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Budapest(54) **Eljárás és berendezés fermentáló létesítmény üzemeltetésére**

Az európai szabadalom ellen, megadásának az Európai Szabadalmi Közlönyben való meghirdetésétől számított kilenc hónapon belül, felszólalást lehet benyújtani az Európai Szabadalmi Hivatalnál. (Európai Szabadalmi Egyezmény 99. cikk(1))

A fordítást a szabadalmas az 1995. évi XXXIII. törvény 84/H. §-a szerint nyújtotta be. A fordítás tartalmi helyességét a Szellemi Tulajdon Nemzeti Hivatala nem vizsgálta.

Method and device for operating a fermentation assembly

The invention relates to a method for operating a fermentation assembly according to the preamble of claim 1.

In a corresponding method a substrate in a fermenter is flushed through with percolate which is mostly collected up at the bottom of the fermenter, returned to a percolate container and then supplied from there again to the fermenter. Methane-containing biogas hereby arises in the fermenter and also in the percolate container and this gas is drawn off from the fermenter and/or the percolate container and supplied to a biogas processing unit to increase the methane concentration. During biogas processing the biogas which is obtained is separated off from further undesired constituent parts and forwarded for further use. During processing a considerable amount of CO_2 , inter alia, is produced.

In order to supply the biogas from the fermenter at the end of the process for biogas processing, the biogas-containing volume above the substrate has to be flushed with a flushing gas after the fermentation process in order to discharge the biogas from the volume. It is known for this from EP 1 997 875 A1 to use CO_2 -containing gas which arises from the processing.

Also during the fermentation process not inconsiderable amounts of biogas arise which are "trapped" in the substrate however. These are released when handling the material or when subsequently post-processing the fermented residues. The released biogas content, more particularly methane, thus passes uncontrolled into the atmosphere.

The EP 1 428 868 A1 (D1) discloses a fermentation assembly in which it is possible to flush the fermenter through with a biogas which has been produced in the fermenters of the fermentation assembly provided there. The biogas is however a high methane-containing, thus in particular combustible, biogas which can be recycled in a recycling or recovery unit and which likewise forces high methane-containing biogas out from the fermenter which is to be flushed. However through this type of flushing no increased methane yield can be achieved. The flushing process serves in the case of D1 (EP1428868 A1) only to devise the heat input into the fermenter in cost-effective manner.

The EP 1 811 015 A1 discloses a liquid fermentation assembly in which the biogas produced in one fermenter is utilised within the scope of a circulating guide as a flushing gas in the same fermenter. Also in this case biogas is displaced by biogas having a comparatively higher methane concentration, and the methane yield is thus not increased through flushing. The biogas flushing here only ensures a better mixing of the liquid biomass and thus functions principally as an agitator mechanism.

Furthermore the printed specifications EP 1 736 535 A, WO 02/06439 A and WO 2005/054423 A disclose fermentation assemblies. However all the fermentation assemblies and methods for operating same disclosed there have the common feature that there is still a problem with the methane collected in the substrate.

The object of the invention is therefore to provide a method in which the said disadvantages do not occur and the methane escape can be reduced to a minimum.

This is achieved according to the invention by the features of claim 1. Advantageous embodiments are found in the dependent claims.

With the method according to the invention the CO_2 -containing flushing gas is directed through the substrate. The flushing gas is preferably introduced at high pressure into the fermenter in the bottom area in the best possible laminar flow. The substrate is thus flushed through and the biogas content existing there passes more particularly into the volume above the substrate and can be extracted in known way for processing biogas. The CO_2 -containing flushing gas can then be removed as exhaust gas from a biogas processing unit. Alternatively or in addition to this it is possible to introduce CO_2 -containing biogas which has arisen in another fermenter through the fermentation process, from an early phase of the fermentation process, into the fermenter which is to be flushed.

A method variation outside of the area of protection of claim 1 will now be explained in further detail with reference to the embodiment shown in the drawings.

A fermenter 1 is loaded with a substrate 1a. Only one fermenter is shown, however, assemblies with a number of fermenters are possible. The fermenter 1 is connected to a percolate container 2 by a supply pipe 21a, with which the percolate 2a is introduced into the fermenter 1 and seeps through the substrate 1a during the fermentation process. The percolate is collected in the lower region of the fermenter 1 and is supplied back to the percolate container 2 via a return pipe 21b.

During the fermentation process biogas arises which initially collects in the fermenter 1 in the volume 1b above the substrate 1a. Biogas is moreover also present in the substrate 1a, which is enclosed therein and which cannot readily pass into the volume 1b. Furthermore additional biogas also arises in the percolate container 2. The biogas which is present in the fermenter in the regions 1b and 1a is discharged through the flushing process according to the invention. For this on the one hand a biogas pipe 12 is provided between the fermenter 1 and percolate container 2, and a further pipe 23 is provided between the percolate container 2 and a processing unit 3. The CO_2 -containing gas which arises in the processing unit 3 during processing is used for flushing. In the following, by CO_2 -containing gas is meant a gas which contains predominantly CO_2 . However it can also contain solely CO_2 , other constituent parts are however also conceivable.

During biogas processing, in addition to highly concentrated methane, which is provided via the pipeline 32, predominantly CO_2 -containing exhaust gas arises which can be discharged via the pipeline 33, or is introduced via the pipeline 31 into the flushing pipeline 4 which leads to the fermenter 1. The flushing connection on the fermenter 1 is positioned so that the flushing gas which is supplied through the flushing pipeline 4 is directed through the substrate. Preferably for this the connection for the flushing pipeline 4 is provided in the bottom 1c or base region of the fermenter 1 or at the side in a region 1d of the fermenter 1 which is still covered by the substrate 1a. Furthermore a distributor device (not shown) can be provided in order to direct the flushing gas through the substrate at several places. This can happen in the fermenter 1 or even by dividing up the flushing pipeline 4 in front of the fermenter 1. In each case a number of flushing connections can be provided.

The CO_2 -containing flushing gas is introduced under pressure into the fermenter 1 so that biogas still stuck firm in the substrate 1a is forced out of the substrate. The connection to the biogas pipeline 12, or a corresponding valve 12a, is then opened so that the biogas forced out from the substrate 1a and the substrate-free volume 1b is discharged through the percolate container 2 and the pipeline 23 to the processing unit 2. If the biogas is discharged from the fermenter 1 or if a predetermined switch-over point is reached which can arise by way of example from a threshold value of the biogas (methane) concentration, the valve 12a in the pipeline 12 is closed

again and the exhaust valve 11a to the exhaust pipe 11 is opened; the valve 31a of the CO₂-pipeline is closed and the CO₂-supply is stopped. Further flushing now takes place through fresh air which is supplied from a fresh air pipe 5 to the flushing pipeline 4. The exhaust air escaping from the fermenter through the exhaust pipe 11 is then subjected to an exhaust air processing and/or extraction which is not described in further detail here.

In the illustrated variation of the method, CO₂-containing biogas, which arises from a further fermenter in the fermentation process there and which has collected during an early phase of the fermentation process, is used as the flushing gas. According to the invention biogas is used which arises in another fermenter (not shown). In the first phase of the fermentation process a large amount of CO₂ arises in the biogas. This CO₂-containing biogas from one fermenter can be used for flushing another fermenter, wherein the flushing gas connection of the fermenter which is to be flushed is connected to the biogas pipeline of another fermenter.

With the method according to the invention the methane escape can be clearly reduced by the method according to the invention. Furthermore the efficiency of the biogas recovery can be increased because the biogas still present in the substrate can be supplied for processing.

Eljárás és berendezés fermentáló létesítmény üzemeltetésére

Szabadalmi igénypontok

1. Eljárás fermentáló létesítmény üzemeltetésére, amely létesítmény legalább egy öblítendő fermentorral (1) rendelkezik, amely egy szubsztrátummal (1a) van feltöltve, ahol a szubsztrátumot (1a) egy perkolátumtartályból (2) származó perkolátummal (2a) perkoláljuk és a perkolálási eljárás során az öblítendő fermentorban (1) és/vagy a perkolátumtartályban (2) keletkező biogázt elvonjuk, emellett egy további fermentorból (1) a fermentációs folyamatban ott keletkezett CO₂-tartalmú biogázt, amely a fermentációs folyamat egy korai fázisában jött létre és ezért megnövekedett CO₂-tartalommal rendelkezik, egy, az öblítendő fermentorban (1) keletkezett biogáz elvezetésére szolgáló öblítővezeték (4) segítségével bevezetjük az öblítendő fermentorba (1), ahol a CO₂-tartalmú öblítőgázt oly módon vezetjük be az öblítendő fermentorba (1), hogy azt a szubsztrátumon (1a) keresztül vezetjük át, amihez az öblítendő fermentor öblítőgáz-csatlakozóját a további fermentor biogáz-vezetékével kötjük össze.
2. Az 1. igénypont szerinti eljárás, *azzal jellemezve, hogy* a CO₂-tartalmú öblítőgázt oly módon vezetjük át a szubsztrátumon keresztül, hogy a szubsztrátumban (1a) jelen levő gázt a fermentor (1) szubsztrátummentes terébe szorítjuk ki.
3. Az előző igénypontok bármelyike szerinti eljárás, *azzal jellemezve, hogy* a CO₂-tartalmú öblítőgázt a fermentor (1) aljába vezetjük be.
4. A 3. igénypont szerinti eljárás, *azzal jellemezve, hogy* a CO₂-tartalmú öblítőgázt a fermentor (1) aljának tartományában eloszlatjuk, így a szubsztrátumot (1a) lényegében egyenletesen áramoltatjuk át alulról felfelé a CO₂-tartalmú öblítőgázzal.
5. Az előző igénypontok bármelyike szerinti eljárás, *azzal jellemezve, hogy* a CO₂-tartalmú öblítőgázzal való öblítés után friss levegőt vezetünk be az öblítővezetéken (4) keresztül a fermentorba (1).

6. Az előző igénypontok bármelyike szerinti eljárás, *azzal jellemezve, hogy* a CO_2 -tartalmú öblítőgáz bevezetése során a biogáz-elvonást egy írtóvezetéken (12, 23) keresztül végezzük.

7. Az előző igénypontok bármelyike szerinti eljárás, *azzal jellemezve, hogy* a CO_2 -tartalmú öblítőgázzal végzett öblítési folyamat befejezése után megszakítjuk a biogáz-elvonást, és egy használtlevegő-elvezető vezeték (11) nyitunk meg.

