Taps – characteristics of the chamfer

The chamfer is the active part of the taps, ie the part that removes the material and that bears much of the cutting force, the part of complete thread has only the function of guidance and calibration.
In general we can observe that a long chamfer reduces the thickness of the metal removed by each tooth and then the stresses due to cutting force will be lower, helping to improve the finish, on the other hand, a chamfer longer increases the time needed to create the thread and cannot be applied in tapping of blind holes.
A short chamfer produces opposite effects: it shortens the time of tapping and minimizes the length of incomplete thread in blind holes , but exposes the tap to severe stress reducing the life of cutting edge and the level of surface quality of the generated thread.
The profile if the thread is realized progressively, ie the entrance of each tooth contributes to the removal of a section of chips until to obtain the full profile of the thread.
In the figure N°1 you can see the difference of the chip thickness in the case of two entrances with different inclinations and, therefore, different lengths .

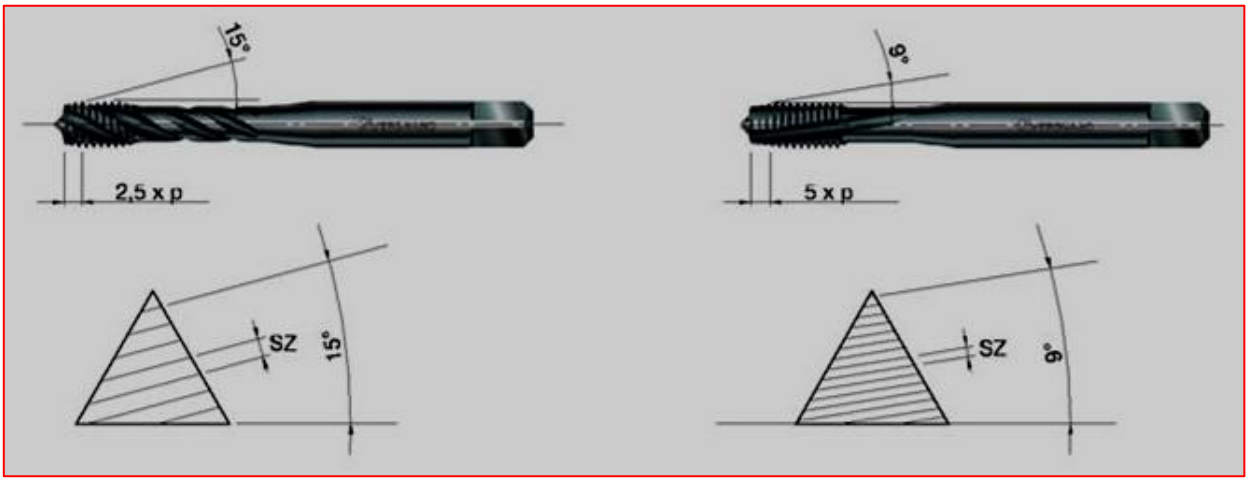

Fig. N°1 – *Difference of the chip thickness in the case of two entrances with different inclinations (Vergnano – Chieri - Torino)*

It is evident that in order to enter freely into the bore to be tapped, the initial diameter of the chamfer must be smaller than the diameter of the hole.
Usually, for through holes, we adopt the chamfer long, if special processing requirements do not prevent it.
For blind holes, the chamfer length must be between the value of the chamfer long and short, in every case, however, must never be less than the short chamfer if you do not wish to incur in case of breakage or of chipping of the tap during the operation.

Modification of chamfer
The modification of the chamfer is the correct angle giving to the cutting edge of taps, as shown schematically in figure N°2. It is executed only for taps working on through holes.
For his action similar to a tract of negative helix , this modification improves the cutting action, causes the formation of long, continuous chips and their expulsion depending on the direction of feed of the tap.
So in short threads not blind, where the chips are freely expelled, it eliminates the risk of tap breakage due to clogging of the chips in the flutes and to increase the speed of tapping.

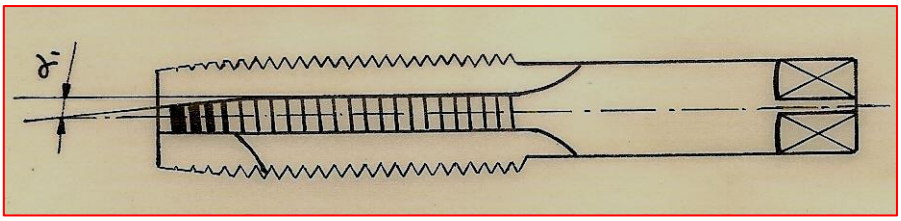

Figure N°2 - *Schematic representation of corrected chamfer, used for long-chipping materials and through holes or blind holes with large room at the end of the hole.*

If the thread has intersecting holes or other irregularities, this modification also offers the advantage of reducing the effect of impact.
Finally, another advantage is the possibility to resharpen the tap obliquely, increasing its life.
The values of the angle ε_1 for taps with straight flutes are:

- *For steel* $\varepsilon_1 = 5° - 15°$
- *For alluminum* $\varepsilon_1 = 15° - 25°$

The length of the tapered part is more than the length of the two threads.
In taps with a large twist in order to reduce the value the helix, it's done the radial modification. This modification carries the cutting edge parallel to the axis of the tap and thus makes a sufficient cutting rake angle .
In figures from N°3 to N°6, are represented some types of chamfer, specifying its use.

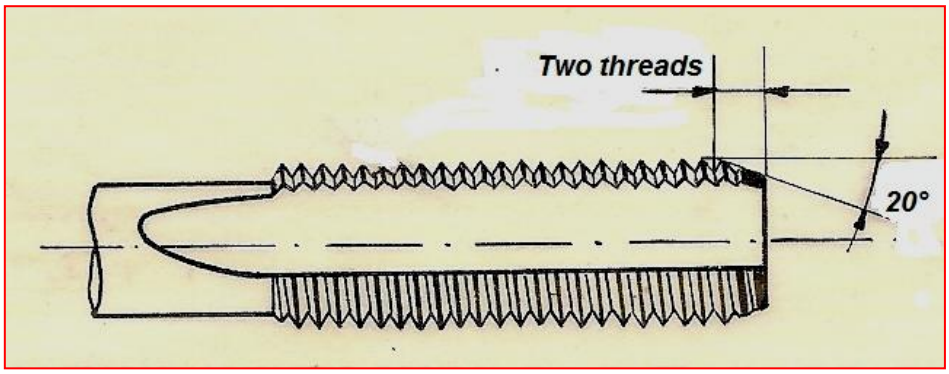

Fig.N°3- *Modified chamfer for blind holes*

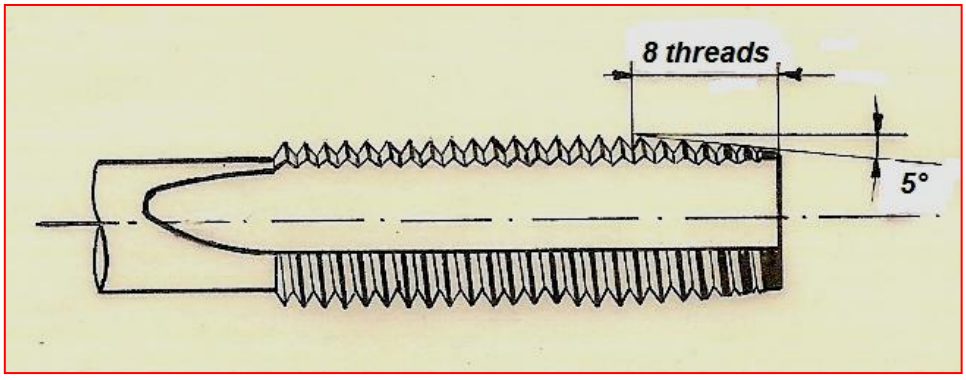

Fig. N°4- *Long chamfer for not blind holes*

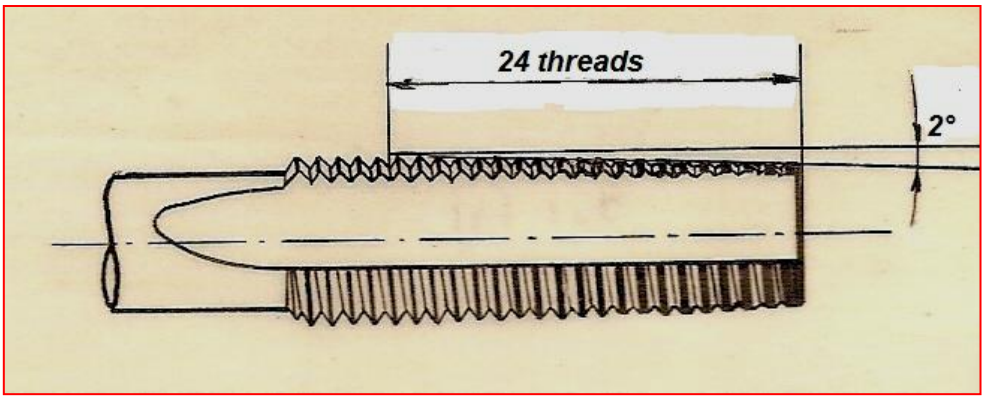

Fig. N°5- *Extra-Long chamfer for nuts*

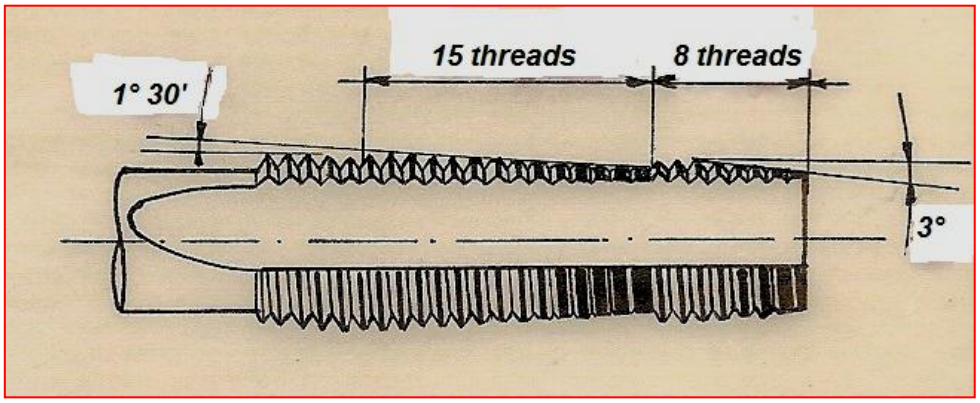

Fig. N°6- *Extra-Long chamfer for nuts with roughing sector*