THE MEAT LOCKER

BY AMERICAN MEAT SCIENCE ASSOCIATION

# The Basics of Tempering (Thawing) Meat

**The use of frozen, raw meat for further processing requires proper tempering and thawing to prevent excessive loss of purge or quality. Additionally, improper thawing allows for growth of both spoilage and pathogenic bacteria.**


Frozen meat in boxes requires that meat blocks must be reduced to a manageable size and shape before further processing. Reduction in size can be accomplished by machines such as slicers or grinders, but they produce particles which vary in size and shape. Therefore, meat must be tempered, which means reducing the ice content within the meat, until is suitable for further processing. Properly tempered meat will grind cleanly but still be rigid enough to prevent smearing. Research has shown that meat ground at 18 °F "shatters" more than meat ground at 28 °F. This produces three times the number of fragments. The increased number of fragments could result in excess purge and change the texture characteristics of processed or ground meats.

## The common ways to temper meat and the advantages and disadvantages include:

### Ambient Air Temperature

The simplest method of tempering meat uses ambient air to temper pallet loads of boxes. However, since pallets act as one combined thickness, tempering periods are long and large temperature variations result. This allows meat blocks on the surface of the pallet to thaw during the process, while the center of the blocks can still be below the temperature required for further processing. Mind your HACCP plan to ensure that the surface temperatures comply with it. Spoilage or pathogenic bacteria may grow on the surface of the meat in this situation.

### Forced Air

A frequently used and generally more satisfactory method of tempering meat uses one or more cold rooms at various air temperatures and incorporates air movement to achieve the desired temper in a given time. Such systems give good control of temperature in the meat if correctly applied, but can be expensive both in terms of energy consumption and space requirements. The rate at which the meat blocks are tempered in an air-based system is dependant upon the type of packaging, air movement and temperature. Warmer air temperatures result in faster heat transfer, but if combined with fast air movement, the surface temperature of the meat block may rise unacceptably. Another, less obvious problem is significant thawing causes drip loss and inhibits the transfer of heat from the surface to the center of the meat.

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## Key Takeaways:

- **Proper tempering and thawing are essential to preserve meat quality and minimize bacterial growth and texture changes.**
- **Different tempering methods offer varying advantages and disadvantages in terms of speed, energy efficiency, and equipment costs.**
- **Temperature control is crucial during tempering to avoid excessive drip loss and maintain product integrity.**

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**The common ways to temper meat and the advantages and disadvantages include:**

## Water-Based Thawing Systems

The use of cold water to thaw sealed packaged meat is another practical method of tempering, but also requires some specialized equipment and space. The advantage of water thawing is reduced times until desired temperature is reached.

## Industrial Microwave Tempering Systems

Industrial microwave tempering systems are available that can provide a practical alternative to conventional air-based systems in many situations especially if flexibility or large volumes of productions are needed. Tempering times of 3–7 min are possible depending on the fat content and starting temperature. However, capital and operational costs are high.

A research project modeled tempering meat at temperatures between 26 and 38°F and air movements of high to low speeds. The results show that single stage air tempering of single blocks of beef trimmings in boxes was a long process. In air at 38 °F and low wind velocity, meat blocks rose to temperatures of 15 ° F and 26 °F after 4.0 and 22.5 hours, respectively. Under these conditions, the surface layers of the meat would have been thawed many hours, resulting in both increased drip loss and lower quality due to bacterial growth. On the other hand, using lower temperatures avoids thawing the surface product faster than the interior. Using lower temperature thawing causes tempering times to be substantially extended. For example, times to reach a frozen meat block internal temperature of 15°F and 26°F using air temperatures of 30 °F and low wind speed were 4.8 and 37.5 hours, respectively.[1]


[1] Brown, T. and S. James. 2006. The effect of air temperature, velocity and visual lean (VL) composition on the tempering times of frozen boneless beef blocks. Meat Science. 73:4, 545-552.



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