

Advanced Control of Respiration



THE BIG 5

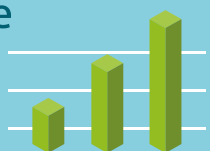
VAN CA technology
AMERONGEN

ACR-System

Reliable



Natural respiration control



Safe



Zero-tolerance Alcohol
Pro-active system
Natural respiration control

0% alc.



Integrated



Connected



Unified



Storage room



Representative
Complete
Measurement



Cost saving



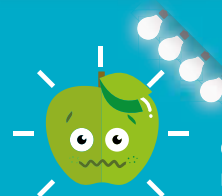
Other "dynamic" systems

Harvest
Watch

DFR

DCS
Auto.

Unreliable



Chlorofyl
measurement

Harvest
Watch

DFR

Crash



Re-active system
Alcohol measurement

40% alc.



DCS
Auto.

Stand alone



No connection

Harvest
Watch

DCS
Auto.

DFR

Isolated



Storage room



Selection

Not representative
Sample measurement

Harvest
Watch

DCS
Auto.

DFR

Casino



Money losing

Harvest
Watch

DCS
Auto.

DFR

My Fruit 5/5

Harvest Watch 1/5

DFR 1/5

DCS Auto. 0/5

A. Reliable?	✓	✗	✗	✗
B. Pro-active?	✓	✓	✓	✗
C. Integration?	✓	✗	✗	✗
D. Representative?	✓	✗	✗	✗
E. Cost efficient?	✓	✗	✗	✗

Why Advanced Control of Respiration ACR?

Huge Energy savings

A lot of energy can be saved by storing products under ACR-conditions. Whenever an average oxygen value of 0,3% is compared to a standard ULO-condition of 1.5% oxygen(O_2), it comes to light that the rate of respiration (breathing) from fruit has declined by 300% (see figure 1). In short, fruit breathes much slower with lower oxygen values. This means that apples produce three times less heat, which results in far lower cooling costs.

"My investment in ACR really cuts back my running costs!"

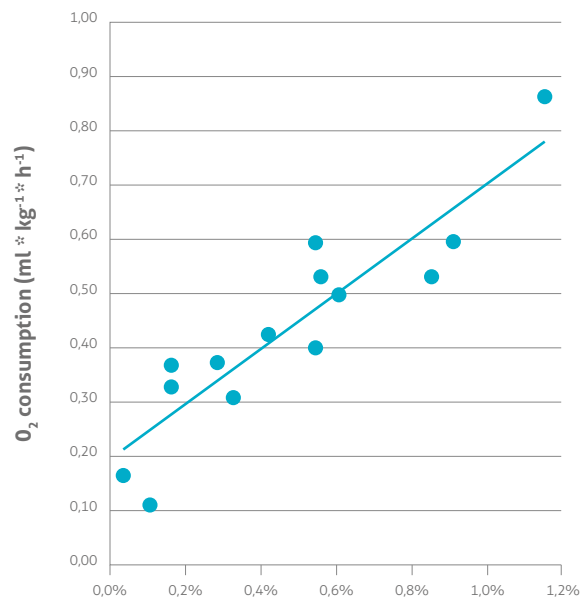


Figure 1. Lower oxygen values result in lower respiration rates (Elstar apples). The trendline which is shown above is just indicative.

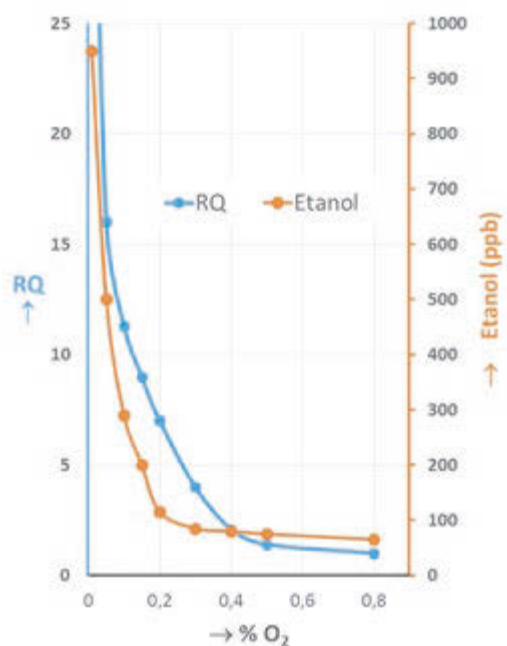


Figure 2. In case oxygen levels are lowered down from 1,0% to 0,3-0,4%, the RQ-value will increase. And still, no alcohol production at all. For this reason, RQ is the perfect and early indicator for fermentation.

ACR gives early warnings

The aim of 'Dynamic storage systems' is to store products at the lowest possible oxygen value. This requires a lot of security for a storage system. Some systems use the measurement of alcohol as an indicator for upcoming fermentation. But as a matter of fact, we actually do not want to measure any alcohol at all. ACR measures in such a way that it is able to react, way before the product even starts the production of alcohol. In figure 2, a real-life example is shown:

A lower oxygen level creates a higher RQ-value, but no alcohol is produced. With 0% oxygen (not shown in the table), the RQ-value will rise infinitely. This results into an alcohol value of more than 1000 ppb (parts per billion).

*"ACR has proven to be reliable.
No nonsense or assumptions,
just facts"*

Prevention of Scald

Anti-scald products, like DPA (di-phenyl amine) are forbidden in a lot of countries. A perfect alternative however, is low oxygen storage. As a rule of thumb, apples need to be stored in a low oxygen environment of 0,6% in order to prevent scald. The ACR system is perfectly suitable for creating this environment.

*"Storage above 1.5%,
that's a recipe for scald!"*

Better quality during shelf life

20 years of research on the effect of ACR storage on the quality of apples during shelf life has shown that extremely low oxygen (<0.6%) results in retention of firmness and color. Even after two weeks of storage at 18°C, the positive effects of ACR will still be visible.

*"The remarkable longer
shelf life with ACR offers big
advantages for my customers".*

Calibration

The numbers tell the tale! Calibration (another term for standardization) of oxygen and CO₂ meters is a requirement for a proper functioning CA installation. Calibration takes place once a week; our My Fruit control system regulates this automatically, thanks to our three-point-calibration with a unique two calibration-ranges (0%-2,5% en 0%-25%). This makes our system one of the safest dynamic systems to exist. Other systems calibrate once a month or even once in a trimester. This is dangerously scarce, especially when fruit is stored at extremely low oxygen levels.

ACR and firmness retention

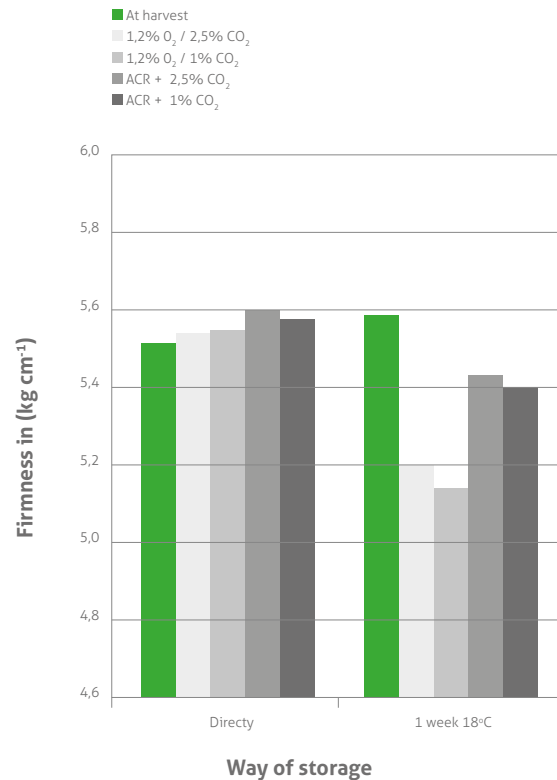


Figure 3. Firmness of Elstar apples during storage. The black and white stripes represent apples stored for 4 months. The green stripes represent apples directly after harvest. In both cases, the firmness was directly measured after one week of storage at 18°C.



The BIG 5 of ACR

ACR is Reliable, Safe, Integrated, Unified and Cost Saving. Underneath some clear advantages of ACR compared to other 'dynamic CA systems'.

ACR measures the respiration of the entire coldstore and not just a sample. Our procedures provide very stable values, and does not need select of a random sample from the cold store. Van Amerongen does not make use of a compartment with samples, but measures the entire cold store as a whole. There are several reasons for this. Compartments are always warmer than the actual cold store. This leads to a lot of condensation in the compartment itself and thus, dehydration of the fruit and formation of mould. It is technically expensive and complex to properly shut down the compartment during a measurement.

Direct measurement in the cold store, the method Van Amerongen uses, is not only easier from a technical aspect, it also much more cost effective.

The measurement of alcohol to determine the fermentation point can be done in 2 different ways. Measuring alcohol with a chemical kit has several disadvantages. Not everyone has lab experience and therefore, the expertise to conduct measurements. How much, and on which fruits does the test need to be executed on for example? As a matter of fact, one should actually not even want to measure any alcohol at all. When alcohol is detected, it is already too late as chances are big that the fruit will be damaged. Perhaps the most important argument against this method is the fact that it is not dynamic at all.

Alcohol can also be measured with an alcohol meter. This happens by taking samples out of the above mentioned compartment in the cold store. Disadvantages:

- Alcohol is not chemically inert, thus air with alcohol is not trustable to measure through sample hoses. Therefore, central measuring is not possible.
- Measuring alcohol requires specific equipment. an alcohol meter is often unreliable, or very expensive.
- Every cold store (or every two cold stores) has its own separate meter.

- Measurements are severely disrupted due to re-metabolism of alcohol. Re-metabolism means that one apple may produce alcohol, whereas other, not yet fermenting, apples may absorb and break down the alcohol. This problem becomes worse with more product varieties in the same cold store. The consequence: Some apples may contain a lot of alcohol while the measurer does not detect any alcohol in the air of the cold store at all!

ACR does not measure any alcohol. Instead, it reacts on actual values. Therefore, decisive action is taken before fermentation has a chance to develop.

There are also systems based on chlorophyll fluorescence. These systems are not really dynamic. By shining a small LED light on chlorophyll (the green pigments in the layer of the apple) in a low oxygen environment, a 'stress signal' can be detected. This stress signal is supposed to be an indicator for fermentation. However, this method has a lot of disadvantages:

- This system is not dynamic, not automatic and not integrated with CA systems. Therefore, the system only measures a small sample in a coldstore (6-24 apples in one or several small boxes). The oxygen level in a cold store is configured for only those 6-24 apples. This is very risky because; which apples are put in the sample box?
- The relation between the 'stress signal' and fermentation is correlative, and not scientifically substantiated. Thus, the system reacts (too) late.

ACR is an extra attachment to a standard CA control system of Van Amerongen. Only a few adjustments, except for the ACR-software, are needed to turn a standard My Fruit CA system into a ACR (My Fruit Dynamic) system.

"ACR is cutting-edge, particularly in comparison with other systems"



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