

ICS 71.100.20

**Feinblasentechnologie –
Gerät zur Induktion von Feinblasen für Flotation –
Installation und Betrieb; Text Englisch**

Fine Bubble Technology –
Fine Bubble Induced Gas Flotation Devices –
Installation and Operation; Text in English

Zur Erstellung einer DIN SPEC können verschiedene Verfahrensweisen herangezogen werden:
Das vorliegende Dokument wurde nach den Verfahrensregeln einer PAS erstellt.

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Foreword

This DIN SPEC has been developed according to the PAS procedure. The development of a DIN SPEC according to the PAS procedure is carried out in DIN SPEC (PAS)-consortiums and does not require the participation of all stakeholders.

This document has been developed and adopted by the initiator(s) and authors named below:

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At present, there are no standards covering this topic in the body of German Standards.

DIN SPEC (PAS)s are not part of the body of German Standards.

A draft of this DIN SPEC (PAS) has not been published.

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Introduction

Fine bubble induced gas flotation can be used to produce gas microbubbles for waste water treatment. Unlike the more common flotation technology, Dissolved Air Flotation (DAF), induced gas flotation does not require dissolving gases in a liquid, recirculating a fluid or swinging of pressure levels. Instead, induced gas flotation simply injects compressed gas (e.g. air) at a low over-atmospheric pressure through a fine diffuser inducing the formation of the fine bubbles mechanically without a phase-change. Induced gas flotation could generate similar separation and removal efficiencies with a fraction of the energy consumption, less equipment (no need for high pressure recirculation pump, high pressure air compressor, pressure tank) and simpler process dynamics.

Currently there are no German standards or technical rules for using any kind of fine bubble technology. This poses an impediment to implementing any kind of technology on a repeatable basis in large numbers. On an international level the ISO/TC 281 "*Fine bubble technology*" has begun working on and publishing standards related to fine bubbles, however none of which is currently involving flotation, especially not induced gas flotation. This DIN SPEC should assist users (EPCs, OEMs, plant operators) in installing, operating and technically maintaining such devices in good conditions. As a result, a more energy efficient and simpler flotation technology could be made popular in the water industry. The outcome would be an improvement of current water treatment chains, reducing energy consumptions and minimizing the footprint. This goes in alliance with the United Nations' Sustainable Development Goals (SDG) number 6 "Clean Water and Sanitation" [1], number 12 "Responsible Consumption and Production" [2] and number 13 "Climate Action" [3].

1 Scope

This DIN SPEC describes the proper installation, operation and commissioning of fine bubble induced gas devices for flotation in wastewater and other fluid treatment.

NOTE Fine bubble induced gas flotation devices can be used to treat wastewaters and other fluids such as:

- spent metalworking fluids (cutting fluids, wash water)
- wastewater from paper industry
- wastewater from food and beverage plants
- wastewater from the oil and gas industry
- surface water (including seawater)
- wastewater from textile industry
- fluids in ore beneficiation and mineral processing
- water re-use in plastics recycling plants
- aerobic biomass separation in biological wastewater treatment plants
- polishing and clarification of effluents from anaerobic processes

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 8573-1:2010, *Compressed air — Part 1: Contaminants and purity classes*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

DIN and DKE maintain terminological databases for use in standardization at the following addresses:

- DIN-TERMinologieportal: available at <https://www.din.de/go/din-term>
- DKE-IEV: available at <http://www.dke.de/DKE-IEV>

3.1 bubble contact zone

part of the tank volume where collision between gas bubbles, solids and/or liquid droplets takes place

3.2 chemical cleaning

removal of foreign materials/substances, such as foulants, scales or oil from the surface of a membrane or diffuser by the action of chemicals

[SOURCE: EN ISO 1891-2:2014, 3.4.2, modified — By replacing "oxides" by "foulants" and "of the fasteners" by "of a membrane or diffuser" (examples applicable for fine bubble technology)]

3.3**chemical flush****CF**

type of chemical cleaning in which the chemicals are pumped through the membrane or diffusor

3.4**cleaning in place****CIP**

cleaning of equipment by impingement or circulation of flowing chemical solutions and water rinses into, onto and over surfaces in equipment or systems without dismantling, using equipment designed and installed for that purpose

[SOURCE: EN 12547:2014, 3.3.4]

3.5**gas solids ratio** **x_{gs}**

ratio of gas bubble volume under standard conditions to solids mass

3.6**gas wastewater ratio** **x_{gw}**

ratio of gas bubble volume under standard conditions to wastewater flow

3.7**maximum working pressure**

maximum pressure up to which the equipment can be operated

[SOURCE: EN 14512:2006, 3.1]

3.8**operating pressure**

pressure specified by the equipment manufacturer to ensure the expected performance

[SOURCE: EN 14652:2005+A1:2007, 3.26]

3.9**operating (gas) flow** **$Q_{g,av}$**

gas flow rate specified by the equipment manufacturer to ensure the expected performance

3.10**point of turbulence**

gas flow rate at which the bubble movement on the surface of the bubble contact zone changes from slow and uniform motion (laminar flow) to fast and uneven movements (turbulent flow)

3.11**shut down**

sequence to put out of operation

[SOURCE: EN 12583:2014, 3.38, modified — Deletion of "and isolate" at the end of the Definition. Note 1 to entry has been omitted.]