SILICA

Adsorption Technology from Design to Turnkey Plant

# CUSTOM-MADE PROCESS TECHNOLOGY


Member of
Berndorf Group

## Adsorption Technology from a single Source

Silica Verfahrenstechnik GmbH designs and constructs complete adsorption plants, tailor-made to fit individual customer requirements. We are your expert for national and international plant construction, offering a complete range of engineering services. This includes a comprehensive service spectrum, basic and detail engineering—based on our own process know-how—planning, development and operation of plants and after-sales services. Highly trained and experienced engineers are at your disposal.

Our highly motivated long-term employees in construction and project handling have comprehensive experiences in the field and ensure on-schedule plant completion. On-site installation and the assembly and operation of the complex plants are part of our range of products and services, as well as a customer friendly after-sales service. Project-specific national and international standards are implemented by qualified and trained employees.

Our quality assurance system complies with the requirements of ISO 9001:2015 and SCC*:2011 and is annually verified, thus ensuring the constantly high quality of our deliveries and services.

## 从设计到即用设备的吸附技术

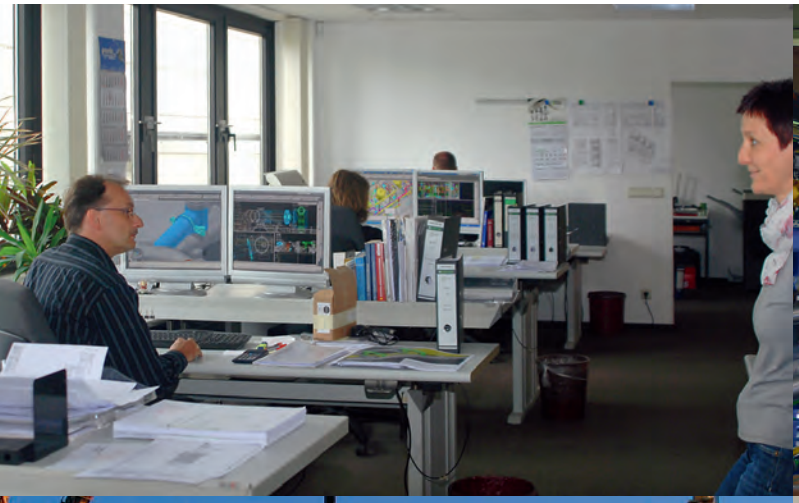
Silica Verfahrenstechnik GmbH 设计和制造整套吸附装置，并进行定制以满足不同客户的需求。我们是国内外工业设备制造方面的专家，为您提供成套工程产品和服务。

其包括项目齐全的服务，以及设备和售后服务的基础及详细工程设计、研发和运作，而这些都基于我们独有的工艺技术。我们训练有素且经验丰富的工程师团队将随时为您提供优质服务。

我们高度热情的专职员工在设备制造和工程行业有着很高的综合素养，可确保按期完成项目任务。

现场安装以及复杂设备的组装和操作都是我们的产品服务，以及客户友好型售后服务的组成部分。

我们训练有素的员工实行项目特定的国内外各项标准。我们的质量保证体系符合 ISO 9001:2015 和 SCC*:2011 的规定，每年都进行验证，从而保证了始终如一的优质产品和服务。





## Silica Verfahrenstechnik GmbH: Innovative Technology with Tradition

Eighty years ago the company for adsorption agents and their application was founded in Berlin. Since the sale of the Silica Gel production plants in 1963, Silica has concentrated on engineering and plant construction.
Silica has delivered more than 500 adsorption technology plants worldwide during the last 20 years, with 20 to 30 new ones every year. Since 1993 the Austrian Berndorf AG holds 75 percent of Silica Verfahrenstechnik GmbH. Silica generates an annual turnover of 15 to 20 million Euro with about 40 employees at its location in Berlin-Reinickendorf.

**1929** Foundation of the German subsidiary of the Silica-Gel Corporation, Baltimore (USA)

**1934** Takeover of the company by the German management

**1963** Sale of Silica Gel production plants to Grace Davison (USA)

**1991/93** Conversion to Silica Verfahrenstechnik GmbH with a 75 percent shareholding of Berndorf AG

**1995** Extension of the new location Berlin-Reinickendorf to central company premises

## Silica Verfahrenstechnik GmbH 现代技术与传统工艺的结合

公司八年前成立于柏林，提供吸附剂产品及其应用服务。自1963年起开始销售硅胶生产设备，Silica 一直侧重于工程设计和工业设备制造。
在过去的20年间，Silica 已在全球范围内交付了五百多套采用吸附技术的工业设备，每年都有 20 到 30 台新设备。从1993年开始，Austrian Berndorf AG获得了Silica Verfahrenstechnik GmbH 75% 的股份。Silica 位于柏林的Reinickendorf, 有大约40名员工，每年的营业额为1500-2000万欧元。

**1929年** Silica-Gel Corporation（美国巴尔的摩）德国子公司成立

**1934年** 公司被德国管理部门接管

**1963年** 向 Grace Davison（美国）销售硅胶生产设备

**1991/93年** 更名为 Silica Verfahrenstechnik GmbH, Berndorf AG 控股 75%

**1995年** 扩大柏林 Reinickendorf 的新厂址，将公司经营场所汇于一地

## Silica Process Technology: From Design to Turnkey Plant

Silica Verfahrenstechnik GmbH is an internationally established company for plant construction and process technology. We design and construct complete adsorption plants, individually tailored to customer needs.

The reliability and quality of Silica plants is appreciated around the world. Decades of experience and technical expertise combined with state-of-the-art technology and timely delivery ensures the successful implementation of customer wishes.

Our plants are used in almost all industrial sectors. For more than 80 years Silica has shown its competence in the fields of petrochemistry, pharmaceutical and plastics industry, gas and natural gas industry.

We design and construct plants for:

- Drying and purification of air, technical and bio gases
- Process gas purification
- Drying of liquids
- Waste air purification with solvent recovery
- Natural gas processing

Furthermore Silica supplies tank breathers and adsorption agents of all kinds: Silica Gel, activated alumina, molecular sieves and activated carbon. Our range of products and services includes the planning, development and operation of plants, based on our own process know-how, as well as the assembly, installation and commissioning. Even after commissioning, our after-sales service arranges for a comprehensive support. The upgrading, extension and maintenance of old plants is another component of our range of services.

## Silica 加工技术：从设计到完整配套设备

Silica Verfahrenstechnik GmbH 是一家专长于工业设备制造和加工技术的国际化公司。我们设计和制造成套吸附设备，并针对各个客户需求进行定制。

Silica 工业设备的可靠性和质量享誉全球。数十年的丰富经验和专长与先进技术和及时交付相结合，为满足客户的各种需求提供了保证。

**我们的设备几乎用于所有工业部门。80多年来，Silica 在石化、制药、塑料、气体和天然气行业已展现出其卓越的能力。**

**我们设计和制造的设备用于：**

- 干燥和净化空气以及技术和生物气体
- 净化工艺气体
- 干燥液体
- 净化废气和回收溶剂
- 处理天然气

Silica 还供应各种油箱呼吸器和吸附剂产品：硅胶、铝胶、分子筛和活性炭。

我们的产品和服务包括基于我们独有工艺技术的设备计划、研发和运作，以及组装、安装和试车。即使在试车之后，我们的售后服务团队也会提供全面支持。我们还提供旧设备的升级、扩展和维护服务。

## AIR AND GAS DRYING

Nearly all gases can be dried by adsorption. Dew points of less than -80 °C can be achieved. Our customers benefit from our extensive know-how in process technology resulting from the sales of more than 5,000 plants we have planned and built.
Besides the dehydration of air and gases our plants can also be used for the removal of other components.

**Atmospheric air**
Our main focus lies on the required residual humidity of less than -30 ... -80 °C at each throughput.

**Compressed air**
Our main focus here lies on plants with throughput capacities from 5,000 Nm³/h up to 100,000 Nm³/h
Residual humidity less than -20 ... -80 °C. By using compression heat the drying process is highly energy-saving.

**Gases**
In addition to the usual process gases like $N_2$, $O_2$, $H_2$ and $CO_2$ we have also dried gases like $SO_2$, $H_2S$, $NH_3$, HCl, Acetylene, Vinylbromide etc. by adsorption.

Capacity 10 ... 250,000 Nm³/h at operating pressures of 1 ... 500 bar. Residual humidity less than 1 ppmv

## 空气和气体干燥

几乎所有气体都可以通过吸附进行干燥。露点可低至 −80° C。借助我们计划和建造的所售5千多套工业设备，客户均受益于我们众多的加工技术实践。

除了空气和气体脱水，我们的设备还用于去除其它组分。

**大气**
侧重于针对各种生产规模的残余水分，且温度低于 −30 . . . −80° C。

**压缩空气**
侧重于生产能力从5千 Nm³/h 到10万 Nm³/h 的工业设备。
残余水分低于 −20 . . . −80° C。由于用的是压缩热，该干燥工艺非常节能。

**气体**
除了 $N_2$、$O_2$、$H_2$ 和 $CO_2$ 等常用工艺气体，我们还通过吸附方式对 $SO_2$ 、 $H_2S$ 、 $NH_3$、HCl、乙炔和溴代乙烯等气体进行干燥。

生产能力 10 . . . 25万 Nm³/h，操作压力 1 . . . 500 巴。残余水分低于 1 ppmv

## DRYING OF LIQUIDS

The drying of organic liquids is a special application of adsorption technology. Silica possesses comprehensive know-how for the design, layout, construction and assembly of such plants.

Beside water other objectionable contaminations can be removed.

**Organic liquids**
Toluene, xylene, hexane, chlorinated hydrocarbons, alcohols, tetrahydrofuran, cyclohexanone etc. are dried by adsorption.
Normal water content at inlet 0.1 ... 1.5% wt.
Residual humidity less than 1 ppm wt

**Liquefied Gases**
Adsorption plants have been built for: propane, propylene, LPG, butane, and others. Normal water content at inlet corresponding to the solubility. Residual humidity less than 1 ppm wt

## 液体干燥

有机液体的干燥是吸附技术的特种应用。对于此类设备，Silica 有着丰富的立项、规划和组装实践经验。

除了水分，其他有害污染物也可以得到去除。

**有机液体**
通过吸附方式可以干燥甲苯、二甲苯、己烷、氯化烃、乙醇、四氢呋喃和环己酮等。正常水，进水量0.1 ...1.5% wt。
残余水分低于 1 ppm wt

**液化气**
吸附设备可用于：丙烷、丙烯、液化石油气（LPG）和丁烷等。溶解度相应进水量的正常水。残余水分低于 1 ppm wt


## GAS PURIFICATION

This procedure is typically used for the removal of $O_2$, $H_2$, CO or hydrocarbons from process gases.
In addition, our special procedure is suitable for the removal of $CO_2$ or methanol.

**Catalytic**
Fine purification of process gases with noble metal catalysts, e.g. removal of $O_2$, $H_2$, CO, hydrocarbons.
Normal inlet concentration 0.01 ... 2%. Residual content less than 1 ppmv. Gas capacity up to 150,000 Nm³/h, operating pressure 1 ... 250 bar.

**Chemisorption**
Fine purification of process gases with a copper contact, e.g. removal of $O_2$, $H_2$ or CO. The purification takes place by oxidation or reduction of the copper contact, thus the purified process gas contains no reaction gas. Residual content of $O_2$ and $H_2$ in the purified gas of less than 1 ppmv.

**Others**
Removal of contaminations by adsorption with molecular sieves, e.g. $CO_2$ from air, methanol from $CO_2$, or with impregnated activated carbon, e.g. $H_2S$ from $CO_2$ or Hg from process gases.

## 工艺气体净化

该过程专用于去除工艺气体中的 $O_2$、$H_2$、CO 或碳氢化合物。
另外，我们的特种工艺还可用于去除 $CO_2$ 或甲醇。

**催化**
使用贵金属催化剂净化工艺气体，比如去除 $O_2$、$H_2$、CO 和碳氢化合物。
正常进入浓度 0.01 ... 2%。残余量低于 1 ppmv。气体容量可达15万 Nm³/h，操作压力 1 ... 250 巴。

**化学吸附**
使用铜触点净化工艺气体，比如去除 $O_2$、$H_2$ 或 CO。通过铜触点的氧化和减少进行净化，从而确保净化工艺气体中不含反应气体。净化气体中的 $O_2$ 和 $H_2$ 残余量低于1 ppmv。

**其他**
通过分子筛吸附去除污染物，例如空气中的 $CO_2$，$CO_2$ 中的甲醇，或者借助浸渍活性炭，例如 $CO_2$ 中的 $H_2S$，或工艺气体中的汞。

## NATURAL GAS CONDITIONING

In the field of natural gas conditioning Silica offers adsorption plants for drying and simultaneous reduction of the hydrocarbon dew point.

We have been building adsorption plants for more than 80 years, letting our customers profit from our extensive know-how.

- Adsorption drying plants are especially suitable for natural gas underground storage due to their immediate availability and great flexibility. Normal range of capacity: Gas capacity 50,000 ... 600,000 m³/h, pressure 30 ... 90 bar
- Adsorption plants for reducing the hydrocarbon dew point and simultaneous drying

## 天然气处理

在天然气处理方面，Silica 提供的设备可用于干燥，以及降低碳氢化合物的露点。

我们已有80多年的吸附设备制造历史，可确保客户从我们丰富的实践经验中受益。

- 由于可以即时使用且有非常大的灵活性，吸附式干燥设备尤其适用于天然气的储存。
  正常容量范围：气体容量5万 . . . 60万 m³/h， 压力 30 . . . 90 巴
- 吸附设备在降低碳氢化合物露点的同时进行干燥

## WASTE AIR PURIFICATION

The purification of waste air by adsorption is especially suitable for reducing organic contaminations to very low residual concentrations. Generally the recovered solvents can be re-used.
Due to decades of experience Silica is in a position to process also special substances and combinations of substances.

**Activated Carbon Plants with Steam Regeneration**
This is the classical process with solvent recovery. We manufacture plants up to a capacity of 300,000 m³/h. For chlorinated hydrocarbons, e.g. dichloromethane, we have built several plants which achieve residual contents of less than < 20 mg/m³.

**Activated Carbon Plants Regenerated with Inert Gas**
During the purification of dry waste gas streams the recovered solvents can be kept free of water with inert gas regeneration.

**Pressure Swing plants (PSA)**
Regeneration by variations in pressure, partly in vacuum. These plants are often used in tank farms as second stage downstream of a membrane plant.

**Additionally, we supply:**
- Waste water purification by air or steam stripping
- Regeneration of recovered solvents by rectification
- Auxiliary plants, such as cooling towers, steam generators, etc.

## 废气净化和溶剂回收

对废气的吸附净化特别适用于将有机污染物降低到极低的残留浓度。回收溶剂通常可以重复使用。

得益于数十年的行业经验，Silica 还可以处理特殊物质和混合物质。

**使用蒸气再生工艺的活性炭设备**
这是溶液再生的经典工艺。我们的设备处理能力可达30万 m³/h。
对于二氯甲烷之类的氯化烃类，我们制造了多种设备，其残留量可低至20 mg/m³ 以下。

**再生惰性气体的活性炭设备**
在净化干燥废气流的过程中，回收溶剂将得到脱水。

**压力回转设备**（PSA）
通过变压进行再生，一部分使用真空这些设备通常用在油库中，作为膜分离设备的后续下游设备。

**此外，我们还可以：**
- 使用气体或蒸气脱附工艺净化废水
- 使用精馏工艺再生回收溶剂
- 提供冷却塔和蒸气发生器等附属设备

## ADSORPTION AGENTS

We deliver adsorption agents of all kinds for the whole variety of possible applications. Based on decades of experience we are specialists in adsorption technology and you can expect extraordinary quality.

**Aluminiumoxide Gel (activated Alumina) (1)**
Used like Silica Gel, but immune to alkaline contaminations like $NH_3$ or KOH.

**Activated Carbon (2)**
For the purification of waste gas and waste air, available in different qualities

**Molecular Sieves (3)**
Drying of air, gases and liquids to residual humidity of less than 1 ppmv. Removal of contaminations from gases by adsorption.

**Silica Gel (4)**
Bead desiccant for drying of air and gases. Generally up to residual humidity corresponding to dew point -65 °C.

Type N: high water adsorption capacity
Type WS: water resistant Silica-Gel, used as a buffer
Type Orange: with an indicator, color change during water adsorption

## 吸附剂

我们供应针对各种应用的品种齐全的吸附剂产品。
我们有着数十年的丰富经验，是吸附技术方面的专家，产品和服务质量卓越。

**铝胶**（活性铝）（1）
用法与硅胶类似，但不受 $NH_3$ 或 KOH 等碱性污染物的影响。

**活性炭**（2）
用于废水废气的净化，各种品质均有供应

**分子筛**（3）
将空气、气体和液体的残余水分干燥至1 ppmv 以下。通过吸附去除气体中的污染物。

**硅胶**（4）
用于气体和空气的珠粒干燥剂。通常可用于残余水分，相应露点 −65° C。

N 型： 水分吸附能力较高
WS 型： 防水型硅胶，用作缓冲物
Orange 型： 使用指示剂，在吸附水分过程中变色




## SERVICE

Our SCC certified specialists handle all kinds of tasks around adsorption plants—for Silica plants as well as for others.

Our Service:

- Commissioning, maintenance and supervision of adsorption plants
- Assessment, reconstruction and modernization of existing adsorption plants
- Inspection and optimization of existing adsorption plants concerning process and energy consumption, implementation of debottlenecking projects
- Operator training
- Connection of plant PLC to the installed DCS, where applicable, installation of a DCS
- Emission analysis for activated carbon plants, adjustment according to governmental regulations (TA Luft)
- Periodic safety monitoring of waste air purification plants by our experts
- Updating of programmable controllers
- Software updates
- Analysis of adsorption agents and catalysts
- Change of adsorption agent fillings including disposal of used materials. Reactivation of used activated carbon

## 服务

我们的 SCC（安全认证供应商）认证专家提供各种吸附设备相关服务，Silica 设备及其他设备均可。

我们的服务：

- 吸附设备的试车，维护和监管
- 已装吸附设备的评估，重建和改造
- 已装吸附设备的检验和优化，涉及工艺和能耗，并按需扩展
- 操作人员培训
- 如果适于安装 DCS（分布式控制系统），则连接设备 PLC（可编程逻辑控制器）至已装 DCS
- 活性炭设备的放射分析，并根据政府规定进行调节 (TA Luft)
- 由我们的专家对废水净化设备执行定期安全监控
- 可编辑控制器更新
- 软件更新
- 吸附剂和催化剂分析
- 吸附剂填料更换，包括废料的弃置已用活性炭的重新活化

Our premises of 7,000 m² in the north of Berlin comprise all the necessary departments needed for the design and construction of special plants, such as calculation and projects department, assembly and installation, as well as our commissioning and service department.

我们在柏林北部的办公地点有7千平方米，包括了特种设备从设计到制造的全部所需部门，例如计算与项目部、组装与安装部，以及试车与服务部。


SILICA

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**Arriving by Car from North**
Coming on autobahn A111 from direction Hamburg leave the autobahn at exit Holzhauser Straße, turn left and pass beneath the autobahn bridge. Turn right into the Wittestraße at the next junction about 100m away. Silica is located on the left side after about 100m.

**Arriving by Car from South**
Follow the autobahn to Berlin-Center (Airport Tegel). At junction no.1 Dreieck Funkturm follow autobahn A100 to Hamburg. Change to A111 to Hamburg at junction no.4 Charlottenburg. Leave the autobahn at exit Holzhauser Straße and turn right. Turn right again into the Wittestraße at the next junction. Silica is located on the left side.

**Arriving by Car from Airport Schönefeld (SXF)**
Take autobahn A113 to Berlin Center. Follow the course of autobahn A100 to Hamburg (Airport Tegel). At junction no.4 Charlottenburg follow autobahn A111 to Hamburg. Leave the autobahn at exit Holzhauser Straße and turn right. Turn right again into the Wittestraße at the next junction. Silica is located on the left side.

**Arriving from Airport Tegel (TXL)**
Airport Tegel is located very close to Silica. Take a taxi to Wittestraße. Silica can be reached in about 10 minutes.

**www.silica.de**