One of the most important problems in Blind Source Separation of convolutive mixtures is the filtering ambiguity. One way to address this is to modify the separation algorithm to enforce some constraint. In this paper, according to our previous studies recently introduced in [El Rhabi et al., A penalized mutual information criterion for blind separation of convolutive mixtures, Signal Processing 84 (2004) 1979–1984], we propose to combine the Minimum Distortion Principle and the Mutual Information criterion in order to reduce the ambiguity filtering. It consists to choose an optimal separator among an infinite number of valid separators that can extract the source signals in a certain sens according to the Minimal Distortion Principle. Our simulations and experimental results confirm that these issues have substantial impact on the performance of the proposed BSS algorithm.