

Company Profile

Sidrabe has been designing and manufacturing vacuum deposition equipment and developing unique processes since 1962.

We offer:

- Development and implementation of vacuum processes.
- Customized vacuum equipment.
- Optimized and cost effective product solutions.
- Contract R&D.
- Contract coating.

Numerous processes have been implemented successfully in *Sidrabe* equipment for many applications:

- Coating of roll-to-roll web materials.
- Metal strip coating.
- Coating of large-size flat glass.
- Coating of artificial diamonds and various powders.
- Protective and decorative coating of 3D articles.
- Various material surface activation in the electric discharge plasma.
- Vacuum lamination.
- Vacuum drying of webs.

Sidrabe is capable of performing contract research in its R&D department which is equipped with many flexible vacuum coaters and extensive measuring instrumentation.

The broad spectrum of experience in vacuum technology gained over the past years allows us to carry out extensive contract coating using own coaters.

History

1962

Our Company was founded as a *Vacuum Metallization Design Bureau* in Riga, Latvia. Aluminum deposition onto flat mirrors for furniture and other consumer products started.

1966

Work coordinator in the area of vacuum coating for the former Soviet Union. Vacuum coaters for depositing protective and decorative coatings onto 3D parts.

1971–1990

This period was marked with processes development for the defense industry and space programs of the USSR. The Company started commercial production of vacuum equipment.

1990–1992

Sidrabe became a Joint Stock Company in the independent Latvia.

1994

The Latvian Ministry of Economy approved Company's privatization. *Sidrabe* received its first orders from western customers.

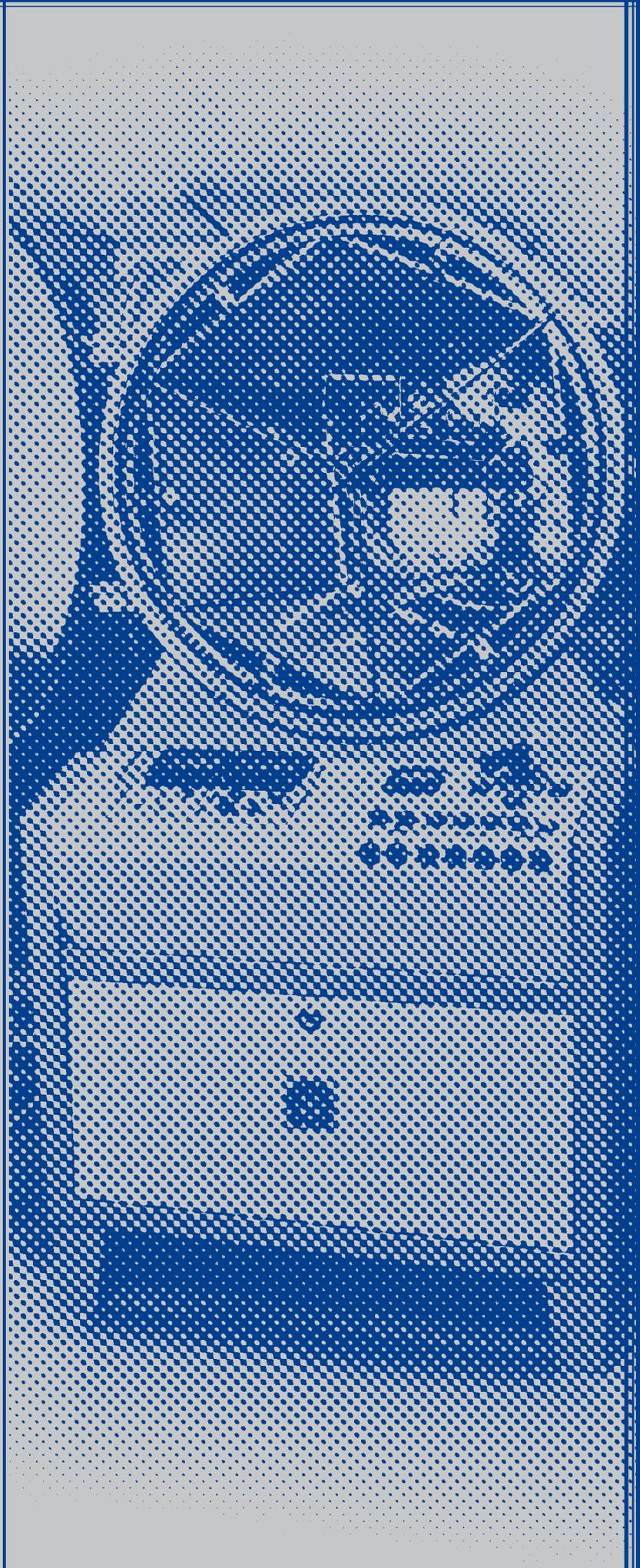
1996

In the mid- 1990's *New Century Holding* (a U.S. based investment fund) joined *Sidrabe* as new shareholder (currently owning 85% of shares). This shareholder started playing an active role in the Company development.

1997 – Present Time

Since 1997 we have promoted our business of building and selling commercial thin film deposition equipment, including in-line systems and batch operating coaters.

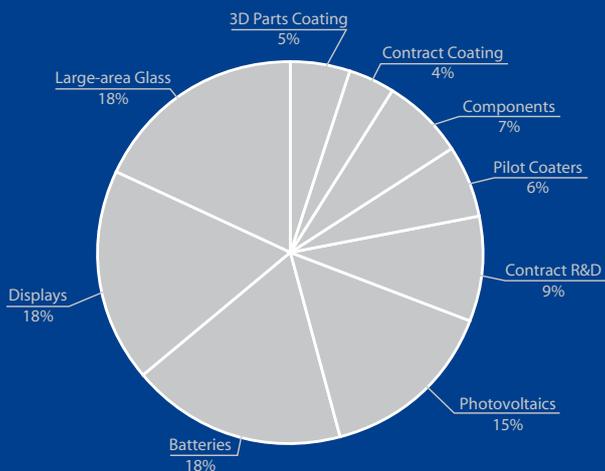
Sidrabe now serves clients all over the world with major customers in the USA, the Netherlands, Taiwan, Japan, Germany, Korea and Canada.



The Present and the Future

The successful progress of the Company is based on an experienced management, world recognized quality standards and a powerful team of scientists and technologists.

Our track record is founded on the following principles:



- An individual approach to each customer.
- An extensive process investigation in the Company's lab for all new processes to be implemented in future machines and samples production.
- All new machine designs are carried out strictly in accordance with the customer's specification, including the selection of most suitable components for that customer's circumstances.
- Before delivery each system is manufactured, assembled, tested and the process proven in the *Sidrabe* facilities under the supervision of the *Sidrabe* scientists. Then in conjunction with customer representatives the equipment is further tested and any final improvements implemented before shipping. Customer training can be provided in *Sidrabe* during this phase.
- Installation, adjustment and process demonstration is carried out at the customer facilities. This machine commissioning on a turnkey basis provides the perfect opportunity for personnel training and certification.
- Warranty and post-warranty support and assistance to the customer are available as production proceeds.

Our aim is to create new and unique technologies and machines having complete confidence that our customers will always find in *Sidrabe* both an expert and a friendly partner.



Quality, innovative technologies and flexible design

are three foundations of our competitiveness and long-term activities.

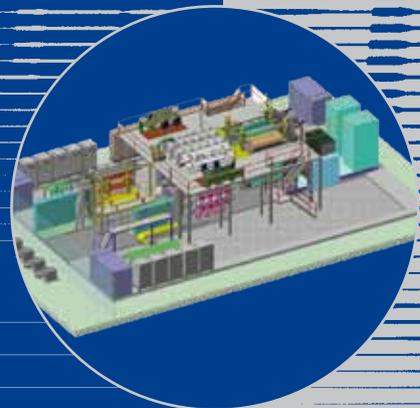


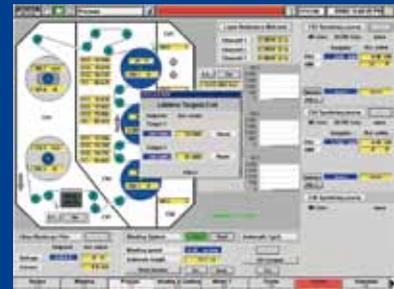
The quality management system embraces all stages of the product cycle, from the market exploration and customer search to manufacture and delivery to the customer with subsequent analysis of customer satisfaction with our product.

Our products are certified based on the directives and regulation of the European Union, but we also ensure that they comply with the standards of the customer's country.

Each project begins at the stage of pre-contract works, when close cooperation between the customer and our R&D department commences.

Our powerful design department makes us capable of creating original solutions for both individual assembly units and whole machines, thus creating truly state-of-the-art systems.





The latest computers and computer designing programs (ACAD® and SolidWork®) in the hands of our specialists, is the guarantee of success in solving the most challenging tasks.

Electrical and automatic control systems, that are the flesh and blood of any modern system, are designed by our electric and software department. To ensure safe operation all necessary hardware and software interlocks are provided meeting European safety standards and directives as well as specific requirements of customer's country.

Our machinery shop is a highly experienced resource for the effective and fast manufacture of most of machine parts and assemblies. The equipment available is suitable for practically all kinds of machining including, milling, welding, and sandblasting, painting etc. Moreover, we have well-established relationships with subcontractors in different countries.

Contract R&D

Our R&D personnel and facilities allow the development of deposition processes, manufacturing samples of future products, and prototyping new assemblies. This becomes the basis for new coaters or units. Carrying out all these activities in conjunction with the customer ensures the accuracy of design, reliability, operability and cost-effectiveness of future coaters.

The R&D department is fully equipped with coaters of various sizes and applications. Wide range of measurement and control instrumentation is available at the lab for coating analysis.

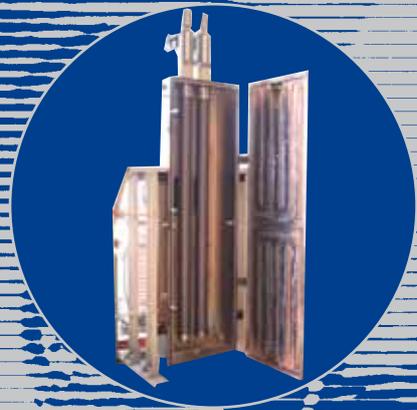
All this equipment is continuously upgraded for future projects; new methods of coating and material research are implemented and new R&D equipment purchased.

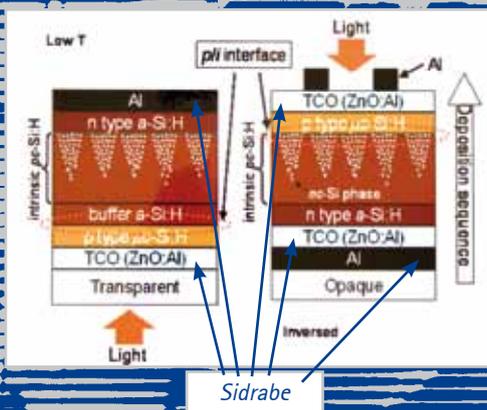
Sidrabe has a unique expertise in effective cooling of metallic foils, polymeric films and foam materials; deposition onto powders; vacuum deposition of thick Li layers onto foil and films.

Vacuum deposition of lithium

A pilot Li coater, operating successfully in *Sidrabe* R&D department, is used for new process development and production of sample materials under the orders of various customers from all over the world.

High quality lithium coatings 1...20 μm thick can be deposited (single or double-sided) onto thin metallic foils. The processes developed allow speaking about the new technological level in creation of materials for the Lithium batteries. Solid state rechargeable batteries in a roll-to-roll vacuum process it is real today.





Web coating

Our lab is equipped with several pilot web coaters for deposition onto polymer films and metal foils by means of magnetron sputtering and thermal evaporation. The pilot web coaters allow to coat magnetic as well as non-magnetic metals and alloys, oxides and nitrides of different metals. ITO, ZAO, AR layers used in displays and solar cells as well as Cu layers for FPCB can be deposited onto polymeric films with width up to 600mm. Own developed evaporation boats allow to deposit Al, Cu, Ag, Au and other materials onto polymeric films and metal foils with width up to 300mm.

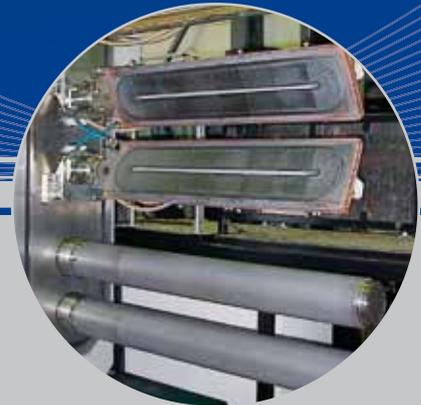
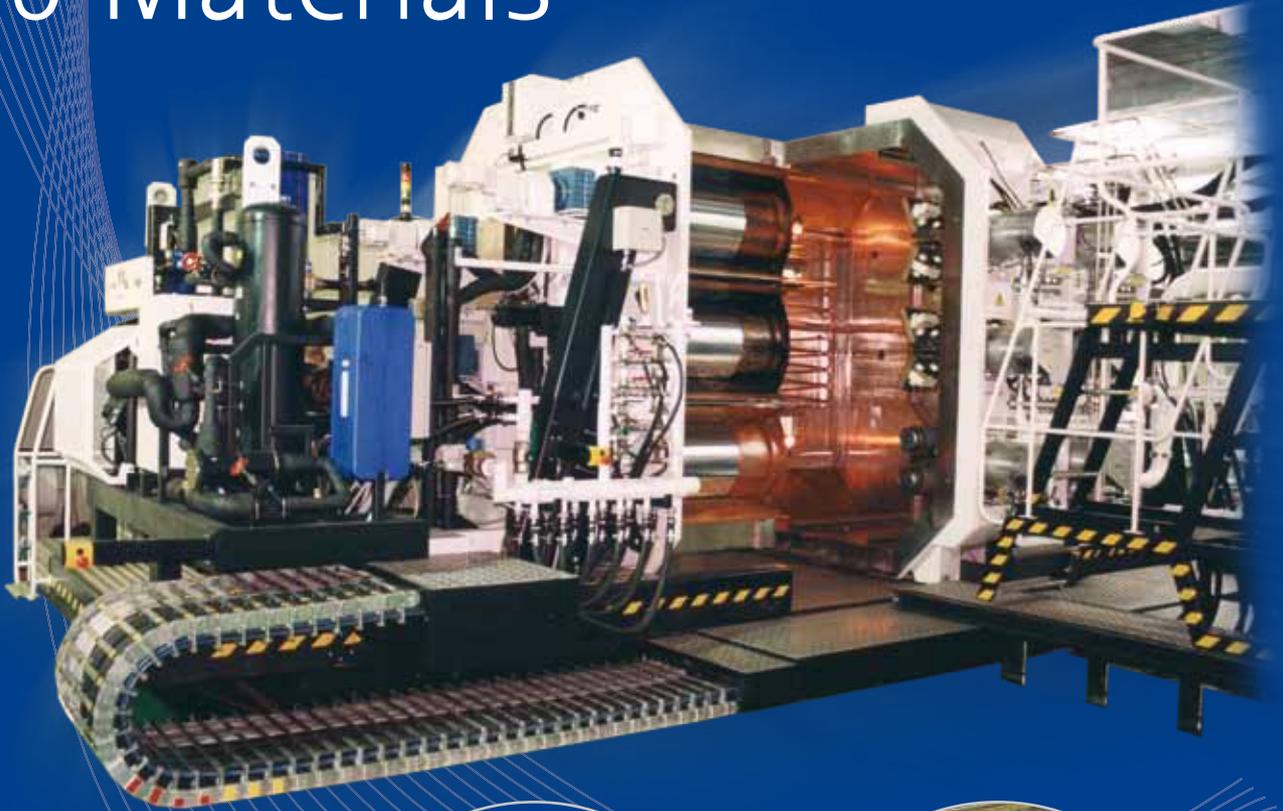
Powder coating

Pilot powder coater operating in *Sidrabe* R&D Department is intended for small-lot production of vacuum coated particulate materials of various natures. Special vibratory-transporting device implemented in the coater ensures constant mixing of the powder. Magnetic and non-magnetic metals their alloys and oxides are deposited by means of magnetron sputtering. Thickness of deposited metal layer can be up to 1 micron.

It has become common practice to carry out joint R&D programs with international customers. During work on a Latvian-European project *Sidrabe* developed the pilot model of new vacuum machine.

Recently, *Sidrabe* also participated in the development of technological processes for the European project LASSOL. This produced a new process route for lightweight, unbreakable and economically feasible solar panels based on the use of amorphous silicon.

Coating of Non-metal Web Materials



Responding to sophisticated demands in the coating of innovative materials, *Sidrabe* offers vacuum machines for coating non-metal webs for a wide range of applications:

- Display technology (AR, AS and TCO coatings).
- Solar cell technology (metal, TCO coatings and CIS structures).
- Automotive industry (heat-reflective and solar-control coatings).
- PCB technology (Cu coatings).
- Battery industry.
- Other functional coatings.

Sidrabe manufactures laboratory, pilot and production-scale machines for vacuum coating of plastic webs, non-woven materials, fabrics and paper using:

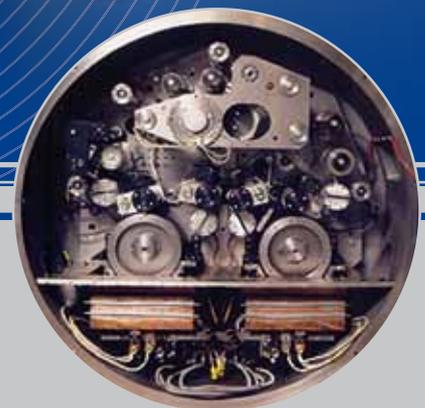
- Magnetron sputtering (AC, DC, pulse DC).
- Thermal evaporation (electron beam and resistive).

Substrate pre-treatment before coating is achieved with built-in devices like glow discharge and ion sources or in separate web drying machines.

The width of the substrates can be up to 2.5 m and the thickness range is 5 to 400 microns. Single-side or double-side coatings may consist of single or multiple layers of oxides, metals, alloys or chemical compounds.

Vacuum machines for coating highly porous foam materials (porosity up to 90%) open up a special niche. Special technology, unique winding and cooling systems have been developed to coat a partially permeable web.

Coating of Metal Web Materials



Sidrabe has got significant expertise in the development and manufacture of vacuum equipment for coating metal foils and strips, using PVD and PECVD processes. At present, we have the processes at our command for depositing:

- Se, Si, St. St., Ti, Cu, Ni, Al, Zn, Mg, TiN, In, Te onto metal strips.
- Al and Cd coating onto nickel foil.
- Cu, TiN, Si onto aluminum foil.
- Various metals and alloys onto copper foil.

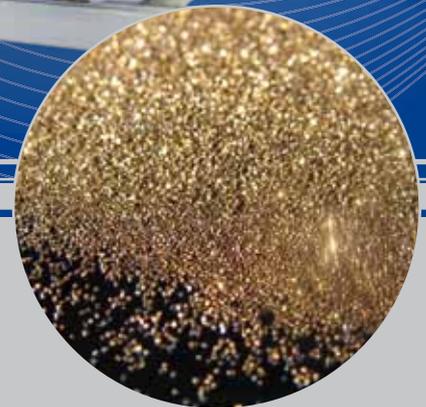
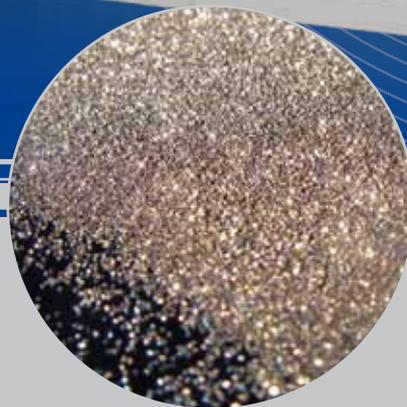
For commercial exploitation of the above processes our engineers have developed and embodied specific designs of:

- Electron beam and resistive evaporators.
- Sputtering magnetrons.
- RF discharge.
- Ion beam evaporators.

Sidrabe's technology of lithium deposition onto metal foils and polymer films opens up new horizons for battery makers.

Applications: special electronic devices, batteries, antirust coatings, catalysts, absorber coatings for solar collectors, solar cell materials.

Coating of Powders



Sidra has been working with vacuum coating of various particulate materials since 1969.

The works included:
encapsulation of particles for solid fuel,
copper deposition onto graphite powder
for heavy-duty electrical brushes, coating
diamonds for abrasive tool manufacture.

Depending on the material nature and targeted coating, the Company has developed numerous processes for layer deposition onto:

- Falling powder curtain.
- Gravitational layer of powder, transported by vibration.
- Dense layer formed by centrifugal forces and mixed mechanically.

Thermal evaporation and magnetron sputtering sources have been developed, tested and field-proven. This work ranges from laboratory operating models to pilot and production coaters.

Recent and current projects include the coating of mica flakes, metal and non-metal particles, granules and powders for subsequent manufacture of unique materials.

Coating of Glass



Vacuum deposition is the technology, which can improve glass properties, particularly its optical and thermal characteristics. We have been working in this field since 1967 and have got significant expertise in research, development and commercial embodiment of the glass coating technology.

Currently we offer batch or in-line thin film deposition systems for the following applications:

- Solar materials.
- Display materials.
- Architectural glass.
- Mirror production.
- Solar control materials.

Metal and oxide multi-layer systems are deposited by DC, pulse DC and AC sputtering using single or double magnetrons with planar or rotary cathodes.

As a substrate large-area glass is used.

Glow discharge or ion beam sources for glass pretreatment are available. All reactive sputtering processes can be controlled with plasma emission monitors. In-situ monitoring of optical characteristics of deposited layers is provided.

Operation of in-line systems is coordinated with loading/unloading stations and glass washing machines.

Coating of 3D Parts



Our Company manufactures coaters for the deposition of reflective, anticorrosive, wear-resistant, decorative and EMI shielding coatings for a wide variety of 3D articles:

- plastic cases for electronic appliances;
- furniture, window and door accessories;
- sanitary appliances;
- church domes;
- lighting fittings;
- china and glass articles;
- perfume packaging;
- toys and souvenirs.

Unprecedented production rates are achieved with the in-line sputtering system G600MN which can operate continuously for a week, providing an output rate of a jig with coated parts every 15 seconds. The System provides coating of 3D plastic and metal parts for decorative application, enhancing wear resistance, electromagnetic shielding etc.

A series of universal batch coaters G900MLR with various productivity and vacuum chamber volumes, provided with thermal and electric arc evaporators and sputtering magnetrons, have been designed for this application. These machines in various configurations ensure production of protective-decorative coatings of a broad color spectrum.

Components: Sputter Magnetrons



Planar and cylindrical magnetron sputtering devices have been developed and put on sale. Both single and double magnetron configurations can be applied. These can feature clamped or bonded target with direct or indirect cooling, and with external or internal cooling water and power connections. Length of targets is up to 3.0 m.



We have developed several types of cylindrical rotary magnetrons, particularly: with rotary targets or rotary magnetic fields.

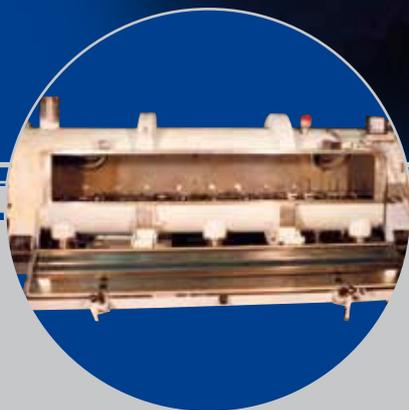
We deliver the magnetrons with or without power supplies and control systems. At the Customer's request they may be equipped with PEM and a gas admission system.



We can also supply sputtering targets.

Having created our own design criteria, we can also equip and modify existing vacuum deposition systems.

Components: Pretreatment Devices



Pretreatment devices provide etching and cleaning of polymer, metal, glass and fabric substrates before coating to enhance adhesion characteristics and ensure stability of the coating properties.

Ion sources

Sidrabe's ion sources operate according to the anode-layer-source principle. The ion sources produce high current ion beams of variable energy levels between 200 and 1500 eV. Energetic ions physically etch the material surface, thus cleaning it. These sources are mainly used for treat-



ment of moving plastic films, glass and metal strips.

Glow discharge sources

The glow discharge sources consist of a compact box with two electrodes and an integrated gas admission manifold for process gas feed and distribution. A magnetic system is provided for higher effectiveness of the pretreatment. These sources are mainly used for the treatment of moving plastic films and 3D parts.



Inverted magnetrons

The magnetron discharge is ignited on the substrate, which is practically a cathode, because it is moved along the roller cathode unit. The magnetic system of the cathode unit is fixed in the space. The cathode unit is equipped with an individual electrical drive. These inverted magnetrons have been used successfully for treatment of moving metal foils.

Having created our own design criteria, we can also equip and modify existing vacuum deposition systems.

Components: Evaporators

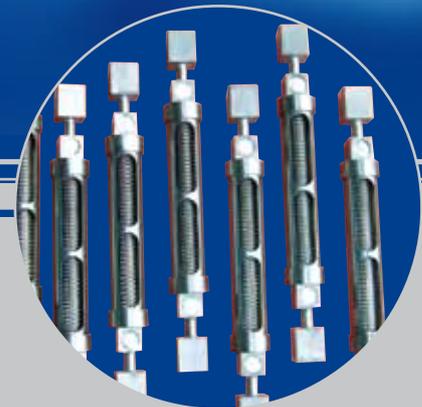


Evaporation boats for the deposition of copper, silver and gold at high rates can be demonstrated as our major achievement in the area of thermal evaporation.

Evaporation rates: up to 10 g/min.
Lifetime: 20-80 hours depending on evaporated materials.



Electric arc evaporators are mainly applied on batch coaters. We have the ability to produce electric arc evaporators of both planar configuration devices with target length up to 1.15 m and tubular form with target length up to 4.0 m (U-shaped) and up to 1.6 m (linear).



One of our specialties is our invention of effective vapor generators for sublimation metals like Mg and Zn with vapor utilization factor close to 1.0.

Having created our own design criteria, we can also equip and modify existing vacuum deposition systems.

Special Equipment: Vacuum Drying Machines



Preliminary drying and degassing of substrate materials in vacuum before deposition will guarantee high quality coating. In particular, this applies to polymer films, synthetic fabrics and non-woven materials. After such treatment the material will not cause any problems during coating. That is why in many cases we recommend that our customers purchase a set of two

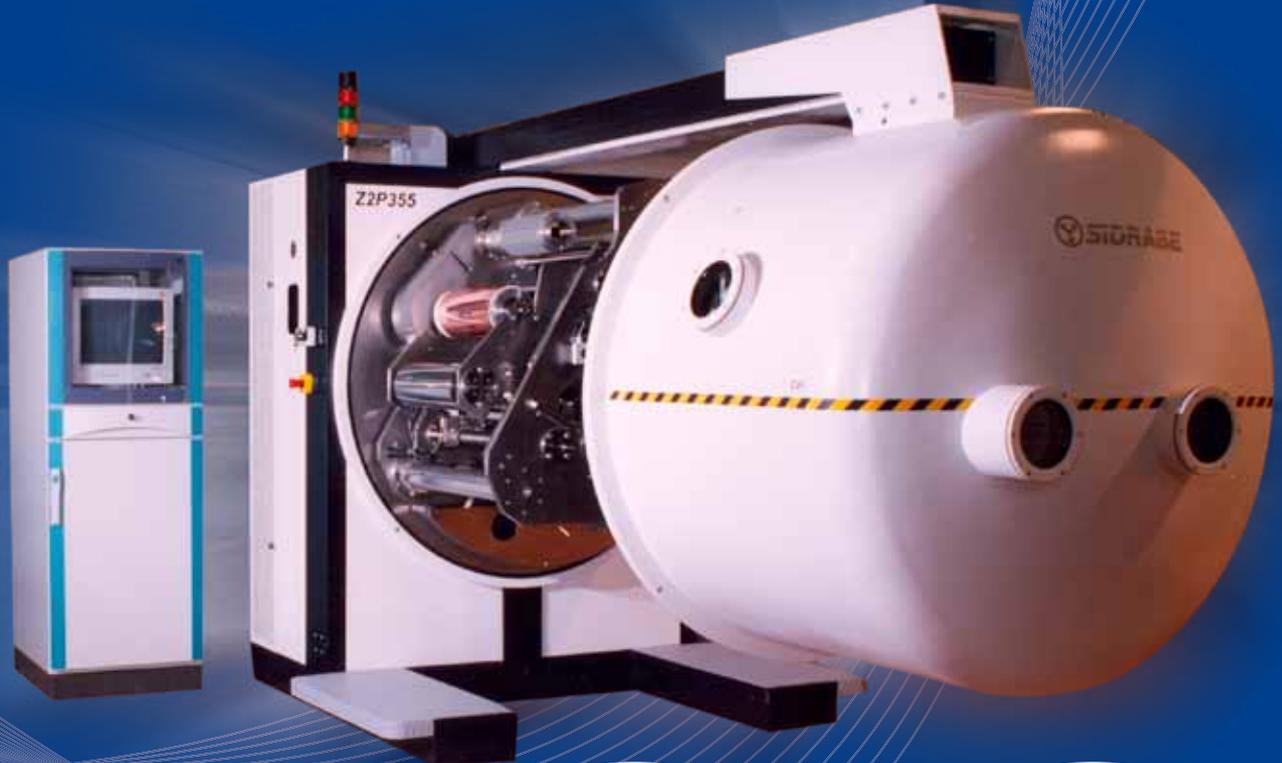
machines: The specified vacuum web coater and a vacuum drying machine.

Vacuum drying machines have been designed specifically for drying of PET and PI films to be vacuum coated in the production of electronic displays and flexible printed circuit boards.

The dryers are batch-operating machines equipped with a mechanical booster pump.

Prior to rewinding, the material is chilled on the water-cooled drum. The drying machines are fully monitored and controlled by the control system.

Special Equipment: Vacuum Laminators



Vacuum laminators play a critical role in the production of flexible printed circuits based on polyimide film. Vacuum laminators have been designed for double-sided lamination of photo resist polymer material onto flexible polyimide printed circuits. Appropriate temperature and pressure

are applied to ensure good contact of the laminating materials. The double-sided laminated material is transported to chilled rollers and then to a rewind station. The machine winding system provides interleaf unwinding from the initial materials as well as rewinding of the ready-made product and the interleaf.

The whole process control and monitoring is under computer control. The major process parameters are monitored during the cycle: temperature, pressing force, winding speed, tension of the materials, edge position, pressure in the chamber and pumping system.

Contract Coating



Based on the availability of wide range of technologies, in 1992 *Sidrabe* decided to create its own coating shop and carry out contract metallization.

Our metallization shop is equipped with coaters, built by *Sidrabe*, and performs protective and decorative coating of 3D parts of metals, plastics, glass and ceramics. The shop has the capacity to coat about 400,000 pc. a month.

There is a also capacity for lacquering parts prior to coating (ground layer) and after deposition (top layer), with a colored outer layer.

Our multiyear experience in vacuum coating processes and complete systems of quality control according to European standards provide an attractive commercial appearance and improved quality of customer's products.

Our normal practice is the provision of experimental coating of customer's parts, the testing of several technological approaches, and the final testing and approval of the products by the customer. You can thus test potential improvements of your product quality and its commercial attractiveness without substantial initial investments.

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