



Cannabis Extraction is based on a Precise Controlling of Cryogenic Temperature Hygiene Processes



Sliding gate valves complete the CryoEXS plant

An application report by Sven Wildförster and Marcel Mokosch

The company DEVEX Verfahrenstechnik in Warendorf has taken a decisive step in the direction of extracting cannabis oil with the development of the CryoEXS plant. This makes it possible to extract cannabis oil from hemp and then filter it, connect an ethanol retrieval system, and then refine it in a final step by deploying decarboxylation that transforms the acid content of the oil. Sven Wildförster, the managing partner of DEVEX Verfahrenstechnik is certain, "As far as we are aware, this makes us the only supplier of such a very economical complete system in the world." Sliding gate valves and aseptic seat valves from Schubert & Salzer provide the highest degree of control precision – even within the sensitive cryogenic temperature range".

There is an increasing global demand for cannabis oil, especially the cannabinoid CBD. This non-psychoactive ingredient in the cannabis oil has antispasmodic, anti-inflammatory and anxiolytic effects in addition to it being effective against nausea. This is the reason why the demand is especially increasing on a global scale in the oncological pain therapy and as a food supplement.

Cannabis oil manufacturers are provided with a special benefit by DEVEX Verfahrenstechnik with its plant as it uses cryogenic ethanol as an extracting agent. This cryogenic temperature process ensures that the extraction is very gentle and productive. The ethanol also runs through a closed and therefore economical cycle. An ethanol recovery system is also integrated in the plant that at the same time ensures that the residual ethanol content in the remaining biomass is kept to a minimum.

Cryogenic temperatures pose a challenge to control valves

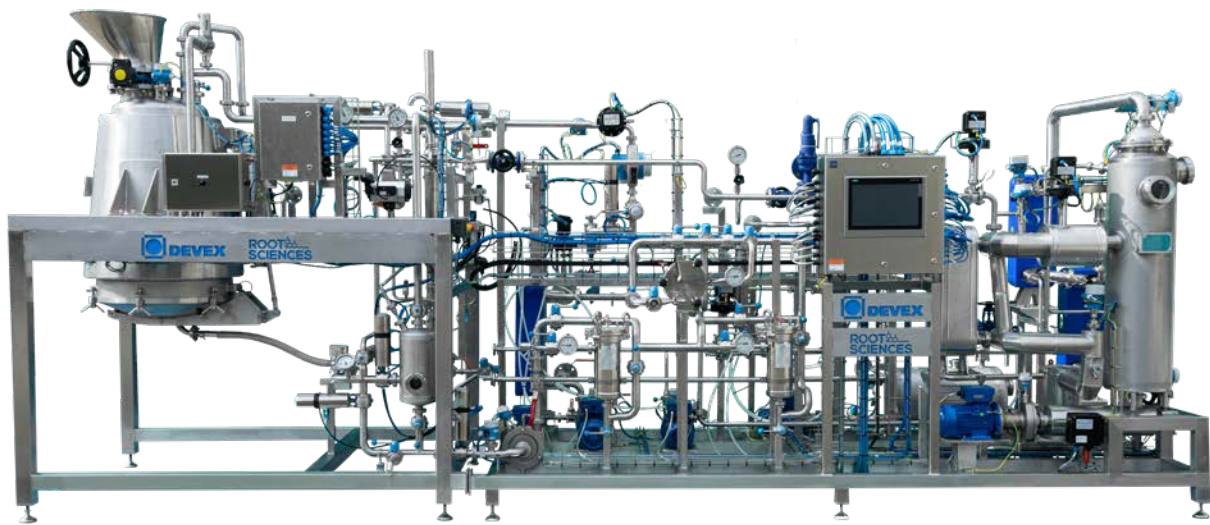
The operating of control valves under cryogenic temperatures places the highest demands on the technology. This showed the distinctive advantages provided by valve solutions from Schubert & Salzer. Even the standard sliding gate valve can be used within a temperature range of -60°C and $+350^{\circ}\text{C}$. "The cooling circuit in our cannabis extraction plant runs in a cryogenic temperature



The cannabidiol that is extracted from hemp is becoming increasingly important in the health sector due to its antispasmodic, anti-inflammatory and anxiolytic effects in addition to it being effective against nausea and an important food supplement.

range of max. -50°C ," says Sven Wildförster. "This is where we make successful use of sliding gate valves from Schubert & Salzer. We use a refrigerant to cool the ethanol down to the required temperature so as to achieve the best possible result in the extraction. Finding suitable control and shut-off valves was not easy. The sliding gate valve was just the solution we needed as the temperature-controlled regulation is fundamentally dependant on the controlling precision of the sliding gate valve. It is down to these valves that we are able to achieve a very precise cryogenic temperature. We are also able to benefit from both the sliding gate valves and the aseptic valves from Schubert & Salzer that we also use as they have a design that meet our needs. They are narrow and compact in addition to them being easy to install and operate."

DEVEX Verfahrenstechnik supplies the cannabis extraction plant to customers around the globe. This is where the sliding gate valves display additional excellent benefits such as their low weight, the easy installation and operation, and the simple maintenance. Mr Wildföster on this subject, "We mainly deliver our plants to the place of installation in the form of pre-as-

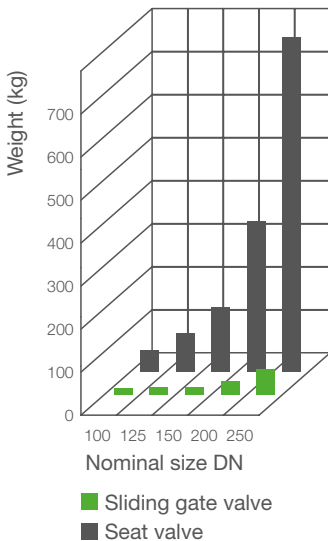


With the CryoEXS plant, it is possible to extract cannabis oil from hemp, filter it, connect an ethanol recovery system and as a final step, carry out a decarboxylation, that transforms the acid in the oil in order to refine it, and that in a closed complete system. Due to their high degree of control precision, sliding gate valves can hereby be used in cryo ex applications as they provide for a very gentle and productive extraction of cannabidiol.

sembled units, this being accompanied by our engineers. The compactness of the sliding gate valves is an advantage during the installation but not only that: these control valves can be easily maintained by the plant operator after completion of the commissioning, it also being possible to adapt them to the changing process parameters. As we normally fit our plants with sliding gate valves with a size of DN50, the benefit gained by the compactness and the low weight is not quite so striking, but I do not want to miss them, nevertheless. Especially as this makes it much easier for our customers to maintain and service their plants.“

short stroke provide short actuating paths and switching times, sliding gate valves are able to achieve opening and closing times of 100 ms for the full stroke with a resolution of 0.1% of the stroke position even when subjected to cryogenic temperatures. Not only do these high dynamics improve the control quality, they also form the basis for control loops with very short reaction times.

The special design that comprises two slotted discs that slide against each other and thereby seal against each other, make sliding gate valves one of the few fittings that combine a very high degree of control precision with almost no leakage. The central throttle device organ – the slotted discs that slide against each other – are also hardly affected by wear so that a long lifetime can even be achieved under extreme conditions.



Size comparison between a normal seat valve and a Schubert & Salzer sliding gate valve. In the example, the nominal size of both valves is identical.

Safe control even in ex-zones

Sliding gate valves are often positioned by digital positioners. Digital positioners are high-precision control loop systems that Schubert & Salzer Control Systems offers in 11 different versions within the 8049 series. The 8049 digital positioner is available in two ex-protected versions as a 2-resistor design for use in areas where there is a risk of explosion. This means that it can be installed on production sites in protection class “intrinsically safe” as defined in ATEX II 2 G Ex ia IIC T3/T4. The digital positioner 8049-Ex-0 for use in Zone 0 has the ATEX marking II 1G Ex ia IIC T3/T4.

The cannabis plant from DEVEK Verfahrenstechnik is also subjected to the requirements of ATEX Group IIB T3 with Zone 1 inside and Zone 2 outside (ATEX II 2G / ATEX II 3G) due to the fact that ethanol is used as a solvent.

It gets even colder

Sliding gate valves with an optional body extension are available in a cryogenic temperature version of max. – 200°C that can be used for the high precision controlling of liquid nitrogen or oxygen, for example. The maximum control stroke of a sliding gate valve also only amounts to 9 mm here. Not only does this

EHEDG-certified aseptic valve for high demands

DEVEK Verfahrenstechnik uses ethanol in a pharmaceutical quality for the extraction. Mr Wildföster in this regard: “The high-quality ethanol that we use comes into contact with the product during the extraction process so that it needs to be conform with the highest hygiene standards. We rely on Series 6051 aseptic valves from Schubert & Salzer for the controlling of these media flows.“

The 6051 series aseptic right angle valves have been consistently optimized in terms of cleanability, position ratio and control precision in addition to ease of maintenance. The cleanability that is a necessity in pharmaceutical and food processes is directly connected to the flow conditions. To put it in a nutshell, this means that the faster the flow velocity on the surface that makes contact with the medium, the higher the cleaning effect. This is the reason why the development objective was to trim the wall shear stresses that are proportional to the flow velocity to maximum values across all of the nominal widths. The perfect achievement of this development objective has last but not least been proven by the European Hygienic Equipment Design Group (EHEDG) certification. This valve series extends from DN 50 to PN 16 and with a position ratio of 50:1, it covers an extraordinarily wide control range.



DEVEX Verfahrenstechnik controls ethanol in a pharmaceutical quality using the EHEDG-certified Series 6051 aseptic valves from Schubert & Salzer.

These are consistently optimized in terms of cleanability, the position ratio and the control precision in addition to their ease of maintenance.

Short delivery times – a service on top

Mr Wildförster sees another aspect of the cooperation with Schubert & Salzer as being decisive, “Both the sliding gate valves and the aseptic valves provide technically distinctive benefits without a doubt. The short reaction times and fast processing times by the specialists from Schubert & Salzer in connection with projects should not go unmentioned. The fast delivery capability is also a decisive benefit. We normally receive the ordered special fittings within a period of just three weeks. We greatly appreciate this!”

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Comprehensive know-how in thermal processes



DEVEX Verfahrenstechnik GmbH with legal domicile in Warendorf in the administrative district of Münster in NRW is a highly specialised plant planning company.

DEVEX is for ‘Drying, Evaporation, Extraction’. 28 employees plan extraction plants, vacuum evaporation plants, vacuum drying plants, aroma recovery plants and sterilisation plants for the food, pharmaceutical, chemical and cannabis/hemp industries.

“DEVEX Verfahrenstechnik has a clear focus on the thermal processing engineering in the three business units coffee, non-coffee and cannabis”, says Sven Wildförster, the managing partner of DEVEX Verfahrenstechnik. “We plan and supply extraction plants for everything that can be extracted. We concentrate on vacuum and freeze drying as far as the drying technology is concerned.”

Today, DEVEX Verfahrenstechnik is a part of the Kahl Group, together with the companies Amandus Kahl, Neuhaus Neotec, Schule Mühlenbau and Heinen. “Together with our affiliate company Neuhaus Neotec, we are an important supplier of instant coffee plants”, says Mr Wildförster. “The green beans are roasted and ground and Neuhaus Neotec developed the plants for this purpose. We at DEVEX Verfahrenstechnik are the leaders when it comes to the following process steps extraction, concentration and freeze drying. As a member of the Kahl Group, we are the only company in the world that is able to supply the entire process chain in the production of instant coffee from a single source.”

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