An Interview with Markus Storz: June 19, 2002

Ethan Russo

Russo: Please tell us a bit about your educational background.

Storz: I'm a qualified graphic designer.

Russo: How did you become involved in vaporizer research and development?

Storz: 5 years ago I was looking for a good Vaporizer and couldn't find one to satisfy me, so I started to develop and design one myself. The Volcano is manufactured in Tuttlingen, a town in Southern Germany which is regarded internationally as a center of medical technology. The know-how in the area of medical technology which is available here has already been utilized in the development phase of the Volcano (Figure 1).

Russo: Why should the clinical cannabis patient consider vaporization as an alternative?

Storz: Because the inhalation application of cannabis in many cases is preferable to the oral or other application methods. The effects appear much faster with inhalation and allows the user an easier dosage titration (Figure 2).

Vaporization of cannabinoids is extremely promising when compared to smoking, particularly with regard to the medical utilization of hemp.

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FIGURE 1. Markus Storz explains the workings of the Volcano at CannaTrade 2002, Bern, Switzerland, March 2002, to Mario Price, Senior Pharmacist, James Paget Hospital, Great Yarmouth, UK (Photo by Ethan Russo).

Russo: What are the advantages and disadvantages of vaporization? Does it eliminate toxic by-products of smoking?

Storz: As is commonly known, the hemp herb (or hashish) is burnt during smoking. Temperatures of approximately 500-700°C are reached during this process.

Vaporization of cannabis, on the other hand, involves the herbal material being heated to a minimum of 185°C, this being the temperature at which THC (tetrahydrocannabinol–the main active ingredient in cannabis) evaporates from the herbal material and blends with air (i.e., being transformed into an inhaled form) (Figure 3).

Vaporization also occurs, in principle, during smoking, with hot gases in smoke flowing through the herbal material, causing the vaporization of active ingredients which then blend with the smoke. However, the heat required there is generated through the combustion of the cannabis,

FIGURE 2. Elke demonstrates inhalation from the Volcano vapor bag at CannaTrade 2002, Bern, Switzerland, March 2002 (Photo by Ethan Russo).

a process which involves serious disadvantages. Smoking entails the unavoidable inhalation of toxic combustion by-products along with the desired ingredients, these being carcinogenic and causing irritation of the respiratory tract and emitting noxious odours (Figure 4).

FIGURE 3. Cannabis before and after vaporization in the Volcano, Hash Marihuana Hemp Museum, Amsterdam, Holland, June 2001 (Photo by Ethan Russo).

The disadvantages of vaporization are, that you require a device which costs much more than a pipe or cigarette papers, and that using a vaporizer effectively is not as easy as smoking a joint.

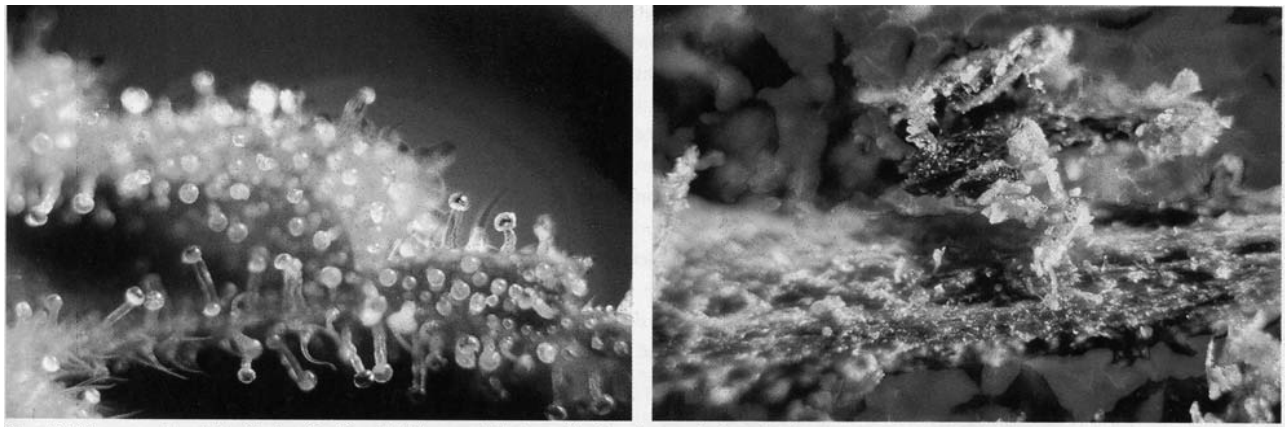
Russo: Could vaporization be done in hospitals or other areas that prohibit smoking?

Storz: Absolutely. No bothersome smoke is created, and non-smokers are not subject to any adverse effects when sharing rooms with users.

Russo: How efficient does the process seem to be? Is there a genuine savings to be achieved as compared to smoking?

Storz: The uncontrolled combustion temperature (which is much too high) causes the unnecessary destruction of the majority of ingredients, thus squandering the original material. Smoking is thus not only damaging to health, but also inefficient.

FIGURE 4. Caption translates as, “Cannabis flowers before and after vaporization.” Note complete disappearance of glandular trichomes from the cannabis.



Cannabisblüten vor und nach dem Verdampfen (Copyright Vapormed, Photograph by Joop Dumay, the Crystalman)

In contrast to this, the use of an effective vaporizer enables one to release with ease 3-4 times the active ingredients in cannabis, while simultaneously reducing the consumption of harmful substances considerably.

Russo: You seem to have taken great care with the materials and construction of your Volcano device. Could you tell us a bit about why you felt that was important?

Storz: This has something to do with my general experience. Whenever I bought a cheap, low quality device, tool, car or whatever, it didn't work as well as the better quality ones and broke after a while. The result always was, I had hassles with the cheap ones, and finally bought the better one, so ended up paying for both. In my opinion, it's just a waste of time and money to buy and use inadequate products.

When I started to design the Volcano, I wasn't thinking about money, I just wanted to create a vaporizer with a design and quality as good as it was possible for me to produce.

Another important point is I feel very responsible for the health of my clients, thus spending a lot of time for research to find harmless materials and assess the general safety of the design.

Russo: How does your device work?

Storz: The most important idea regarding safety and easy use was to separate the process of vaporization from the process of inhalation.

The problem of precise hot air generation is solved by employing an astoundingly simple principle: the air is pumped through a heated aluminium block (similar to an oven with aeration ducts) and thus inevitably assumes the desired temperature. A diaphragm pump ensures that the air flow remains constant, and volumetric flow fluctuations are eliminated. This functions so effectively that electronic controls can be dispensed with. A bimetallic control mechanism is sufficient to ensure a maximum air temperature fluctuation of 8°C (± 4°C) in the filling chamber. This means that the Volcano has the most accurate temperature control of any current available vaporizer. A higher precision is not necessarily essential to vaporize cannabis, but could easily be reached in the Volcano with a much more expensive electronic control.

However, the main distinguishing feature of the Volcano is the patented valve balloon into which the vapor generated is pumped. The valve balloon can be completely detached from the device after filling and the contents inhaled at the user's ease. This ensures that the application is absolutely safe, as

vaporization occurs previously and the user does not come into contact with glass, heat or electricity during inhalation.

Russo: The collecting bag is an interesting feature. Is it chemically inert?

Storz: The balloon is an oven bag as commonly used to bake food for hours in an oven with temperatures up to 200°C. The vapors have a maximum temperature of 130°C when they come out of the Volcano's valve, touching the balloon then the first time. Because of the greater surface area of the balloon, the vapors cool down to ambient temperatures immediately. Oven bags are heatproof, safe for use with food, and absolutely tasteless. They are perfect for use with vapors and can be bought in nearly every supermarket in the world. They don't add anything to the vapor.

Russo: Does not the THC merely coat the bag? How long can the vapor be stored in the bag and still be active?

Storz: Vapors condense as soon as they touch a surface with a lower temperature. But it's not advisable to inhale hot vapors, so the vapors have to be cooled down somehow.

If you want to inhale cool vapor, a partial loss of condensed vapors is unavoidable in every vaporizer design. Once the vapors have cooled down in the balloon to ambient temperatures, it takes hours until the rest coat the bag. I recommend inhaling the vapors, at the latest, 5 or 10 minutes after filling the balloon.

The balloon is not designed to store vapors. It just helps to inhale safely and in comfort, much as a glass helps you to drink easier than drinking directly from the tap of a barrel.

Russo: How many bags can be collected per gram of herbal cannabis?

Storz: This depends on the quality of the cannabis and the size of the balloon, on average approximately 10 balloons.

Russo: How often may a bag be employed? What does it look like when it is fully used?

Storz: Though I recommend changing the balloon earlier, it can be used more than a hundred times.

If you always inhale right after filling the balloon, it looks clean even after a hundred fillings, but then tears may appear making the balloon fill only loosely.

If you "store" the vapors for hours in the balloon, giving them the opportunity to condense completely on the sheath of the balloon, a green-brown layer appears after a few fillings inside the balloon.

Russo: How often does the Volcano unit need be cleaned? What foreign material collects?

Storz: The Volcano (hot air generator) itself is free of maintenance. The mouthpiece, valve and filling chamber should be cleaned regularly to guarantee proper function and a clean taste. As soon as any distinct residue is detected, it is time for cleaning. For hygienic reasons, cleaning of the mouthpiece should also be done before another person inhales. Cleaning the valve parts and changing the balloon should always be done at the same time.

There are no "foreign" materials collected. It's just condensed vapor that can be easily wiped away with pure ethanol and a paper towel.

Russo: Please compare and contrast the Volcano with other vaporizer designs ("frying pan" or bulb)?

Storz: There are essentially two different functional principles by which vaporizers work. One is the "frying pan" principle (i.e., herbal material is distributed on a heated surface and the vapor or smoke which arises from this is inhaled). However, construction restrictions prevent the material being heated in an even manner when employing this method. Such devices are relatively cheap, but ineffective and, consequently, not recommended.

The other method is to permeate the material with a flow of hot air. This achieves a considerably more even heating of cannabis (a prerequisite for controlled vaporization).

The greatest technical difficulty encountered here is heating the air to a pre-specified temperature. THC vaporizes at temperatures of 185°C and over, cellulose (herbal material) beginning to change to cook at 235°C and subsequently combusting.

Theoretically speaking, temperatures between 185°C and 235°C are possible for vaporizing cannabis. However, an effective vaporizer should be capable of achieving air temperature fluctuations of 185°C to a maximum of 205°C in the filling chamber under practical conditions (for reasons relating to flavor, efficiency and avoiding irritating substances). If the fluctuation is lower, it is better.

There are devices with digital displays available that pretend to have an accurate temperature control, but what those displays show is the desired temperature, not the real one in the filling chamber.

One of those vaporizers utilizes a light bulb for heating, meaning that the heating element wires do not contaminate the inhaled air (as they are encapsulated in glass).

Most vaporizers also require that air movement be induced by the users' lungs, resulting in inevitable volumetric flow fluctuations which even well-honed technology cannot compensate for with an adequate degree of precision, particularly if the temperature sensor is not located at the center of activity (i.e., in the filling chamber). The user can, however, attempt to minimize flow fluctuations through a consistent inhalation technique, so that a satisfactory result can eventually be achieved.

Some vaporizers cool and filter vapor with water, a method which results in deposition of a considerable proportion of active ingredients in the water, rather than in the lungs.

There are other "vaporizer"-producers using hot-air-guns (paint-strippers) as a heat source for inhalation purposes.

Russo: I have heard criticism from some cannabis smokers that they do not feel much when they use a vaporizer. Could you please address this contention?

Storz: A Dutch head shop owner told me, his clients, all experienced cannabis users, tell him there are only two kinds of vaporizers giving them a real "hit." These are the Volcano and the ones working with hot air guns, because only with them are you able to inhale a large volume of vapor in one toke. The other ones with the small plastic hoses to inhale from don't produce enough heat to deliver sufficient vapor for a real "kick," but maybe enough for a cannabis patient who requires only small dosages.

Using the Volcano's valve balloon, anyone can inhale in a way that's appropriate for him, because the process of inhalation is separate from the process of vaporization.

Russo: How long should a clinical cannabis patient hold their breath with this device?

Storz: Vaporized natural cannabis irritates the respiratory tract much less than smoked cannabis, but it is not completely free of irritating properties. The cannabis used, the quality of the vaporizer, and the respiratory method employed all have a considerable influence in this respect. It is therefore important that one inhale deliberately, holding ones breath for a

few seconds and then exhaling again. Talking or laughing during inhalation should be avoided, as this can lead to fits of coughing among less experienced consumers. Inhalation of vaporized cannabis for non-smokers becomes easier after a certain individual settling-in period.

Russo: Can the Volcano be employed with hashish, or with "bubble hash?"

Storz: Common hashish and herbal cannabis are perfectly suitable for vaporizers. Cannabis resin in powder form (often erroneously called pollen) can also be used without difficulty. There are a few hashish varieties which become oily or sticky when heated, subsequently smearing the sieve filter. Hash of this kind should be heated previously and mixed with a carrier material (e.g., hemp leaves, sage or peppermint). This prevents blockage of the filters, increases the surface area and also generates interesting flavors. Hashish oil can be used in the same manner.

Another possibility is to dissolve the oil in alcohol, like synthetically-produced pure delta-9 THC (available on prescription in Germany), and trickle it onto the lower screen in the filling chamber, then vaporizing after the alcohol has evaporated.

Russo: Will it work with essential oils?

Storz: The Volcano has an air temperature range from 130°C to 230°C. As far as I know, essential oils should be vaporized at lower temperatures. There are cheaper and better suited devices for this.

Russo: What do you hear from clinical cannabis patients concerning their results with the Volcano?

Storz: They appreciate the easy handling of the Volcano. Some multiple sclerosis patients told me it's impossible for them to roll a joint or use other vaporizers, but it's possible for them to handle the Volcano independently. They just need help when it's time to clean the valve parts of the Volcano or change the balloon.

Russo: Has it been efficient for them?

Storz: If inhaled cannabis helps, the Volcano makes it more efficient and pleasant.

Russo: Have patients reported any changes in their respiratory status after using the Volcano?

Storz: Yes, especially asthma-patients reported they have benefits with vaporized cannabis.

Russo: Are you aware of anyone vaporizing Marinol® with the Volcano?

Storz: No. As far as I know, the THC in Marinol is dissolved in sesame oil. This is not appropriate for vaporization, I think.

Russo: Please address the use of synthetic THC and CBD by vaporization in Germany.

Storz: Compared to natural cannabis, vaporized THC and CBD have the advantage to be free of any irritation during inhalation. The disadvantage of synthetic cannabinoids is the much higher price. In practice, it's easy to vaporize synthetic THC and CBD with the Volcano.

However, the Volcano is not certified as a medical device, yet. Studies of the use of the Volcano with synthetic THC and CBD in various illnesses are just beginning.

Russo: What are the laws in Germany with respect to the use of cannabis with the Volcano?

Storz: Natural cannabis and hashish are illegal in Germany, even for medical use. Synthetic THC, available only on prescription, may be used as pills, and might be used to vaporize, but there are no vaporizers which are certified as medical devices yet.

Russo: To how many countries have Volcano units been shipped?

Storz: We deliver to all countries of the European Community and to Switzerland. That's 17 countries altogether.

Russo: Does that include North America?

Storz: Not yet.

Russo: Will you be planning a unit for the North American market?

Storz: Yes.

Russo: Will you seek Food and Drug Administration (FDA) approval of the Volcano as a medical device?

Storz: Yes, in the medium-term.

Russo: What do you predict for the future of cannabis vaporization and the Volcano?

Storz: As vaporization has lots of convincing advantages compared to smoking, more and more people will quit smoking and start to vaporize cannabis.

Right now the problem is that more than 90% of the available devices on the market don't keep their promise and are simply not suitable for an effective vaporization. I often hear from disappointed users: "Vaporization? Yes, I tried it, but it didn't work well."

I guarantee, vaporization works fine if you use a good vaporizer.

There are other "vaporizer" producers using hot air guns (paint-strippers) as a heat source for inhalation purposes. When I asked the producers of hot-air-guns what they think about using their paint-strippers for inhalation purposes, they told me not to use it for this, because of the cheap blower-motor (with coal-brushes) emitting carcinogenic coal particles that could be inhaled.

Regarding the future of the Volcano, I have reason to be very optimistic, as this patented invention is a real milestone in development of vaporizers. Anyone who wishes to enjoy the benefits of the vaporization method right now is well advised to try the Volcano.

Russo: Thank you very much for your participation.