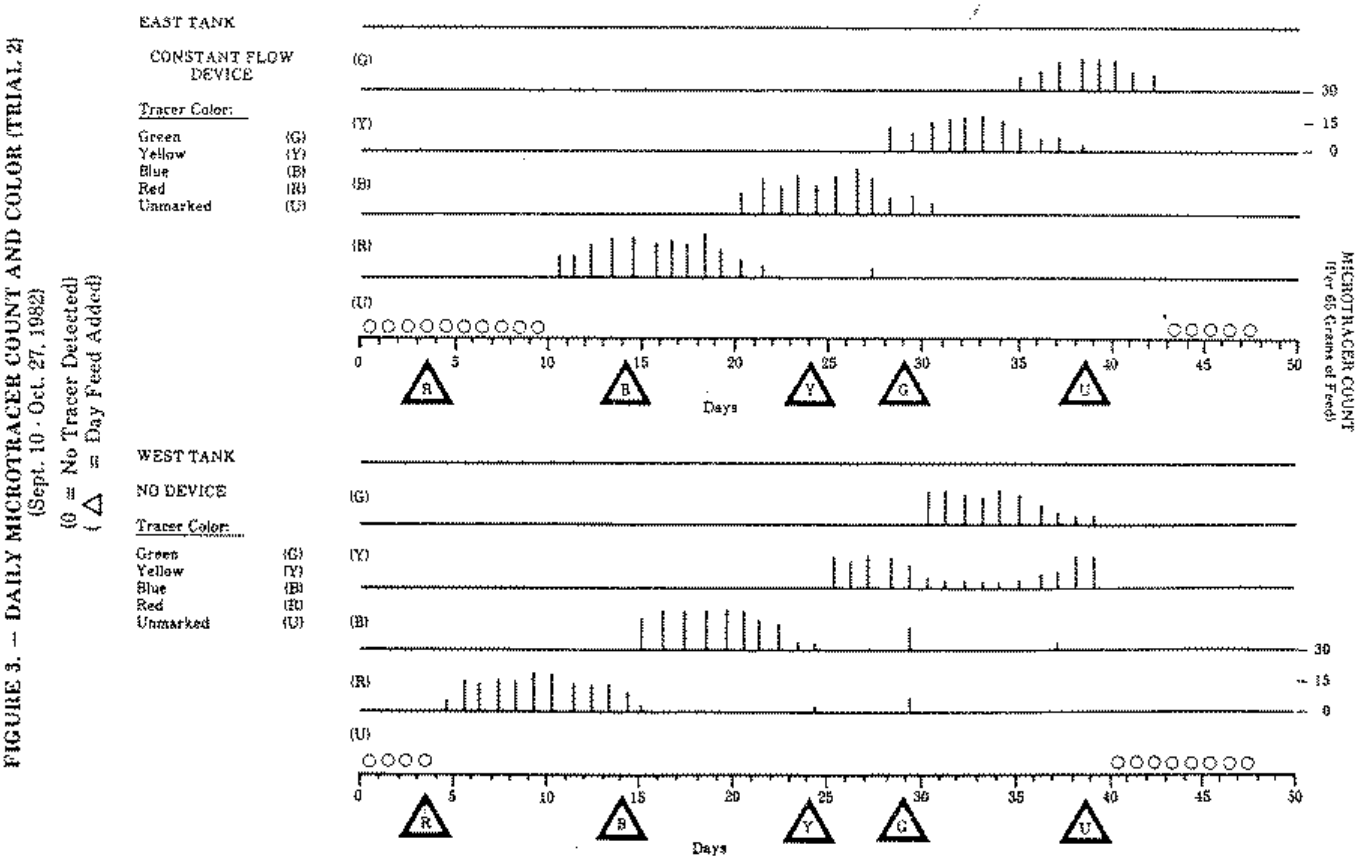

FIGURE 3. — DAILY MICROTRACER COUNT AND COLOR (TRIAL 2)
(Sept. 10 - Oct. 27, 1982)
(0 = No Tracer Detected)
(△ = Day Feed Added)