



# THE ATMOSPHERIC RESERVOIR

*Examining the Atmosphere and Atmospheric Resource Management*

## The Atmosphere Inside a Bag of Potato Chips

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Changes in atmospheric pressure occur all around us and in North Dakota our gusty winds are the most obvious example. When we fly in a commercial jet or drive over a mountain pass, our ears tell us about a pressure change by popping. Suppose that you're a potato chip company wanting to distribute your product to many locations across the country. Some of these locations are at high altitudes which can cause your potato chip bags to expand and possibly burst open due to a change in atmospheric pressure. How do you package and ship your chips without damaging them? Certainly climate-controlled trucks or containers are one part of the solution. By keeping your product at a constant temperature, you're eliminating a change in pressure due to either heating or cooling.

The initial packaging process before the potato chips are shipped plays the largest role in successful distribution though. The trick is to provide enough air (gas) inside the packaging so that the contents are protected, but not to overfill, allowing space for the additional expansion due to changes in pressure.

Nitrogen gas, making up 78 percent of the air we breathe, helps keep potato chips and other foods fresh and manufacturers attempt to eliminate oxygen from packaging altogether. Once a food package is opened and exposed to our "normal" environmental air, the contents can become stale or spoil after exposure to oxygen. The process of filling packages with nearly 100 percent nitrogen is called Modified Atmosphere Packaging (MAP).



During MAP, nitrogen gas is repeatedly injected and removed from food packaging to eliminate oxygen. This process can reduce the oxygen content to 3% or less. The end result is increased shelf-life with a longer expiration date for consumers.

Once a bag of potato chips is opened, the inevitable mixing of outside air begins to oxidize the contents and degrade the freshness. The 21 percent oxygen gas now introduced to the bag begins its work breaking down the oils that help give potato chips their flavor. Now that the package has been opened, there is less protection against breakage. By the time the last chips are eaten from the bottom of a bag (many days or weeks after being opened), they're usually small, broken pieces.

So the next time you open a bag of potato chips and discover that the chips only fill about half of the package, you'll know that it's not just a marketing ploy to increase sales and that the extra air space in the package is there to protect the chips from being damaged during handling. It's amazing how humans are able to use our knowledge of the atmosphere to improve our way of living.

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