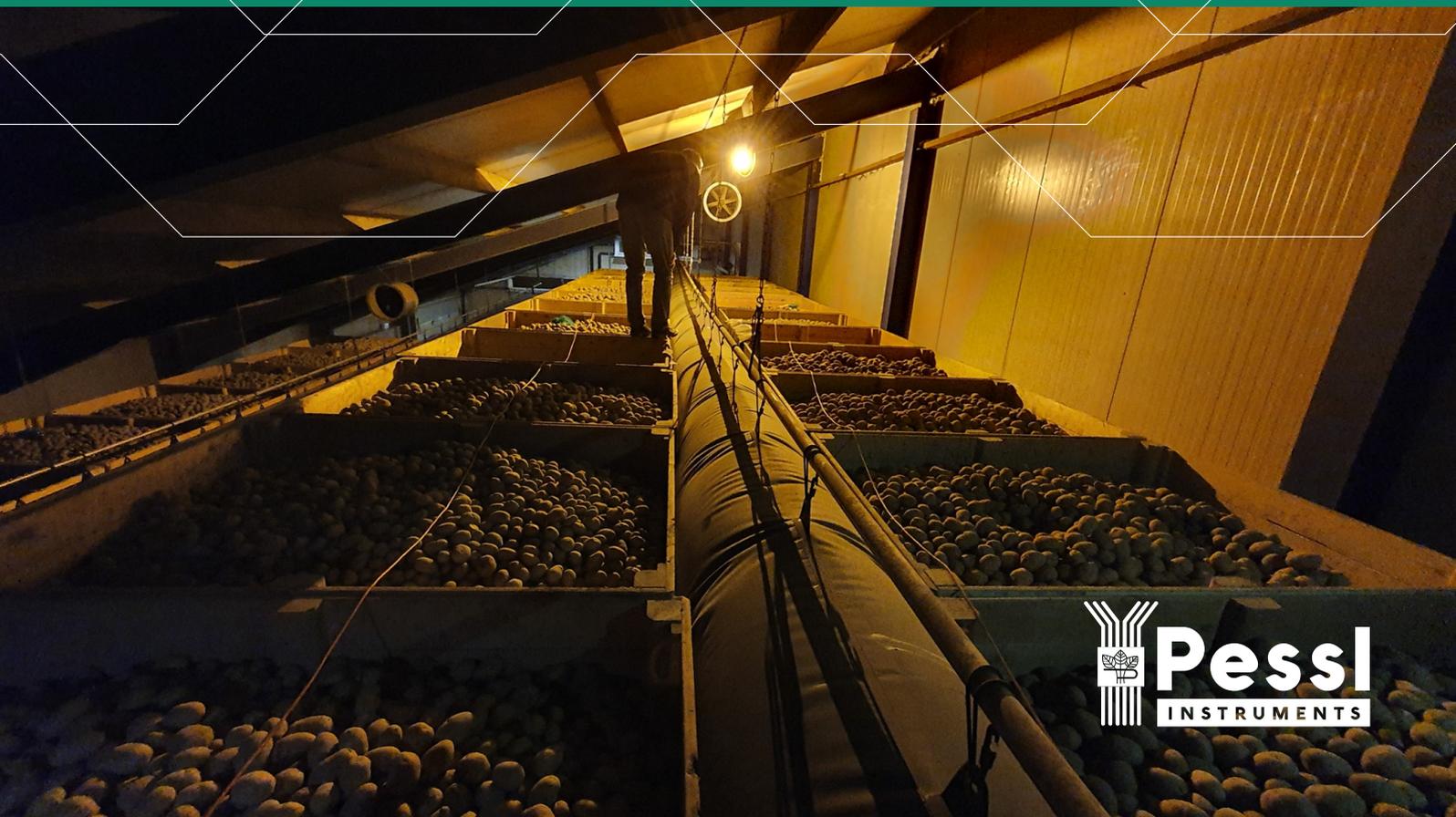


HOW TO GET A GRIP ON YOUR STORAGE CONDITIONS

THE IMPACT OF THE BAN ON CIPC



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Introduction

Managing your storage is key to ensure that the quality of your potatoes meets the requirements of the customers. Every season it is a challenge to maintain the quality of the harvest and minimize the losses as much as possible. Many factors like variety, harvest conditions and other factors influence the quality of your potatoes. The storage at other hand is a more controlled environment where you can manage the optimal climate conditions with the most important parameter temperature, humidity and CO₂.

The challenge in the coming years is even bigger, since the changes in the use of crop protection by the government. From this year CIPC is prohibited and you have to deal with this. What other possibilities are there? And how can we make sure we keep the highest quality of our potatoes leaves your storage? Let us think further, in smart solutions for now and the future. So, the central question in this whitepaper is:

“How can we store our potatoes well, and keep the quality under controlled conditions?”

Knowledge is one of the biggest requirements for a good storage to keep the best quality. By gaining insight into data, you can make your decisions based on information combines with your knowledge.



Processes of potato storage: from field to shed

The behavior of potatoes during storage is influenced by several factors such as variety, growing conditions in the field, cultivation technique, crop protection, harvest maturity, and conditions when harvesting are also decisive. Only healthy tubers are easy to store. Once a healthy product has been stored, the most optimal climate must be pursued. Temperature, relative humidity and CO₂ concentration should be controlled for minimum weight and quality losses.

It can always be better: less losses, less costs, and a better quality. Data gives you more information and objective knowledge. Collecting objective data with sensors combined with your subjective knowledge is important to ensure good quality during the storage process.

Basic rules can only be properly applied if you know what is happening in your field and shed. Various measurements in the cycle are required.

HARVEST

Storing good quality potatoes starts already in the field. Harvest of potatoes is a critical part of the total potato production and should be done carefully under well and dry conditions to prevent damages. Mechanical damages during loading could cause rot in the storage of potatoes. After the harvest, potatoes should be sorted, and all rotten potatoes needs to separate. Only a few rotten potatoes can result in a huge loss in storage, which can cause rejections from the market demand.

DRYING AND WOUND HEALING

During the harvest you cannot manage the yield of potatoes. However, during the next process (storage), you could manage the quality and yield. If potatoes are stored under well controlled conditions, you have less risk on diseases and weight losses. Therefore, after following the advices during harvest, it is important to dry, not cool, the potatoes with the same temperature or two degrees higher as soon as possible. The aim is to dry the skin of the potato. You can stimulate the equal temperature with the help of heaters (5 to 6 times quicker) and intern ventilation. When it is not too hot outside it is recommended to keep the doors open. Otherwise it is better to ventilate intern with closed doors. There is a higher risk of silver scab if the potatoes are not dry within 24 hours. In addition, there is a stimulation to remove remaining soil, and to promote wound healing and inhibit condensation during drying. Keep the potatoes in a dark shed, this will slow down sprouting. Keep ventilating until all the potatoes are dry.

If the potatoes are dry you should give them the opportunity for wound healing. This is an important process and the basic to minimize weight loss and diseases like Fusarium dry rot. Keep the potatoes on a uniform temperature and avoid large temperature differences, as this could lead to condensation and slows down the drying process. The potatoes are dry if the tubers until 30-40 cm in the bulk are all completely dry.

COOLING

After drying and wound healing, it is necessary to cool down the potatoes to the specific temperature do it step by step and not too quickly, otherwise there is a risk of weight loss.

RELATIVE HUMIDITY AND CO₂

Relative humidity (RH) should be high (about 92-97% for dry, healthy potatoes and 85-90% for wet, leaky potatoes) to reduce tuber weight loss, but condensation needs to be avoided to minimize diseases. Keep the potatoes dry and prevent a too high CO₂-concentration (because of the risk of a bad baking color and weight loss) by ventilating with fresh air.

KEEP THE RIGHT TEMPERATURE

The different cold storage temperatures for potatoes depends on the destination and use:

- Crisps: stored between 7 and 10 °C
- Chips: stored between 5 and 6 °C
- Fresh consumption: between 4 and 7 °C.

Once the potatoes are at the desired storage temperature, it is important to maintain that temperature and control this. The tuber temperature must always be known. Potatoes keep breathing and produce heat. This heat must continuously be removed by ventilation to prevent the risk of weight loss. A constant temperature is necessary, fluctuations can lead to sprouting, weight loss, pressure marks and more sugar. To prevent sprouting there are several possibilities to manage.

CO₂-CONTENT

In order not to have a negative influence on the baking color of potatoes, the CO₂-content in the storage shed must not exceed 0.5%. So, there must be enough ventilation. CO₂ measurements are therefore crucial to create constant values. Ventilation with external air is recommended, each day two times 10 minutes.

STORAGE MONITORING

The storage conditions are critical. Potato storage requires knowledge. Storage is a crucial part in the potato chain, because it strongly determines the quality of the end product, and therefore the storage process needs all the attention. Crop monitoring and regular sampling are essential to track the quality during storage and to minimize storage problems. To identify problems in the storage, keeping records is key to control the information related to the storage conditions. This could be done with a diary but keeping these records more easily you use your device with information gathered by SolAntennas.

What are the alternatives if CIPC is prohibited?

Sprout suppression is a key part of potato storage. Potatoes do not sprout with a temperature below 3 or 4 °C. Cold storage can cause accumulation of reducing sugars, which make the potatoes unsuitable for processing into crisps or fries. Table potatoes are stored at relatively low temperatures. Nevertheless, even at too low values, they can lose their good taste through sweetening. To prevent sprouting, one active substance has been recognized: Chlorpropham (CIPC). This sprout inhibitor is banned by the European Union from October 8, 2020. So you have to apply alternatives. Your rules of thumb for managing your storage will change.

During storage potatoes are treated with a sprout suppressant once the natural dormancy period of the tuber is over. It is estimated that approximately 90% of all ware potatoes use Chlorpropham as a sprout inhibitor.

ALTERNATIVES FOR CIPC

1. Maleic Hydrazide (MH Royal or MH Crown)

MH is not applied as an in-storage treatment but is applied to the growing crop as a liquid, typically 3-5 weeks before haulm killing. Long-term storage requires an additional sprout suppressant. Timing of this application is then critical, applying too early reduces yield, too late reduces the efficacy of uptake and sprout control is compromised. Another pro of MH is less risk in your storage.

2. 1.4-Sight (1.4 dimethylnaphthalene, DMN) during storage;

1.4-Sight is applied in the storage as a vapor, using nebulizing equipment, and can be used a few days after storing, provided the potato is dry. At least 40% of the volume should be filled with potatoes, otherwise you don't get the effect (the more volume, the better the effect). The application can be repeated with an interval of 5-6 weeks. The dosage is 20 ml/ton per application. The advice is to keep the storage closed for 48 hours with regular internal ventilation. To prevent condensation, the storage temperature should be minimal 5 degrees, so avoid temperature fluctuations and control the temperature several times. The advice is not to use 1.4-Sight with the variety Mozart (because of further research of vascular bundle discoloration).

3. Spearmint oil (Biox-M) during storage;

Biox-M offers a good opportunity to use less pesticides residues on stored potatoes. Biox M is extracted from the spearmint plant using a steam distillation process; no other products are added to the oil extracted. For this reason, this oil also approved for organic potatoes. Biox M can be applied as a thermal fog or with Xedavap evaporator. The first treatment should be immediately after hardening, no more than three weeks after storage, and in any case before sprouting is observed. For optimal effect keep the storage space closed for 48-72 hours after each application. During this period ventilate only internally.

4. Ethylene (Restrain) during storage

Another alternative to control sprouting is Ethylene, a naturally occurring gas that is introduced to the store using specialist equipment and disrupts tuber hormones relating to dormancy break. The results of this vary between varieties. With this method there is a risk for damaging fry color, it must be carefully managed.

OTHER RULES OF THUMB WITHOUT CIPC

Without CIPC it becomes a bigger challenge to keep your potatoes healthy and to ensure the quality. The alternatives listened above are more expensive, needs a follow-up, and only work if you check regularly the temperature. The better your storage, the less you have to use 1.4 Sight and the more costs you could save. If the storage is constant, you also have to use less ethylene. The basis of the storage should be there, without this basic the spray does not help! The fertilizers only help to extend the storage. In other words; monitoring and measuring are a crucial part of your storage success.



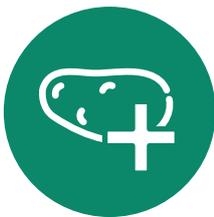
How can data limit my quality loss?

Our SolAntenna helps you! The SolAntenna is a multipurpose electronic potato device providing automated real-time advice. It is designed to collect, analyze and help to control storage conditions. It measures the most critical measurements like temperature, CO2 and relative humidity.

With a completely wireless connection you can check or adjust all settings and values, 24/7, seven days a week in the SolAntenna Portal. On this basis, electronic signals are issued when something does not match the set target values and preconditions. With this method you are always connected with your storage conditions and can manage it everywhere, and at every time.

Of course, you, as a farmer, know exactly what you are doing and you have a lot of skills and experience, generation on generation, multiple years of experience, you trust yourselves. However, data from our SolAntenna can confirm these findings, or can finetune or let you think about it. This combination of facts and experience can lead to different decisions to get the best results.

The Solantenna gives you valuable information resulting in: Less losses, less costs, better quality.



Prevent losses



Suitable for any
type of storages



Flexible solution



Completely wireless



Start tomorrow

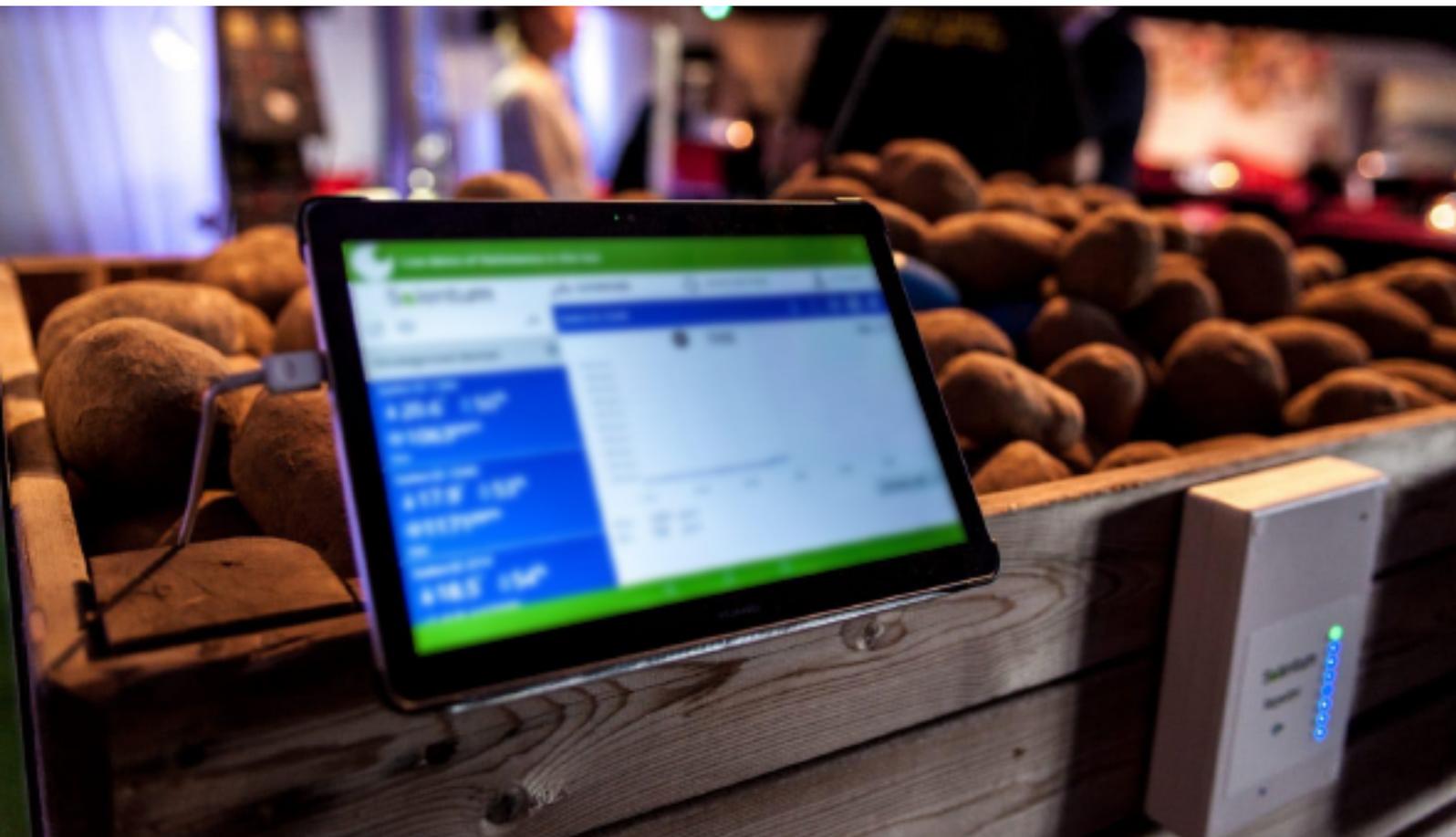
Conclusion

A good and strong storage is the basic to keep the quality of the potatoes to the end of the storage time. CIPC as sprout inhibitor is prohibited by the government. For this reason, it is even more important to control the storage of your potatoes.

Data collection and implementation will be the key to successful store your potatoes the coming years. It is crucial to think about a smart storage strategy. The SolAntenna enables to collect your data. The SolAntenna-concept advice farmers based on the most critical measurements like temperature, relative humidity and CO₂. Data is automatically uploaded to the cloud and can be viewed using the portal 24/7. Here you can refer measurements to recommended level and get alarms if a measurement exceeds a certain allowed threshold. SolAntenna dashboard gives interactive checklists with corrective actions based on the measurements.

DO YOU WANT
TO MEASURE
CO₂ VALUES IN
YOUR STORAGE
THIS SEASON?

Contact us at
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About Pessl Instruments

For more than 37 years, Pessl Instruments has been offering tools for informed decision making. A complete range of wireless, solar-powered monitoring systems which supports almost all communication standards roofed under the METOS® brand are available to our clients worldwide. The systems, along with the online platform and mobile application Fieldclimate, are applicable in all climate zones and can be used in various industries and for various purposes – from agriculture, both crop production and animal breeding, to smart cities, research, hydrology, meteorology, flood warning and more.

Over the years, METOS® has become a global brand with local support in over 85 countries, and we are proud to say we managed to reach out to every corner of the world. We believe that our durable, highly precise technology and demonstrated support from our trained partners worldwide are the recipe for our global success.

The METOS® brand lasts longer, performs better, is easier to use and offers you the lowest total cost of ownership.

Do you have a question? Or a big idea? Do you want to learn more?

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