

**Title** New development of dynamic controlled atmosphere storage of apples applying repeated and controlled low oxygen stress treatments

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### **Abstract**

The first experiences carried out by U.O. Frutticoltura Segmento Conservazione del Dip. VRP, started in the Trentino region of Italy around year 2000 with trials testing the use of ILOS (Initial Low Oxygen Stress) techniques in commercial warehouses with Red Delicious and Granny Smith varieties. From the start the outcome was encouraging particularly for the results obtained with regards to scald control and quality preservation (pulp firmness and total acidity) even after 210 days of storage in CA ULO + ILOS and 10 days of shelf life (Matte P. -Fadanelli L. et al ILOS + ULO AS A PRATICAL TECHNOLOGY FOR APPLES SCALD PREVENTION, 8th Int. Controlled Atmosphere Research Conference, Verona-Italy 2004). In 2007 and 2008, the trials continued with applications on 10 commercial cells at 4 cooperatives, all equipped with suitable technological solutions for maintaining and checking the stress conditions. The combination of I.L.O.S. techniques and repeated gas stress treatments in 2-3 intervals during the storage period has in fact produced a type of Dynamic Controlled Atmosphere (DCA). The gas stress treatment consists in maintaining the following conditions : $O_2=0,5 - 0,7\%$  and  $CO_2 = < 1 \%$  over a certain period of time(8-15days). The factor that determines the end of the stress period and therefore the return to the gaseous parameters of U.L.O. ( $O_2=1-1,3\%$ ,  $CO_2= 1,0-1,3\%$ ) is the level of ethyl alcohol accumulated in the fruit pulp, determined by a representative sample batch (20 apples) at weekly intervals. The methods of determination of ethyl alcohol (in GC and by enzymatic reaction) have been perfected to obtain trustworthy and repeatable values. It has been proved that if the levels of ethyl alcohol do not exceed a certain limit, on return to normal respiratory parameters inside the cell, the alcohol content regresses to almost completely disappear and therefore without altering the flavour of the apples. The results obtained in 2007 and confirmed in 2008 for Red Delicious and Granny Smith cv. have lead to total control of damage due to scald up to over 8 months in storage without any preventive chemical treatment, as well as maintaining the top qualitative requirements even during the commercial phase of distribution (Shelflife 10-15 days).