



# Reference Guide for Solving Poultry Processing Problems

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To produce a quality poultry meat product from a live bird involves a series of efficiently-performed, specific tasks in a sanitary manner. Before broilers can be processed, they must be caught, cooped, transported and held, then unloaded at the processing plant. Inside the processing plant, broilers are hung on shackles, stunned, bled, defeathered, eviscerated, inspected, chilled, graded, packaged and shipped. Because of the complexity of production and processing procedures, several factors may reduce carcass yield, carcass grade and the company's overall profit margin.

Defects resulting in carcass downgrading and product losses are caused by diseases, damage to the bird before slaughter, or maladjusted equipment and manual errors during processing. This publication focuses on those problems during processing and will assist management and supervisory personnel in reducing carcass downgrades. Tables 1-3 serve as quick reference guides for problems observed during processing.

## **Catching, Cooping and Transporting Live Broilers**

At the grow-out house, market-age broilers are caught by the live haul catch crew, loaded into coops and transported to the processing plant. During catching, minimize bruising because it results in carcass downgrading and yield loss. Ninety percent of bruising occurs within 12 to 24 hours before processing. Areas most frequently bruised are the breast (42%), wings (33%) and legs (25%).

Good live haul procedures can reduce bruising and the number of birds that are dead-on-arrival (DOAs) at the plant. The distance that broilers are transported before processing affects carcass contamination and yield. Broilers that are transported long distances (6 hours) have fewer bruises due to confinement, and the fatigue from traveling makes them less active during slaughter. However, the stress associated with transporting slows digestive tract clearance and increases the live shrink (live weight loss).

## **Receiving, Holding and Unloading Live Broilers**

When birds arrive at the plant, they need adequate ventilation in the holding area to minimize mortality and excessive live shrink. Broilers should arrive at the plant and be scheduled for processing 8 to 12 hours after their last feeding. This decreases the amount of material that could potentially contaminate the carcass during processing by allowing adequate time for the bird's gastrointestinal tract to become empty. Birds that go without feed for long periods of time (greater than 13 to 14 hours) begin to lose the mucosal lining of their intestines and will have lower carcass yields at slaughter. When the intestinal lining is lost, fecal material in the bottom of the coops will have a reddish-orange appearance to it, and the resulting intestine will be much weaker and more easily broken during evisceration.

Be careful during the unloading and hanging steps to minimize carcass bruising, broken legs, broken wings, and red wing tips. If the doors (hinged front flap) to the coops (modules) are not positioned correctly during unloading, they will cause leg and wing damage. Bruising is minimal when coops are tilted in a smooth motion as opposed to bounc-

ing the coop back and forth. Clean empty coops properly before reloading to minimize cross contamination among broilers. In the hanging area, use low levels of light to minimize the birds' excitement once they are placed in the shackles. Blue or red light seems to be most effective at calming broilers.

## **Stunning, Slaughtering and Bleeding**

Stunning of broilers is commonly done in the range of 12 to 150 mA per bird (milliamps) of electrical current for a duration of 2 to 11 seconds. This practice is important, not only because it renders the bird unconscious, but also because it affects bleeding, feather release and overall meat quality. When the stunning voltage is high, wing hemorrhages, red skin condition, poor feather removal, broken bones and blood splashes in the meat may result.

The main concern with stunning, slaughtering and bleeding is to minimize the number of birds that are improperly bled and to limit those that have not expired before they enter the scalding tank. The position of the bird's head during the slaughter operation is critical for proper bleeding and depends upon the alignment of the toe and head guide bars. If the bird's head is not in the correct position for neck cutting, the trachea and esophagus will also be severed. When the trachea and esophagus are severed, it is difficult to remove the head and lungs. The USDA recommends a bleed time in the range of 55 seconds to 2 minutes and 13 seconds.

## **Scalding and Defeathering**

After bleeding, birds are scalded by immersion in a scald tank for 1.5 to 3.5 minutes, depending upon the water temperature. Scalding facilitates feather removal, but only if a uniform temperature is maintained throughout the scalding tank. When the scald temperature is too high, carcasses become discolored due to uneven moisture loss. If the bird is alive when it enters the scald tank, the trachea, esophagus, lungs, crop, gizzard and air sacs may become contaminated with scald water. The resulting carcass will be red in appearance. Moreover, the lungs may collapse and be difficult to remove, or they may drip as the viscera is transported through the plant.

Carcasses leave the scalding tank and go through a series of pickers designed to remove feathers from the body, wing, hock and neck. Feather removal is most successful when the pickers are placed close to the scalding tank so that the bird's body temperature remains high during picking. The pickers can be a major source of carcass bruising, wing breakage and broken hocks, especially if rubber fingers are worn or not positioned correctly.

## **Eviscerating**

During the evisceration process, carcasses can easily become contaminated with fecal material, especially if the vent opener and draw hand are misaligned or the intestines are unusually weak. If the body cavity of the bird appears convex, then the length of the feed withdrawal before processing was too short, and the bird's intestines are full of fecal material. Full intestines are more easily cut or torn during evisceration, and the contents may leak on to the carcass during extraction. On the other hand, when birds go without feed for too long before processing (greater than 14 hours), then the intestinal lining is lost and intestines may break during extraction. Carcass, gizzard and liver contamination with bile are also related to an extended feed withdrawal time. Contaminated surfaces on the carcass have to be washed, trimmed or vacuumed at a reprocessing station, and this process is expensive and time consuming.

## **Chilling and Packaging**

The chilling operation decreases the carcass temperature to 40 degrees F within 4 hours of slaughter and inhibits microbial spoilage. Rapid chilling limits the growth of pathogenic bacteria on the carcass and increases the products' shelf-life, especially when an appropriate amount of chlorine (20 to 50 ppm) is used in the chiller water. Depending upon the extent of their attachment, bacteria present on the carcass as it enters the chiller are frequently removed during the chilling operation.

After chilling, carcasses are hung on a drip line generally for 2.5 to 4 minutes to control the amount of moisture pick-up. Although most of the moisture from chilling is retained in the skin, the amount of cutting during evisceration will have a significant effect on carcass water retention. Carcass temperature on exit from the chiller must be 40 degrees F or less to comply with the USDA regulations.

In the packaging area, whole carcasses or parts must have an internal product temperature of 40 degrees F or less. This temperatures should be maintained throughout storage and shipment. Also place emphasis on minimizing re-contamination of the product with proper equipment sanitation and good manufacturing practices.

## Summary

Poultry is processed primarily to convert the bird's muscles into meat, to remove the unwanted components of the bird (blood, feathers, viscera, feet, and head), and to keep microbiological contamination at a minimum. The ultimate quality of the final product depends not only on the condition of the birds when they arrive at the plant, but also on how the bird is handled during processing. Bruising, broken bones, missing parts and high carcass reprocessing numbers can cause significant economic losses. Unloading, stunning, slaughter, scalding, picking, eviscerating, chilling and packaging poultry are some of the processing steps that can result in product defects. Thus, these steps must be continuously monitored and precisely controlled.

## References

- Benoff, F. H., J. P. Hudspeth, and G. A. Schuler. 1982. *Troubleshooting guide for poultry processing*. University of Georgia Extension Publication 40.
- Bilgili, S. F. 1993. Broiler carcass quality: Seven-year survey. *Broiler Industry* 56:32-42.
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**Table 1. Problems and Solutions Observed During Uploading Broilers through the Picking Room.**

Observations	Causes	Corrective Action
Wing Damage	<ul style="list-style-type: none"> <li>• Wings caught on coop door.</li> <li>• Hangers too rough.</li> <li>• Toe guard out of line.</li> <li>• Pickers not properly adjusted.</li> <li>• Picker fingers missing.</li> <li>• Field causes.</li> </ul>	<ul style="list-style-type: none"> <li>• Make sure doors on coop at proper angle for dumping.</li> <li>• Hangers shouldn't pick up birds by the wings.</li> <li>• Adjust toe guard.</li> <li>• Adjust pickers</li> <li>• Replace missing or worn fingers daily.</li> <li>• Checks for field bruises/broken bones.</li> </ul>
Carcass Bruising	<ul style="list-style-type: none"> <li>• Stunning voltage too high.</li> <li>• Picker not properly adjusted.</li> <li>• Field causes.</li> </ul>	<ul style="list-style-type: none"> <li>• Check voltage.</li> <li>• Adjust pickers daily.</li> <li>• Check flock placement density in grow-out house.</li> </ul>
Poor Bleed-out, "Red Birds," "Red wing tips"	<ul style="list-style-type: none"> <li>• Improper setting for neck cutting.</li> <li>• Bleed time too short. Back-up personnel in killing area. Birds not properly stunned.</li> <li>• Overscalding.</li> </ul>	<ul style="list-style-type: none"> <li>• Do not sever the spinal cord, trachea or esophagus during neck cutting. Adjust killing machine &amp; sharpen knife. Check with the back-up personnel. Make sure the bleed time is at least 55 sec. Allow birds time to calm down before stunning. Check the stunner. Check scald temperature (124-138 degrees F).</li> </ul>
Dead birds on line (cadavers)	<ul style="list-style-type: none"> <li>• Hangers too rough. Neck cutting malfunctioned. Live birds entered scald.</li> </ul>	<ul style="list-style-type: none"> <li>• Check hanging, killing areas.</li> </ul>
Shattered bones, dis-integrated hearts and livers, pooled blood in the body cavity, blood splashes or blood spots in meat	<ul style="list-style-type: none"> <li>• Stunning voltage too high.</li> </ul>	<ul style="list-style-type: none"> <li>• Adjust stunner and stunning conditions.</li> </ul>
Miscut or broken hocks	<ul style="list-style-type: none"> <li>• Improper setting on hock cutters.</li> <li>• Worn equipment.</li> <li>• Birds not hung correctly.</li> <li>• Bird size variation.</li> <li>• Weak bones.</li> </ul>	<ul style="list-style-type: none"> <li>• Check hock cutters with each bird flock; adjust properly.</li> <li>• Check foot unloader.</li> <li>• Check with grow-out manager and nutritionist if you suspect weak bones.</li> </ul>
Breast Blisters	<ul style="list-style-type: none"> <li>• Field causes related to litter condition.</li> </ul>	<ul style="list-style-type: none"> <li>• Alert grow-out manager of increase in breast blisters.</li> </ul>
Underpicking	<ul style="list-style-type: none"> <li>• Scald temperatures too low or not uniform.</li> <li>• Pickers misaligned.</li> </ul>	<ul style="list-style-type: none"> <li>• Check scald temperature and adjust, if necessary.</li> <li>• Check picker.</li> </ul>
Benoff, et. al., 1982.		

**Table 2. Problems and Solutions Observed During Poultry Evisceration.**

Observations	Causes	Corrective Action
Carcass Contamination	<ul style="list-style-type: none"> <li>• Broilers off feed too short or too long before processing.</li> <li>• Intestines are cut or torn.</li> </ul>	<ul style="list-style-type: none"> <li>• Check with grow-out manager and adjust feed withdrawal time to 8-12 hr.</li> <li>• Adjust vent opener.</li> </ul>
Oily Birds	<ul style="list-style-type: none"> <li>• Nutritional imbalance.</li> <li>• High scald temperature.</li> <li>• Pickers too close together.</li> </ul>	<ul style="list-style-type: none"> <li>• Check with nutritionist.</li> <li>• Check &amp; adjust scald temperature, if necessary.</li> <li>• Adjust pickers, if necessary.</li> <li>• May be related to seasonal weather.</li> </ul>
Abnormal condition of intestines	<ul style="list-style-type: none"> <li>• Weak intestines.</li> <li>• Watery fecal material.</li> <li>• Possible disease condition.</li> </ul>	<ul style="list-style-type: none"> <li>• Check length of feed withdrawal.</li> <li>• Check for possible disease conditions in the field.</li> </ul>
Downgrades too high	<ul style="list-style-type: none"> <li>• Wing bruises, back bruises, leg bruises, poor bleed-out, contamination, breast blisters, etc.</li> </ul>	<ul style="list-style-type: none"> <li>• See Table 1.</li> </ul>
Carcasses contaminated with bile	<ul style="list-style-type: none"> <li>• Feed withdrawal time too long.</li> <li>• Draw spoon needs adjusting.</li> </ul>	<ul style="list-style-type: none"> <li>• Check to see if gall bladders on eviscerated broilers are enlarged. Large gall bladders indicate feed withdrawal is too long.</li> <li>• Check evisceration equipment.</li> </ul>
Benoff, et al., 1982.		

**Table 3. Problems and Solutions Observed During Chilling and Packaging.**

Observations	Causes	Corrective Action
Carcass/parts moisture too low or too high	<ul style="list-style-type: none"> <li>• Improper time in chiller.</li> <li>• Improper temperature sequence of chillers.</li> <li>• Cuts, tears, excessive loose skin.</li> </ul>	<ul style="list-style-type: none"> <li>• Notify chiller operator.</li> <li>• Check vent opening and pickers.</li> </ul>
Bird temperature too high or too low	<ul style="list-style-type: none"> <li>• Improper temperature in chiller.</li> </ul>	<ul style="list-style-type: none"> <li>• Adjust temperature of chiller.</li> <li>• Discuss problem with chiller operator.</li> </ul>
Stated weight is not the same as actual weight.	<ul style="list-style-type: none"> <li>• Scale is off.</li> <li>• Improper moisture pick-up.</li> </ul>	<ul style="list-style-type: none"> <li>• Check tare weight.</li> <li>• Check scales daily.</li> </ul>
Excessive short weights.	<ul style="list-style-type: none"> <li>• Moisture too high.</li> <li>• Product is warming during transportation.</li> </ul>	<ul style="list-style-type: none"> <li>• Check moisture pick-up records.</li> <li>• Check packages for excessive purge.</li> <li>• Check truck loading &amp; unloading procedures.</li> </ul>
Product returns for off-odors	<ul style="list-style-type: none"> <li>• Product is warming during storage or transportation.</li> <li>• Contact with contaminated surfaces or other contaminated products.</li> </ul>	<ul style="list-style-type: none"> <li>• Check product storage temperature, out-going product temperature &amp; chiller temperature.</li> <li>• Check chlorine levels in chiller.</li> <li>• Have QC check equipment sanitation procedures, and check for spoilage organisms on the product.</li> </ul>
Benoff, et al., 1982.		