



Warm and Soft

The German magazine “Alpin” published an article in March 2004, entitled “Warm and Soft”, about down sleeping bags. The author, Mr. Olaf Perwitzschky, evaluated results on 13 sleeping bags which were rated for the temperature range from -15 to -20 °C. Roughly translated, the subtitle summarizes the concerns of consumer protection as follows:

To be on the safe side -- choose a sleeping bag with a warmer temperature rating.

The article further finds that all of the sleeping bags tested at a lower fill power than labeled or claimed.

We have come to the following conclusions:

- First, IDFL in no way doubts the measured, published and critically commented fill power test results. (We have calibrated our test equipment against the instrument that was used in the “Alpin test” and found very close fill power correlation.)
- Second, we believe that labeled or claimed fill power might also be accurate.

How can this be possible?

To clarify this discrepancy we have screened our several thousand fill power tests, evaluated additional observations and analyzed them in cooperation with other professional experts.

Manufacturers of down and feather products have endeavored for many years to express the warmth insulation qualities in simple, understandable and easy to communicate figures. TOG values are well known in Great Britain for garments and bedding. The temperature ratings, as commented in “Alpin” and in other publications, serve to classify sleeping bags. After all, these are high-grade products which call for expert advice. These recommendations are based on test norms and standards, the technical terminology by which measured values can be internationally compared and understandably presented.

One simple way to get comparable answers to questions on down’s insulation performance is the determination of the fill power, or the filling volume (sometimes referred to as “loft”) under standardized test conditions. This evaluation is done initially without any consideration of design details of the finished products. The following test procedures and measurement units are customary and they can be interchangeably compared, using appropriate conversion factors.

European Norm EN 12130:

- **Fill Power:** The height in mm of the volume occupied by a specified filling material mass (20.0 g \pm 0.1 g) in a cylinder of known diameter and compressed under a preset pressure.
- **Filling Volume:** The volume (sometimes named “loft”) occupied by a specified filling mass (20.0 g \pm 0.1 g), expressed in cm³/g (or Liter/kg).

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IDFB Testing Regulations, Part 10

- **Fill Power:** In principle as per EN 12130, except that 30 ± 0.1 g sample mass is taken. As an additional measuring unit “cubic inches” are permitted.

Japan Norm

- Similar to IDFB but measured under higher pressure.

USA-Method

- The USA measuring cylinder is slightly smaller in diameter. But the specific load is equal to the EN or IDFB methods. The sample mass is one American ounce (28.4 g). The measured values are expressed in cubic inch per ounce (cuin/oz).

Despite all efforts of the “metric world” the USA fill power units are the most frequently used internationally. One reason may be that the results are expressed in comma-free, optically easy to memorize three-digit numbers.

Fill power values become comparable and useful as a mark for quality only if the down and feathers are conditioned prior to testing. Conditioning simulates the interaction between man and the down products. In practical use this occurs by body motion, perspiration, air circulation and warmth. These factors help the “blooming” of down to its original inherent filling volume. This idea of “conditioning” is not new, but as more and more down products are packaged and shipped long distances, conditioning methods require further development.

The implementation of proper conditioning methods happened in several steps.

Box Conditioning

The first conditioning method required placing a down specimen of approximately 50g into boxes made of electrostatically neutral material (preferably wood). It's four sides are cut out and screened. In these boxes the material is then stored for 72 hours at 20°C and 65% relative humidity (standard climate). Under these conditions down and feathers will pick-up an equilibrium moisture content of about 13%. For the tests in the USA cylinder the down is agitated at least once daily by means of an air stream from a hair dryer. According to the EN and IDFB test procedures, the sample material is whirled-up by an air jet, then stored at standard climate for 48 hours prior to testing.

Tumble Dry Conditioning

IDFB and later the EU approved a more intensive conditioning method called tumble dry. A prescribed sample amount is sewn into a pillow. This pillow is then tumble-dried in a household tumbler/dryer for 30 minutes at 60°C (EN and IDFB regulations).



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Tumble Dry Conditioning with a Damp Cloth

In a further development a moistened towel, e.g. a conventional facial towel made of cotton, was placed together with the pillow into the tumble-dryer. This process simulates the normal addition of moisture to down that occurs when sleeping under a comforter or using a jacket. (Recorded in the 2004 version of the IDFB regulation and in the addition PAS 1003 to EN12130.) A certain reproducibility improvement was noticed.

Problems with Down Garments and Sleeping Bags

IDFL has stated for several years that the restoration of the original fill power did not occur for garments and sleeping bags even with tumble dry conditioning.

Water Rinse Conditioning

Later the water rinse conditioning method was studied. This method further restores fill power towards values measured at the down factory shortly after the washing and drying process. A down sample is "washed" in a small pillow, in a laundry machine during a water rinse cycle, followed by tumble-drying. In most cases, the results are consistently positive, i.e. fill power values return very close to the original value. However, in a few cases water rinse conditioning has an unexpected lower or higher fill power than with tumble dry. Also, some experts worry about "washing" the down (especially if it is not clean to begin with.) Currently, IDFL recommends water rinse for jackets and sleeping bags and for severely compressed bulk down in some cases.

Steam Conditioning

During 2003 Japan's down association made a study where the down in the conditioning box was agitated not only by air but in addition by steam from a steam jet cleaner. Fill power is measured after cooling and adaptation to standard climate condition. The Japanese data showed that steam conditioning gave the most consistent fill power after the shortest conditioning period. Based on several hundred subsequent tests IDFL agrees with the Japanese conclusion that steam conditioning can quickly determine the original fill power. Our testing also indicates that no artificially high fill power values are created by steam conditioning if testing is completed 72 hours after the steaming process.

Conclusion

Unfortunately, we must realize that the fill power results which are obtained on the basis of tumble dry conditioning may differ considerably as the down is processed, filled, compressed and shipped. The difference may be higher than the $\pm 5\%$ tolerance.

In particular this applies to down garments and sleeping bags. They are generally stored in much more compressed form and also for longer periods of time. Compressed bulk down shipped overseas may also have this problem.

For example, we have received sleeping bags for military use which are stored in compressed rock hard blocks. The range of results depending on conditioning methods is astounding.

This wide range of fill power results is neither a mistake in the test regulation, nor an oversight of the test institutes – it is simply one of the exquisite and unique qualities of the natural product we call DOWN.

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