

Extra Practice Processing Calculations

Sausage Formulation

1. Establishment 38 is preparing raw pork sausage using the following formula. The fat target is 50%.

Regular pork trimmings (60% fat)	700 lb
Special pork trimmings (20% fat)	300 lb
Mechanically separated pork (30% fat)	200 lb
Salt	15 lb
Spices	5 lb 15 oz
Sugar	4 lb
Antioxidant compound (BHA, BHT propyl gallate and citric acid)	<div style="display: flex; justify-content: flex-end; align-items: center;"> 1 oz <hr style="width: 100px; border: 0.5px solid black;"/> </div>
	1225 lb

What is the maximum amount of mechanically separated pork, in pounds, that could be added to the formula and be in compliance with the regulations?

Answer: 250 lb

2. Establishment 38 is developing the following formula for a raw sausage patty.

Regular pork trimmings (40% fat)	700 lb
Water	?? lb unknown 3%
Salt	15 lb
Dextrose	6 lb
Flavorings	5 lb
Sugar	4 lb
Monosodium glutamate	2 lb 15 oz
Antioxidant compound (BHA, BHT, and citric acid)	<div style="display: flex; justify-content: flex-end; align-items: center;"> 1 oz <hr style="width: 100px; border: 0.5px solid black;"/> </div>
	??? lb

What is the maximum amount of water that can be added to this formula?

Answer: 22.67 lb

3. Establishment 38 is preparing raw bratwurst using the following formula.

Pork trimmings (30% fat)	225 lb
Skinned pork jowls (60% fat)	100 lb
Water	10 lb
Non-fat dry milk (NFDM)	7 lb
Salt	5 lb 8 oz
Flavorings	4 lb 7 oz
Antioxidant compound (BHT, BHA, and citric acid)	
	<u>1 oz</u>
	352 lb

a. What is the maximum amount of water allowed in the formula?

Answer: 10.74 lb

b. What is the maximum amount of NFDM allowed in the formula?

Answer: 12.54 lb

4. Establishment 38 is formulating a 1240 lb batch of raw pork sausage with a fat content of 40% (determined by rapid fat analysis on the processing floor). The formula calls for 0.34 lb (5.44 oz) of an antioxidant compound that has the following ingredients and their percentages listed on the label: BHA-25%, BHT-20%, propyl gallate-10%, citric acid-10%, and carrier-35%.

A. What is the maximum amount of antioxidant compound allowed in this formula?

Answer: 2.88 oz

b. Is the amount of antioxidant compound used in this batch in compliance? **NO**

5. Establishment 38 is formulating an 800 lb batch of raw Italian sausage. The formula includes 210 lb of pork (30% fat), 187 lb skinned pork jowls (88% fat) and 50 lb MSP (30% fat). The percentages listed on the label of antioxidant compound added to the formula are: BHA-25%, BHT-10%, propyl gallate-10%, citric acid-10%, and carrier-45%.

What is the maximum amount of antioxidant compound allowed in this formula?

Answer: 1.55 oz

6. Establishment 38 is preparing Italian sausage using the following formula

Pork trimmings (30% fat)	380 lb	Target fat 32%
Pork Fat	25 lb	
Water	15 lb	
Salt	7 lb	
Spice mix (black pepper and fennel includes 1% BHT and BHA)	5 lb	
	<hr/>	
	432 lb	

Rapid fat analysis on the processing floor = 33%

- a. What is the percentage of meat or meat and fat content of this formula?

Answer: 93%

- b. What is the maximum amount of water allowed in this formula?

Answer: 12.89 lb

- c. What is the maximum amount of antioxidant allowed in the formula?

Answer: .02 lb or .32 oz

- d. Is this formula in compliance with the regulations? **NO; adding .05 lb of antioxidant and 15 lb of water**

7. What is the maximum amount of cure mix (6.25% sodium nitrite) allowed in a raw pork chorizo formula that contains 400 lb of meat and meat byproducts?

Answer: 16 oz

8. What is the ingoing parts per million (ppm) of sodium nitrite for a franks formula that contains 550 lb of meat, poultry, and meat byproducts and 1.5 oz of sodium nitrite?

Answer: 170.45 ppm

9. A knockwurst formula contains 600 pounds of meat and meat byproducts. Determine the maximum amount of nitrite **and** nitrate permitted in this formula.

Answers: 1.5 oz max nitrite and 16.5 oz max nitrate

10. A pickle and pimento loaf formula contains 450 pounds of meat and meat byproducts. Determine the maximum amount of erythorbic acid permitted in this formula.

Answer: 3.37 oz

11. A wiener formula contains 400 pounds of meat, poultry, and meat byproducts and 3 ounces of ascorbic acid.

- a. What is the ingoing ppm of ascorbic acid?

Answer: 468.75 ppm

- b. Is this formula in compliance? **Yes**

12. A bologna formula contains 325 pounds of meat and meat byproducts and 2.5 ounces of sodium erythorbate. What is the ingoing ppm of sodium erythorbate?

Answer: 480.76 ppm

13. A chicken frankfurter formula contains 500 pounds of chicken meat and chicken byproducts and 20 ounces of cure mix containing 8% sodium nitrite.

- a. What is the ingoing ppm of sodium nitrite?

Answer: 200 ppm

- b. Is this formula in compliance? **NO**

14. The establishment 38 is preparing bologna using the following formula.

Beef	125 lb
Pork	65 lb
Water and ice	40 lb
Rework	20 lb
Mechanically separated chicken	15 lb
Corn syrup solids	5 lb
Salt	5 lb
Flavorings	3 lb
Sodium phosphate	1 lb
Paprika	1 lb
Sodium lactate	8 oz
Sodium diacetate	6 oz
Ascorbic acid	1½ oz
Sodium nitrite	<u>½ oz</u>
	281 lb

Finished Product Target = 10% Water and 30% Fat

a. What is the weight of the meat, poultry, and meat byproducts (meat block)?

Answer: 205 lb

b. What is the maximum amount of sodium nitrite allowed in the formula?

Answer: .51 oz

c. What is the maximum amount of ascorbic acid allowed in the formula

Answer: 1.53 oz

d. What is the ingoing ppm of ascorbic acid?

Answer: 457.31 ppm

e. What is the maximum of mechanically separated chicken allowed in the formula?

Answer: 36.35 lb

f. What is the bologna's PFW?

Answer: 245.81 lb

g. What is the maximum amount of sodium phosphate allowed in the formula?

Answer: 1.22 lb

15. Establishment 38 is preparing Frankfurters with variety meats using the following formula.

Pork	250 lb
Water	80 lb
Pork Hearts	60 lb
Beef	35 lb
Non-Fat Dry Milk (NFDM)	17 lb
Corn Syrup	12 lb
Rework	10 lb
Salt	9 lb
Dextrose	6 lb
Mustard	6 lb
Sodium Phosphate	4 lb
Monosodium Glutamate	4 lb
Paprika	3 lb
Oleoresin of Black Pepper	2 lb 8 oz
Onion	2 lb 4 oz
Garlic Powder	1 lb
Sodium Ascorbate	3 oz
Sodium Nitrite	<u>1 oz</u>
	502.00 lb

Finished Product Target =10% water and 30% fat

a. What is the weight of the meat and meat byproducts (meat block)?

Answer: 345 lb

b. What is the ingoing ppm of sodium nitrite?

Answer: 181.15 ppm

c. What is the maximum amount of sodium nitrite allowed in the formula?

Answer: .86 oz

d. What is the ingoing ppm of sodium ascorbate?

Answer: 543.47 ppm

e. What is the maximum amount of sodium ascorbate allowed in the formula?

Answer: 3.01 oz

f. Is the cure agent and cure accelerator in compliance? **NO; Too much Nitrite**

g. What is the frankfurters PFW?

Answer: 451.86 lb

h. What is the maximum amount of NFDM that can be added to this frankfurter formula?

Answer: 15.81 lb

i. Is the amount of NFDM added to the formula in compliance? **NO**

j. What is the maximum of sodium phosphate allowed in the frankfurter formula?

Answer: 2.25 lb

k. Is the amount of sodium phosphate added to the formula in compliance? **NO**

Cured Meat and Poultry Product Operations

1. Establishment 38 is pumping boneless pork picnic shoulders with 14% curing solution. The solution weighs 3700 lb. What is the maximum amount of sodium nitrite allowed?

Answer: 5.28 lb

2. Establishment 38 has prepared a curing solution to be pumped into raw uncooked boneless beef rounds. The solution weighs 2000 lb and has had 4 lb of sodium nitrite added to it.

a. What is the maximum % pump allowed?

Answer: 10%

b. Before pumping 25 beef rounds weigh 102 lb. After pumping and draining the same 25 beef rounds weigh 116 lb. What is the actual % pump?

Answer: 13.72%

c. What is the ingoing ppm of sodium nitrite based on the *actual % pump*?

Answer: 274.8 ppm

d. Is the amount of ingoing sodium nitrite in compliance? **NO**

e. Is the standard of identity for corned beef rounds met? **NO; only 10% solution allowed**

3. Establishment 42 is pumping boneless turkey breasts with 15% curing solution. The solution weighs 4897 lb. The establishment adds a curing compound with 6.25% sodium nitrite in it. What is the maximum amount of curing compound allowed in the solution?

Answer: 104.46 lb

4. Establishment 38 has prepared a curing solution to be pumped into beef briskets at a 10% level. The solution weighs 950 lb and has had 21 lb of a curing compound with 8% nitrite, 5 lb of sodium erythorbate and 30 lbs sodium phosphate added to it. What is the ingoing ppm of sodium nitrite, sodium erythorbate and sodium phosphate?

Answers: 176.84 ppm of nitrite; 526.31 ppm of sodium erythorbate, 3157.89 ppm of sodium phosphate

5. Establishment 38 intends to pump pork bellies for bacon with 9% curing solution. The curing solution will weigh 986 lb.

a) What is the amount of sodium nitrite in pounds that must be listed in the establishment's written bacon processing procedure?

Answer: 1.31 lb

b) If the actual curing solution pumped into the pork bellies is 11.5%, what is the actual ingoing amount of sodium nitrite?

Answer: 152.78 ppm

c) Are the pork bellies in compliance for ingoing sodium nitrite? **NO, maximum of 144 ppm at the time of pumping (plus or minus 20%)**

6. A rectangular tank has the following dimensions: L= 40 inches, W = 40 inches and height = 30 inches. What is the volume 4 inches from the top of this tank?

Answer: 180.08 gallons

7. There is a mark 3 inches from the top of a cylindrical pickle tank which indicates the 250 gallon level. (TANK DIMENSIONS: Diameter = 40", Height = 48", and $\pi = 3.14$).

a. Is the mark correct? **NO**

b. How many gallons will be in the tank when it is filled to the 3 inch mark?

Answer: 244.7 gallons

8. How many inches down from the top will 950 gallons be in a tank with the following dimensions? Diameter 80 inches and Height 50 inches.

Answer: 6.32 inches

9. Fifty uncured pork bellies weigh 608 lb. After smoking and chilling the same 50 pork bellies weigh 603 lb. What is the % yield?

Answer: 99.17%

10. Twenty bone hams-in weigh 312 lb before pumping. After pumping and draining the same 20 hams weigh 368 lb. After cooking and smoking the same hams weigh 328 lb. After chilling and just prior to slicing the same hams weigh 321 lb.

a. What is the % pump/gain?

Answer: 17.94%

b. What is the percentage of smokehouse shrink?

Answer: 10.86%

c. What is the percentage of cooler shrink

Answer: 2.13%

11. Twenty five beef briskets weigh 225 lb before pumping with a curing solution. After pumping the same 25 beef briskets weigh 264 lb. What is the % pump/gain?

Answer: 17.33%

Meat and Poultry Products with Added Solutions (X% Labeled)

1. Establishment 42 is producing a product labeled Diced Chicken Breast Contains up to 17% of Brine, Seasoning, Canola Oil, Spice Blend, Vinegar Powder and Rosemary Extract. The establishment's written processing procedure at the production station near the tumbler states to add 300 lb of diced chicken breasts and 50 lb of a brine/oil based solution to the tumbler. Tumble until the solution is gone.

What is the percentage of added solution, pick-up or gain?

Answer: 16.66%

2. Establishment 38 is producing product labeled Pork Roast Containing up to 10% Solution of Jalapeno Tequila Sauce. The weight of a vat of untreated pork roasts weighs 142 lb (less the tare). The same pork roasts after pumping with the solution weigh 158 lb (less the tare).

What is the percentage of added solution, pick-up or gain?

Answer: 11.26%

3. Establishment 38 is producing product labeled Corned Beef Contains up to 15% of a Flavoring Solution. The weight of a vat of uncured beef eye of the round roasts weighs 185 lb (less the tare). The same eye of the round roasts weigh 217 lb (less the tare) after cooking and chilling.

The percentage of solution remaining in the corned beef round roasts is?

Answer: 14.74%