inopower

“HAIL CONTROL SYSTEM”

The improved hail control gun

The horticulturist Marnix Van Praet, being owner and user of a hail control gun for years, has combined his experiences and has refined the machine in collaboration with some engineers.

In this article we will have a closer look at the principle of hail creation and hail control and also at the advantages of the new machine.

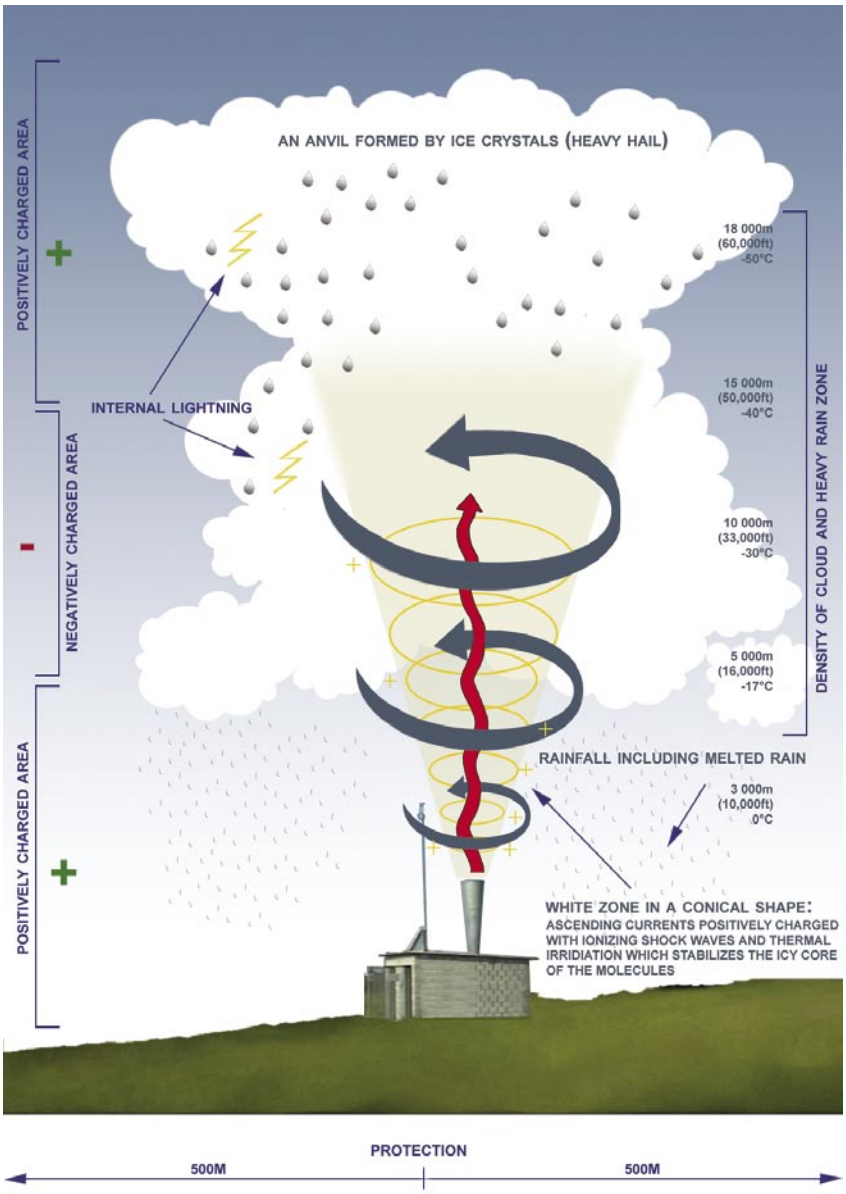
Already in the 19th century, Italian farmers used a primitive hail control gun. The essential pipe form is still the same as roughly 150 years ago. The gun of that time was controlled manually and worked on carbide. The actual gun works on acetylene gas and can be remote controlled. So the hail control gun is not an innovation. For over 25 years, it has been used by vine and fruit growers in France, Spain, Austria and Belgium. Also in the Zeeland Krabbendijke such a machine has been installed recently.

What is hail?

Hail is produced when supercooled rain drops circulate in an area with an upward flow of a Cumulonimbus cloud. While the drops circulate through areas with different temperatures and humidity levels, they grow on and on in different ice layers. The hailstone freezes and melts alternatively when he moves through the cold and hot air.
The clouds reach a height of 15000 metres, at a temperature of -50°C. The higher this cloud belt, the bigger the hailstone.

This hail is created during a summer storm and can not be compared to winter hail, which is actually supercooled rain (frozen rain drops). Winter hail often comes down as drizzle. During a summer storm, there is a big potential difference between the ground and the cloud, with a thunderbolt (discharge) as a result. What winter hail is concerned, there is no sign of potential difference.

Principle of the shock wave



With this gun, every five seconds ionizing (high energy) shock waves go up in the air. These reach very fast the high atmosphere, up to 15000m, at -50°C, where the hail is created.

A part of the waves will be reverberated by the clouds and the tropopause. These strike against the climbing waves. As a result their speed and energy is enhanced and they transport a large ionizing potential (ionizing means sweeping away electrons).

Because the waves move constantly up and down, a mixture of polarities is created in the cloud. They can no longer take on water drops or vapour. They fall down and, during their fall, range over the disturbance area that is created by the shock waves. Consequently, the stones are smashed.

Eventually, the hail falls down on the ground in the form of rain or wet snow.

Measurements

Of course, we remain sceptic, but recent radar images, from July 17., prove that, thanks to the gun, a wedge was driven in a thunderstorm line. The hail was turned into rain, so no damage was caused. It all comes down to starting up the gun in time, at least 20 minutes before the storm can hit you. Marnix is kept up to date about the storm activity in his neighbourhood by, amongst others, SMS messages of the RMI.

Also on www.blikseminslagen.com you will find such information. These radar images offer you a good view, but when a storm is being developed “right above your head”, no warranty can be provided by the system yet, because new images are put online only every 15 minutes. By measuring the polarity differences in the air, it is possible to see something in development, way in advance. But this system has not been finished yet and will be further developed. The aim is to draw up a value table thanks to which it will be possible to determine when a storm is being developed. In the early part of 2005, it will be possible to predict summer hail by means of a calculation method connected to the meteoradar in Zaventem. The idea is to provide the user a parameter network as to enhance the system efficiency.

Decisive parameters

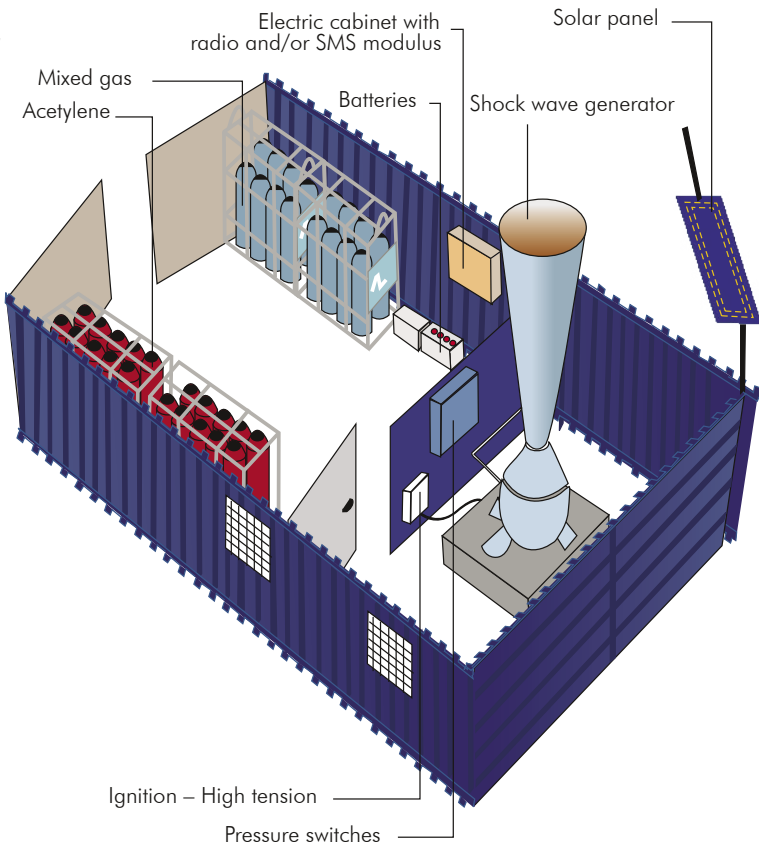
- *Storm anouncement within a radius of 25 km via sms*
- *Examinating radar images via meteoweb*
- *Examinating lightening images via blikseminslagen.com*
- *Hail warning via calculation model connected to the meteoradar (in development)*
- *Measuring polarity differences in the air (in development)*
- *Also contact with other gun owners provides a lot of information*

Operating procedure of the hail control gun

Acetylene is injected in an explosion room and is mixed with oxygen and nitrogen present in the air. In the new gun, oxygen is injected under pressure in order to optimise the explosion force. Also nitrogen is brought in separately in the new gun because the air becomes too damp during storms. In this way, the explosion force is considerably waned. With the former gun, an explosion could be produced every 7 seconds. Thanks to the improved electrodes, it is now possible to generate an explosion every 4 to 5 seconds with the new gun.

The explosions are 30% more powerful now and this has a positive influence on the explosion efficiency. Moreover, the storm will be under control a lot faster.

The new system works with 12V solar panels, a safe tension taking into account the lightening activity during a storm, and can be started up by means of a radio signal. In option, also a GSM control is available.

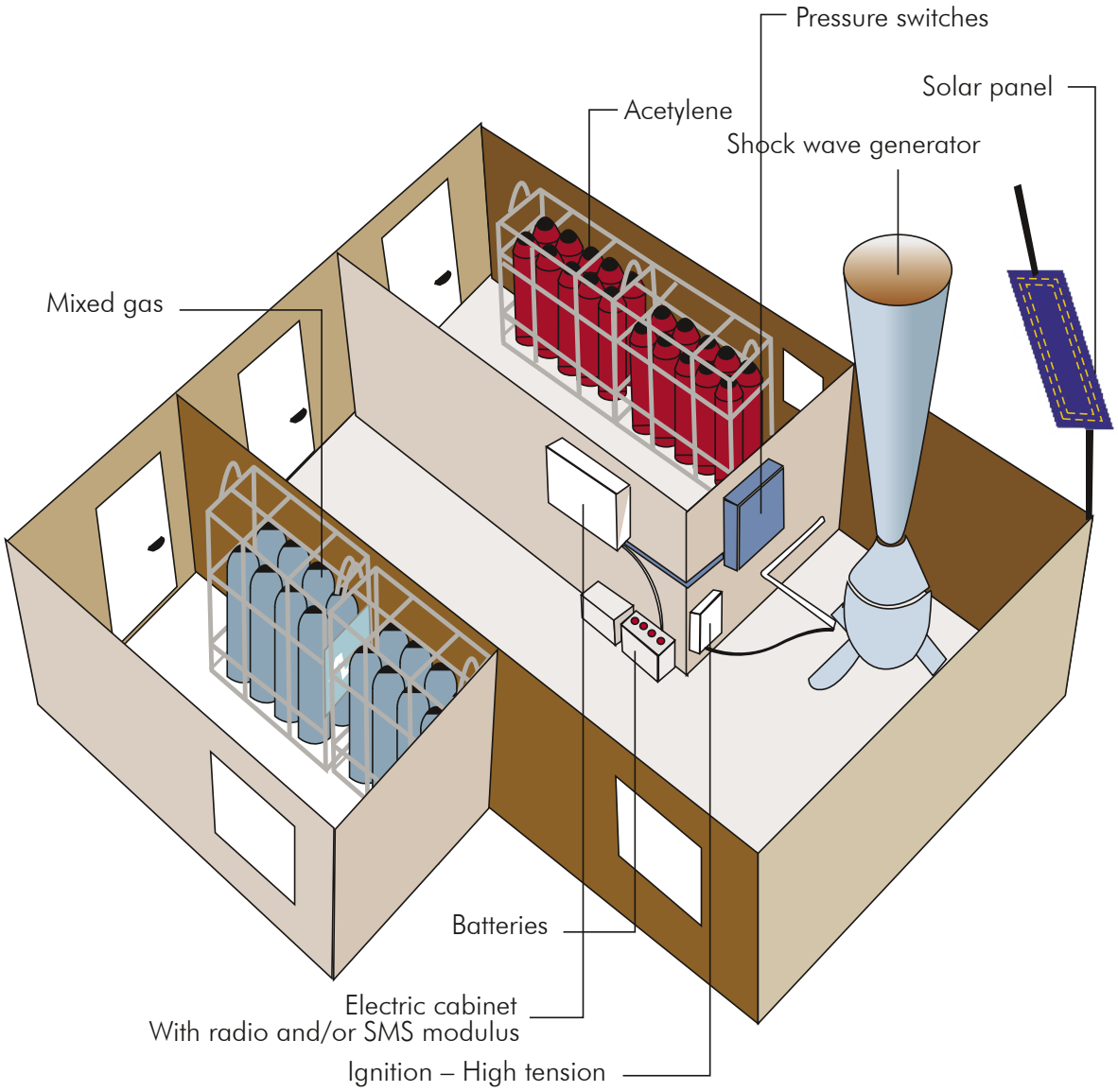


inopower

Operating procedure of the hail control gun

Also the electronics have been modernized and are incorporated now in a resin block in order to avoid oxidation and damp problems. The new gun works with 8 acetylene bottles in stead of 6 bottles in the previous model; so now a lower injection pressure can be adopted. Taking into account acetylene is a very explosive gas; this will certainly enhance the safety.

In the new gun, the ignition mechanism is built in as this was bare in the old model. Imagine: a bird flies by accident in the pipe on the electrodes; this was very often the reason of the device breakdown. This building-in now solves this problem. But the most important success factor is the attention and know-how of the hail control gun user. Intervening in time and being constantly alert is absolutely necessary in order to achieve good results.



The indicators

The old machine costed approximately 42.000,00 euros. The new version would be a little cheaper but a sms start-up modulus and a maintenance contract would be included. The gun safeguards 80 to 90 hectare from hail. So, an investment of 41,80 euros per ha with an amortization on 10 years, really seems a well-founded investment for cultivations with a high financial value.

The gas filling (acetylene bottles, oxygen and azote), good for 4 to 6 hours of shooting, costs approximately 500,00 euros per year.

By means of comparison: for the company of Van Praet (10 ha), with particularly chrysanthemums, Canna and glass house cultivations, a hail insurance would cost approximately 10.000,00 euros every year.

Distance in meters from the machine	Acoustic pressure level	Sound scale realised by Dr. Jean Goujon
10 metres	130 dB	a shout of pain
45 mètres	112 dB	pop orchestra
100 mètres	90 dB	bus or truck
150 mètres	80 dB	bus or truck
200 mètres	73 dB	with open window in the street
500 mètres	68 dB	with open window in the street
1000 mètres	61 dB	passionate discussion

Faint noise

40 dB. room where it is quiet
50 dB. normal conversation

Conclusion

After a few years of experience and examination, Marnix Van Praet has improved the classic hail control gun. Owing to climatic variations and air pollution the risk of hail damage increases. This increase is also due to the presence of watercourses, high voltage lines, expressways and air traffic routes.

Coordinates

Marnix Van Praet
GSM : (0032)486/93.98.11
GSM : (0032)473/48.02.90
Tel : (0032)52/47.31.80
Fax : (0032)52/48.13.44
e-mail : info@inopower.be
website: www.inopower.be

inopower