

R&D strategies for Green Deal applications

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Content of Presentation

- ▶ General Information about Slovakia and STU in Bratislava
- ▶ Education System at Institute of Process Engineering
- ▶ Laboratory and Research at Institute of Process Engineering
- ▶ Agglomeration Technologies in Slovakian Industry

General Information about Slovakia



SLOVAKIA (brief overview)

Official name:	<i>Slovak Republic</i>
Date of establishment:	<i>1st January 1993</i>
Area:	<i>49,035 km²</i>
Population:	<i>5.4 million (51,5 % female)</i>
Capital:	<i>Bratislava (431,061 inhabitants)</i>
Official language:	<i>Slovak</i>
Currency:	<i>Euro (1 € = 100 cents)</i>
Time zone:	<i>Central European time zone (GMT +1)</i>
Weather:	<i>continental climate (4 seasons)</i>
Political system:	<i>parliamentary democracy</i>



General Information about STU in Bratislava








SLOVAK UNIVERSITY OF TECHNOLOGY in Bratislava

- **1762** Mining and Forestry Academy under empress of Maria Theresa
first technical higher education institution in the world
founded in Banská Štiavnica
- **1937** University of Technology of M. R. Štefánik
first Slovak technical university was founded in Košice
- **1939** Slovak University of Technology, Bratislava
Branch of Construction Engineering
Branch of Specialized Sciences
Branch of Forestry and Agricultural Engineering
Branch of Chemical Engineering
Branch of Mechanical and Electrical Engineering



General Information about STU in Bratislava

Faculties and workplaces

-  Faculty of Civil Engineering
-  Faculty of Mechanical Engineering
-  Faculty of Electrical Engineering and Information Technology
-  Faculty of Chemical and Food Technology
-  Faculty of Architecture
-  Faculty of Materials Science and Technology in Trnava
-  Faculty of Informatics and Information Technologies



Institute of Management

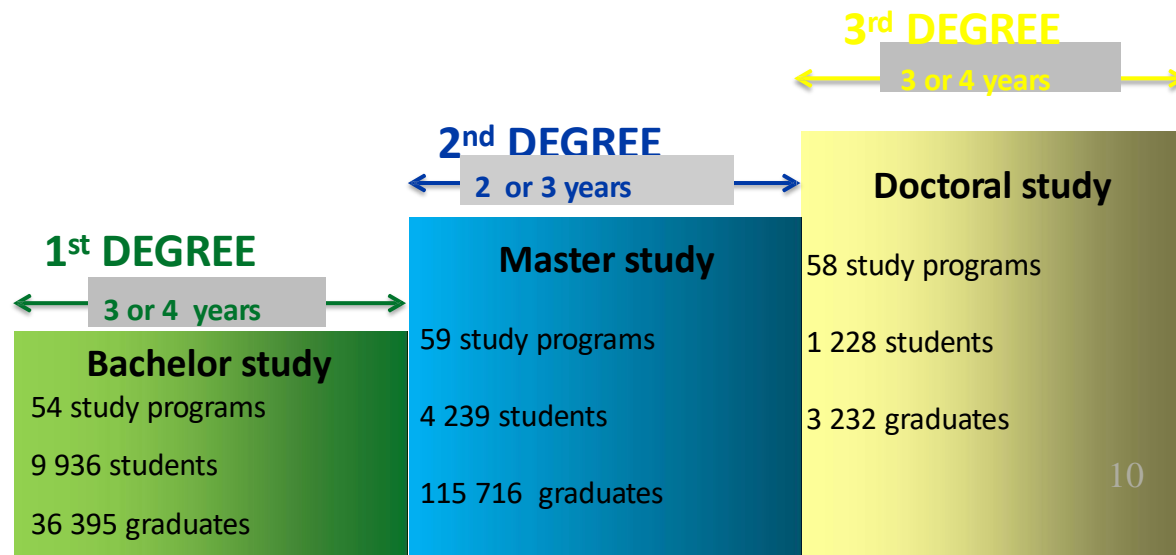
University workplaces:

Lifelong Learning Institute, University Research Park , Know-How Centre, Project Centre , Multimedia Centre, Computing Centre, Publishing House, Student Houses, Academic Sports Centre

General Information about STU in Bratislava

Study system

- harmonized with Bologna Declaration and European Credit Transfer System (ECTS)
ECTS Label – ECTS information package
DS Label – Diploma Supplement (3 cycle degree study system)

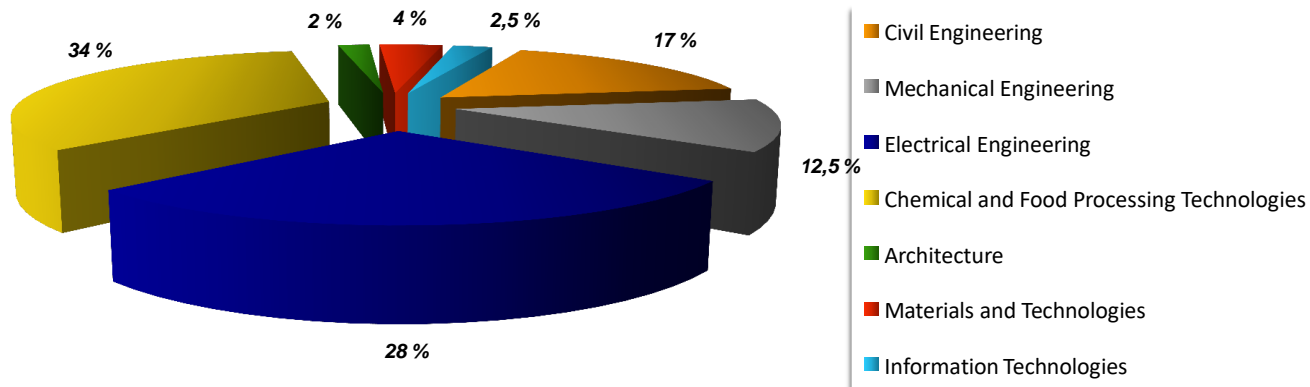


General Information about STU in Bratislava

Research at STU today

Research areas

500 research projects



Centres of Excellence

- Centre of Excellence of Integrated Flood Protection Systems
- Centre of Excellence for Diagnostic Method of Materials
- Centre of Excellence for the Settlement Infrastructure Development of the Knowledge-Based Economy
- National Centre for Research and Application of Renewable Energy Sources
- Centre of Excellence of 5- Axis Machining
- Centre of Excellence for SMART Technologies, Systems and Services
- Centre of Cooperation for Transfer of Innovative technologies from research to Practice
- Centre of Excellence for Industrial Bio-technology

STU

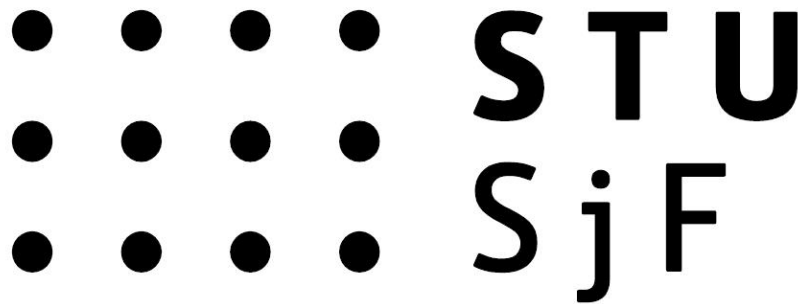
SLOVENSKÁ TECHNICKÁ
UNIVERZITA V BRATISLAVE

General Information about STU in Bratislava

▶ **Faculty of Mechanical Engineering**

- ▶ Institute of Automation, Measurement and Applied Informatics
- ▶ Institute of Applied Mechanics and Mechatronics
- ▶ Institute of Technologies and Materials
- ▶ Institute of Transport Technology and Designing
- ▶ Institute of Manufacturing Systems, Environmental Technology and Quality Management
- ▶ **Institute of Process Engineering**
- ▶ Institute of Thermal Power Engineering
- ▶ Institute of Mathematics and Physics
- ▶ Institute of Languages and Sports
- ▶ Computer and Information Centre
- ▶ Centre of innovations

Institute of Process Engineering



**SLOVAK UNIVERSITY OF
TECHNOLOGY IN BRATISLAVA**
FACULTY OF MECHANICAL ENGINEERING
INSTITUTE OF PROCESS ENGINEERING



Institute of Process Engineering

- ▶ **The Brief Information about the Department with the Short History**
 - ▶ Department of the Paper Machinery Equipment Design (1953)



Institute of Process Engineering

▶ **The Brief Information about the Department with the Short History**

▶ Department of the Chemical Machines and Equipment (1957)

The development of the chemical and food industry in Czechoslovakia gradually changed the content of the subjects.

In accordance with this the name of the department has been changed.

The new study program "Machinery and equipment for chemical, food and consumer industries" was created.

Institute of Process Engineering

▶ The Brief Information about the Department with the Short History

▶ Institute of Process Engineering (2016)

Staff:

- ▶ professor 2
- ▶ associate professor 3
- ▶ lecturer 2
- ▶ researcher 2
- ▶ doctoral student 5

Average number of students at the master's degree from 5 to 15 per year.

Education System of Institute of Process Engineering

▶ PROCESSING TECHNOLOGY

- ▶ bachelor's degree **ENVIRONMENTAL PROTECTION TECHNOLOGY**
- ▶ **1st - 5th semester:** common subjects as mathematics, physics, material engineering, applied mechanics, thermodynamics, hydromechanics, design and construction, ...
- ▶ **the 6th semester:** mostly for the study program **ENVIRONMENTAL PROTECTION TECHNOLOGY:**
 - ▶ Design of Process Equipment
 - ▶ Solid Waste Processing and Recycling
 - ▶ Wastewater Treatment
 - ▶ Air Protection
 - ▶ Process Engineering

Education System of Institute of Process Engineering

▶ PROCESSING TECHNOLOGY

- ▶ bachelor's degree **ENVIRONMENTAL PROTECTION TECHNOLOGY**

Examples of the bachelor's thesis:

- ▶ Granulation of multi-component fertilizers
- ▶ Tableting of pharmaceutical materials
- ▶ Best available techniques for waste-water treatment
- ▶ Design of a laboratory station for a beer production
- ▶ Composting plant for a biowaste
- ▶ Capturing CO₂ from the air...

Education System of Institute of Process Engineering

▶ PROCESSING TECHNOLOGY

- ▶ masters' degree **CHEMICAL AND FOOD MACHINES AND EQUIPMENT** (4 semesters)

All compulsory subjects:

- ▶ Applied Physical Chemistry
- ▶ Transport Phenomena (Momentum, Heat and Mass)
- ▶ Design of Equipment for Chemical and Food Industry
- ▶ Mechanics of Particulate Materials (powder milling, breaking, mixing, extrusion, roll pressing, conveying, storage, powder properties testing, ...)
- ▶ Hydro-Mechanical processes (liquid flow, rheology, filtration, cyclones, fluidization, ...)
- ▶ Heat Transfer Processes (heat exchangers, evaporators, dryers, ...)
- ▶ Mass Transfer Processes (distillation, rectification, extraction, adsorption, ...)
- ▶ Safety Engineering and Equipment Maintenance
- ▶ Project Design

Education System of Institute of Process Engineering

▶ PROCESSING TECHNOLOGY

- ▶ masters' degree **CHEMICAL AND FOOD MACHINES AND EQUIPMENT** (4 semesters)

Some of optional subject:

- ▶ Bioreactors
- ▶ Paper Machines
- ▶ Material and Energy Balance
- ▶ Chemical and Food Production Lines

Software applications:

- ▶ Chemical Engineering Computing (Honeywell UniSim, EDEM)
- ▶ Design Computing Programs (AnSYS)



Education System of Institute of Process Engineering

▶ PROCESSING TECHNOLOGY

- ▶ masters´ degree CHEMICAL AND FOOD MACHINES AND EQUIPMENT (4 semesters)

Examples of the master´ s thesis:

- ▶ Disintegration of the bulk materials
- ▶ One-axis compression of the industrial fertilizers
- ▶ Plate rectification tower
- ▶ Granulation of industrial fertilizers by compaction
- ▶ Design of the pipe for steam transport
- ▶ Separation characteristics of the hydrocyclones
- ▶ Design of the distillation boiler
- ▶ Mixing of the bulk materials
- ▶ Design of the photo – bioreactor...

Education System of Institute of Process Engineering

▶ PROCESSING TECHNOLOGY

- ▶ doctoral degree PROCESS TECHNOLOGY (3 years)

Examples of the doctoral thesis:

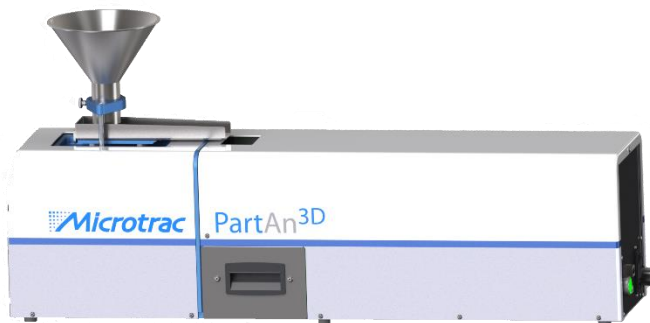
- ▶ Influence of the process parameters of a high shear granulation on the growth of agglomerates
- ▶ Modification of the one - axis compressibility models of a bulk material
- ▶ Approximate modeling of the process characteristics in the cyclone separators
- ▶ Distribution of the pressure on the blade of homogenizer of bulk material
- ▶ Liquid phase migration during the extrusion of a paste
- ▶ Study of the filling zone of the two-rolls compactor
- ▶ Influence of the rectangular cross-sectional shape of the helix channel on the liquid velocity fields
- ▶ Transport phenomena in a new circulating loop bioreactor with an annular gas-liquid sparger for waste water treatment
- ▶ Mixing of the bulk materials
- ▶ New processes and devices for the formation of fibrous materials from aqueous suspensions between two convergent screens...

The Main Activities in the Research

- ▶ mechanics and processes for processing of particulate materials
- ▶ pump and pipe systems, flow of the liquids, ...
- ▶ separation, filtration, ...
- ▶ bioreactors
- ▶ heat and mass transfer
- ▶ design of the pilot plants
- ▶ drawing documentation and strength analysis for manufacturing of equipment for chemical, food, pharmaceutical industry

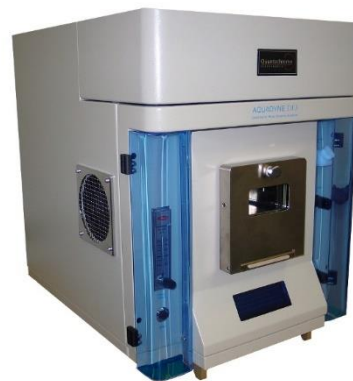
Laboratory of Particulate Materials

- ▶ testing of the basic mechanical and physical properties of the particles materials (compressibility, rheological properties of powders, particle size distribution, particle shape, pores, adsorption properties)
- ▶ **Microtrac PartAn 3D** - dynamic particle size distribution
- ▶ **Malvern Mastersizer 3000** - wet or dry analysis of particle size
- ▶ **Malvern Morphologi G3** - particle shape analysis



Laboratory of Particulate Materials

- ▶ Freeman Technology FT4 - rheometer for powders
- ▶ Quantachrome Poremaster GT - measuring the porosity
- ▶ Quantachrome Aquadyne DVS - adsorption kinetics
- ▶ Electromechanical press Kistler - electromechanical press for a powder material compression testing



Laboratory of Particulate Materials



Laboratory for Granulation

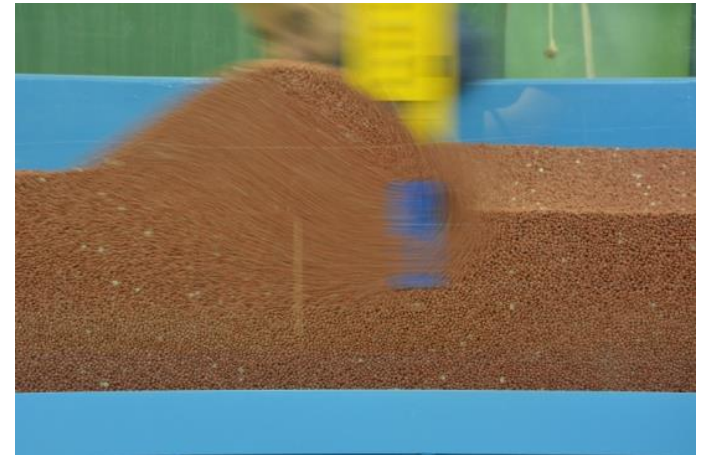
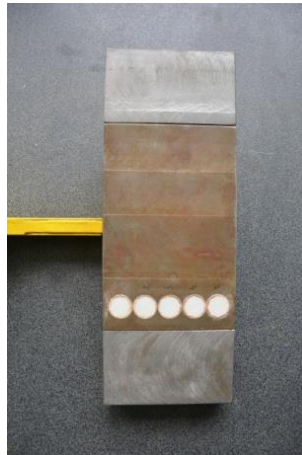
- ▶ It is focused on experimental verification of processes at the pilot - plant scale in the individual processes:
- ▶ **powder milling, crushing, cutting:**



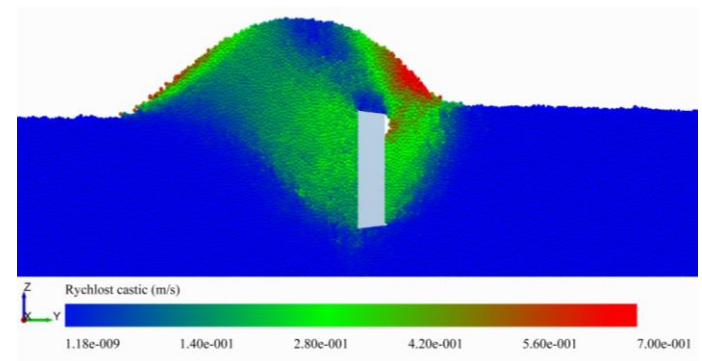
Vibratory ball mill, pin mill, jaw crusher, hammer mill

Laboratory for Granulation

► homogenization, mixing

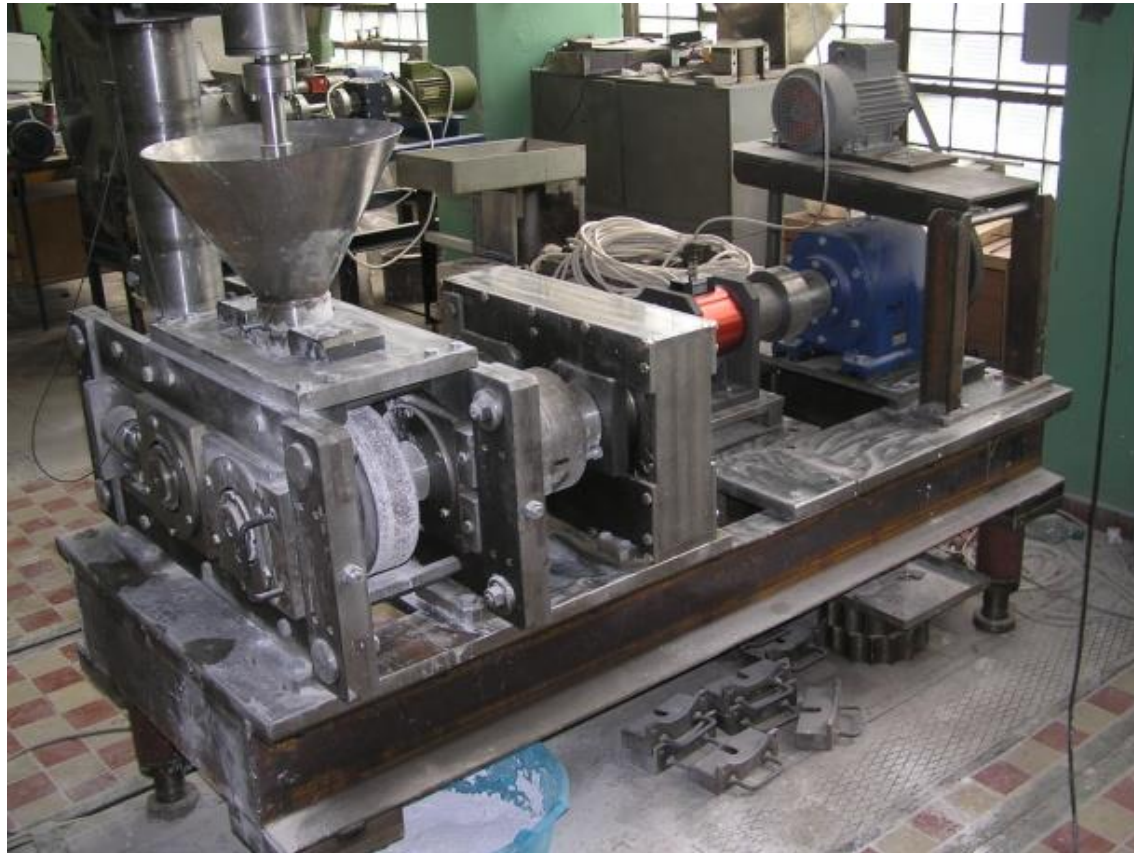


- a) experimental chamber for measuring pressure distribution on the blade surface during the mixing,
- b) the detail of the blade with ceramic sensors,
- c) the motion trajectories of the particles during mixing
- d) DEM simulation



Laboratory for Granulation

► roll pressing



Laboratory roll press, measuring of the torque and force between the rolls, gap from 0 to 5 mm, roll diameter 260 mm, width 70 mm.

Laboratory for Granulation

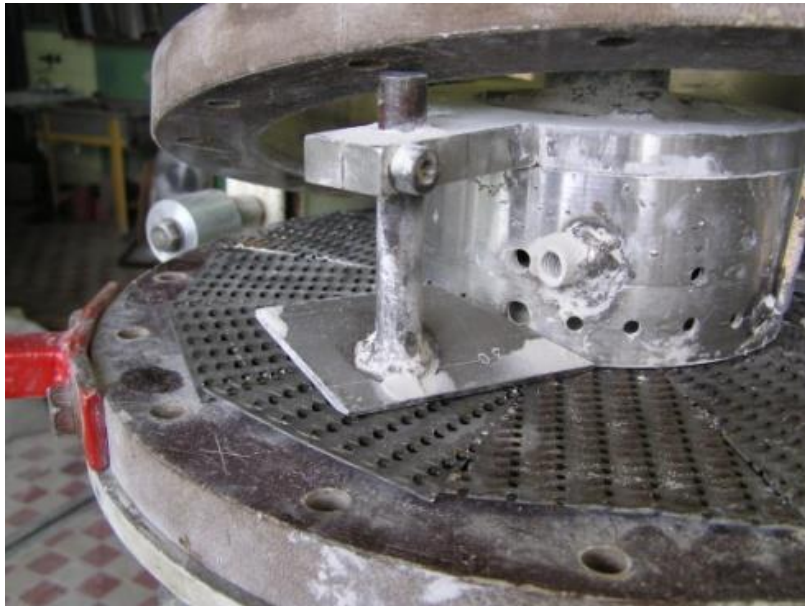
- ▶ granulation
 - ▶ wet granulation



Laboratory high shear granulation

Laboratory for Granulation

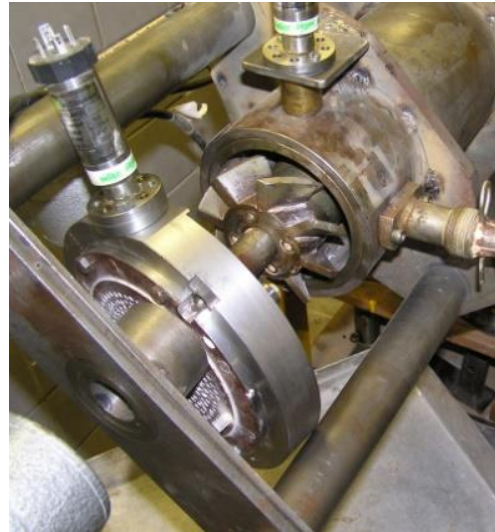
- ▶ granulation
 - ▶ dry granulation
- disintegration of the compacts after roll pressing



- a) detail of the laboratory granulator, perforated metal sheet or sieve and the sloping blades, b) industrial granulator for the technology of fertilizers processing

Laboratory for Granulation

▶ extrusion of the paste materials



- a) screw extruder with the rotating head,
- b) screw extruder with the independent regulation of the screw and rotor with the blades
- c) granulator utilized as the extruder

Laboratory for Granulation

- ▶ classification, separation, sieving



Special sieving machines with the rotating sieve. It can work with air stream under sieve which helps to clean the sieve.

Laboratory of Laser Doppler Anemometry

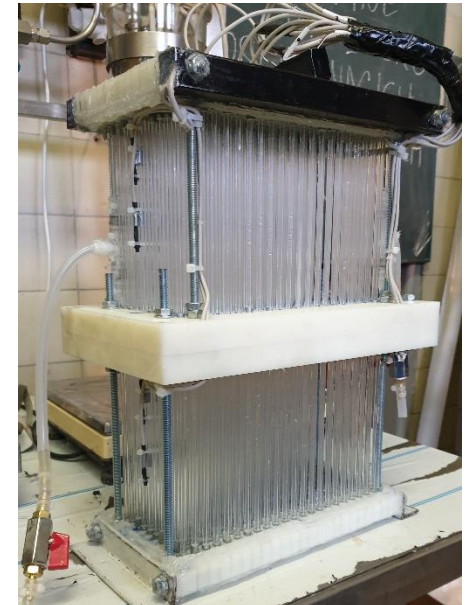
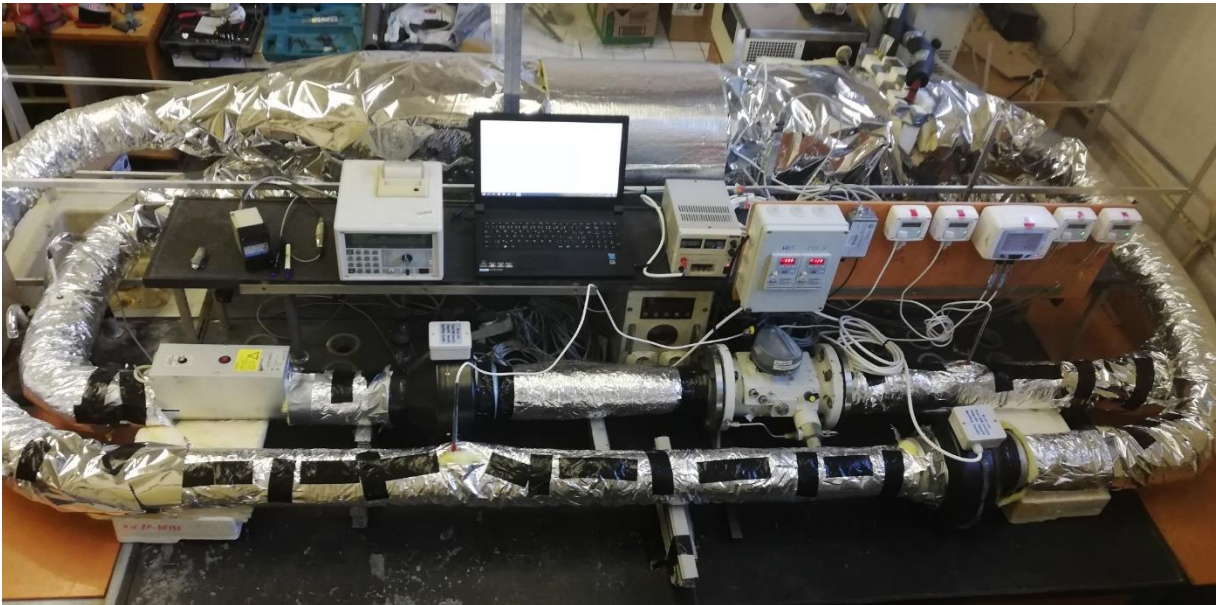
- ▶ The laboratory provides the possibility of non-invasive and non-contact point measurement of fluid flow with high precision across the cross-section of channels with optically transparent material.



Laser Doppler Anemometry experimental device.

Laboratory of the Heat and Mass Transfer

- ▶ The laboratory is designed to investigate heat transfer during heating, cooling, condensation, evaporation and drying.



Testing the heat transfer in the pulsating heat pipes (doctoral thesis).

Laboratory of Bioprocess

- ▶ The study of hydrodynamics and gas transfer, pilot-plant fermentation technologies, alga cultivation.



Experimental bioreactor in the regime as photobioreactor for alga cultivation. Testing the influence of color temperature on the kinetics of algae growth.

Paper Laboratory

- ▶ Technological processes for the production of papers from pulp to paper. It is equipped with a small paper machine MODELL-PM VEB Papiermaschinenwerke Freiberg / Sachs



Paper machine MODELL-PM VEB Papiermaschinenwerke Freiberg / Sachs

Chemical Laboratory

- ▶ The chemical laboratory is mainly used for familiarizing students with the principles of the work in the chemical laboratory. The doctoral and diploma project are realized here also.



Reduction of the ethanol amount in the fermentation process by adsorption into the pores particles with following desorption and condensation of ethanol.

The Main Projects

- ▶ **Research Center ALLEGRO.** Project OPVaV, ITMS:26220220198, 2014-2015.
 - ▶ It is focuses on the tasks of energy, safety and reliability of the operation of existing nuclear power plants, storage of spent nuclear fuel, nuclear waste disposal and decommissioning of nuclear installations.

The Main Projects

- ▶ **Competence Center for New Materials, Advanced Technologies and Energy. Project OPVaV, ITMS:26240220073, 2011-2014.**
- ▶ An integrated competence center, linking the private and academic sectors, aiming to support the key industries of the Slovak Republic

KCMTE
**KOMPETENČNÉ CENTRUM
PRE NOVÉ MATERIÁLY,
POKROČILÉ TECHNOLOGIE
A ENERGETIKU**

Európska únia
Európsky fond regionálneho rozvoja

Dopytovo-orientovaný projekt

ERDF – „EURÓPSKY FOND REGIONÁLNEHO ROZVOJA“

Podporujeme výskumné aktivity na Slovensku /
Projekt je spolufinancovaný zo zdrojov EÚ

ITMS kód projektu : 26240220073
Termín realizácie projektu: 08/2011 – 11/2014

Agentúra
Ministerstva školstva, vedy, výskumu a športu SR
pre štrukturálne fondy EÚ

The Main Projects

- ▶ **University Science Park STU Bratislava - SCIENCE CITY. Project OPVaV, ITMS:26240220084, 2013-2015.**
- ▶ Infrastructure and renewal, state-of-the-art instrumentation infrastructure, including optimization of its location, and support for intellectual property protection and the transfer of new knowledge and technology into practice.



Hlavný partner projektu:



Partneri projektu:



Podporujeme výskumné aktivity na Slovensku /
Projekt je spolufinancovaný zo zdrojov EÚ

Realizujeme dopytovo-orientovaný projekt:

**Univerzitný
vedecký park
STU Bratislava**

ITMS: 26240220084
Realizácia aktivít projektu: 04/2013 - 06/2015

The Main Projects

- ▶ **Advancing University Capacity and Competence in Research, Development and Innovation. Project OPVal, ITMS:2014+ 313021X329, 2019-2023.**

Projekt

Advancing University Capacity and Competence in Research, Development and Innovation

ACCORD
SCIENCE FOR FUTURE

je spolufinancovaný Európskou úniou

Cieľ:

Zvýšenie výskumnej aktivity Bratislavského kraja prostredníctvom revitalizácie a posilnenia výskumno-vzdelávacích, inovačných a podnikateľských kapacít výskumných inštitúcií v Bratislave

Príjemca:

STU
SLOVENSKÁ TECHNICKÁ
UNIVERZITA V BRATISLAVE

Dátum začatia projektu: 09/2019
Dátum ukončenia projektu: 12/2023

Sprostredovateľský orgán:

 EURÓPSKA ÚNIA
Európsky fond regionálneho rozvoja
OP Integrovaná infraštruktúra 2014 – 2020

 MINISTERSTVO
ŠKOLSTVA, VEDY,
VÝSKUMU A ŠPORTU
SLOVENSKEJ REPUBLIKY

The Main Projects

- ▶ **Basic research of processes in the mechanics of particle materials.**
 - ▶ Research Grant Project VEGA 1/0276/17
- ▶ **Research and development of the granulation for production of composite particulate materials suitable for 3D printing applications**
 - ▶ Research Grant Project VEGA 1/0070/22
- ▶ **Application of DEM method in the education of process technology.**
 - ▶ Research Grant Project KEGA 016STU-4/2019
- ▶ **Application of Process Technology Innovations in the Education of Mechanical Engineering Subjects.**
 - ▶ Research Grant Project KEGA 036STU-4/2020
- ▶ **Utilization of algae for reduction of CO₂ and the production of biofuels.**
 - ▶ Research Grant Project APVV, 2011-2014.

Co-operation with Industry

▶ Various projects:

- ▶ Development and manufacture of a prototype of the electric composter for bioplastics products and food waste. (2018-2019)



- ▶ Assessment of transport of the lye storage tanks. (2018)
- ▶ Development of the construction of the high pressure drawing machine. (2017-2018)

Co-operation with Industry

- ▶ Various projects:
 - ▶ Laboratory boiler for pulp production testing (2015)



- ▶ Design of the heating / cooling station for melting white chocolate (2014)

Agglomeration Technologies in Slovakian Industry

- ▶ Slovakian industry has a long and strong tradition in the chemical, refinery and food industries.
- ▶ Besides these fields another strong area of industry here is heavy engineering manufacturing.
- ▶ All these facts create a suitable background for the application of agglomeration technologies. This is the reason why in the 80th a research team was founded, oriented towards agglomeration processes, design of equipment and technologies for granulation.
- ▶ There is an effort to obtain cooperation with firms and to offer them a complete technology designed in accordance with laboratory experimental results.

Agglomeration Technologies in Slovakian Industry

- ▶ Co-operation with industry with main orientation on the agglomeration / granulation of powder materials
 - ▶ **Verification of the powder colostrum granulation.**
Project for Ingredia, Czech Republic, 2019
 - ▶ **Experimental verification of cyanide granulation.**
Project for Lučební záv. Draslovka Kolín, Czech Republic, 2012
 - ▶ **Pilot station construction and technology verification for building aggregate coating.**
Project for Linsel Bau Bad Bergzabern, Germany, 2019
 - ▶ **Research of granulation of the water-soluble dyes for textiles.**
Project for Huntsmann GmbH Basel, Switzerland, 2009

Agglomeration of Addition Agents into Polymers and Rubber

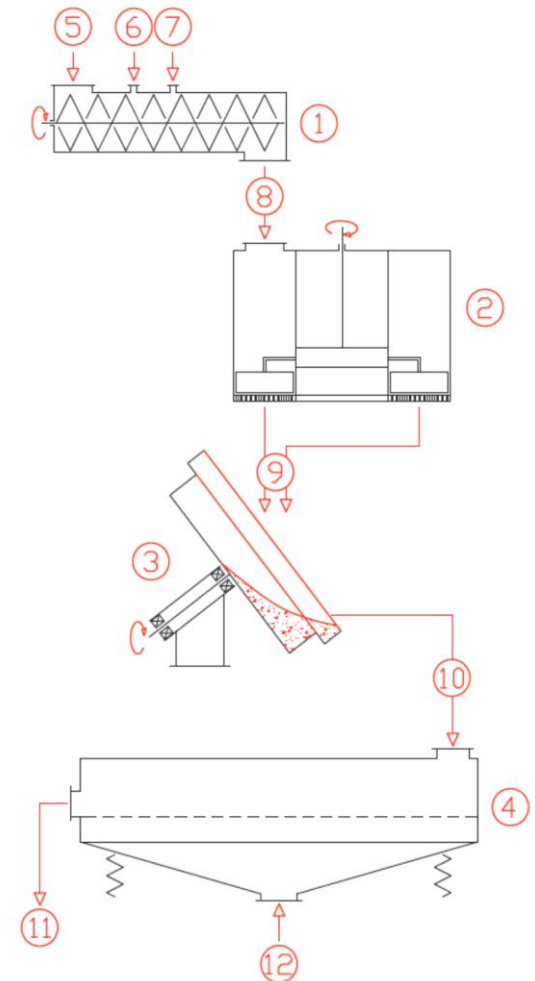
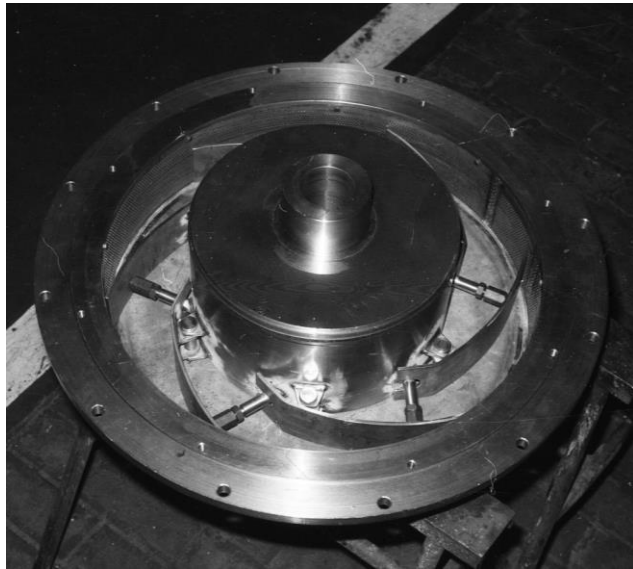
- ▶ The research in this field started during the 1970s and was connected with the evolution and application of the technology for agglomeration of addition agents into polymers and rubber.
- ▶ Sulfenaxu CBS, a primary rapid sulfenamide accelerator for vulcanization of rubbers and polymers.
 - ▶ extrusion of the powder product in the form of the paste
 - ▶ following granulation in a rotating disc
 - ▶ granules from 2 to 5 millimetres
 - ▶ required strength for rubber application

Agglomeration of Addition Agents into Polymers and Rubber

- ▶ Following problems had to be solved here:
 - ▶ **Finding the way of granulation for obtaining the desired quality of granules**
 - product with the high degree of mono – dispersion, minimum of a dusty fraction and the optimum strength for another application
 - the main problem was extrusion, the paste was mix of powder and water, this system had unsuitable properties for extrusion
 - the addition of lubricants for improving rheological properties was limited because it could change the quality of product
 - ▶ **Finding an additive for keeping the shape and strength of granules in the dry state**
 - the strength of wet granules is determined by liquid bridges among particles in the granule
 - they are created by the bridges of synthetic starch in this case

Agglomeration of Addition Agents into Polymers and Rubber

- ▶ Using laboratory results to design the equipment for industrial technology

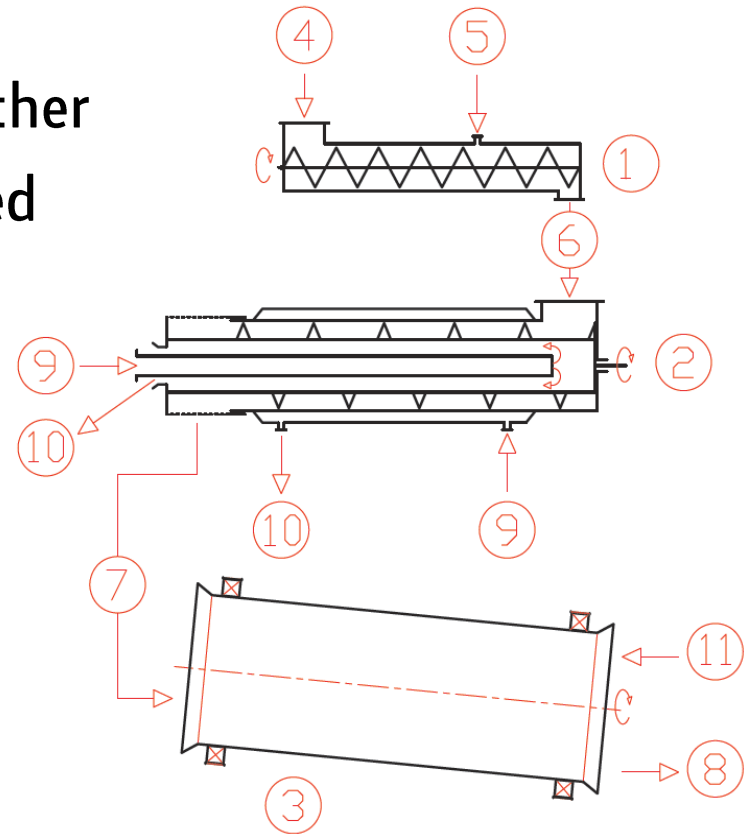


Agglomeration of wet materials.

1. mixer, 2. extruder, 3. rotating disc, 4. fluid drier, 5. filter cake, 6. water, 7. additives, 8. paste, 9. extruded material, 10. additives, 11. dried granules, 12. warm air

Agglomeration of the Light Stability Agent by Extrusion

- ▶ agglomeration by an extrusion
- ▶ powder product was mixed together with a polyethylene and extruded
- ▶ the main aim was increasing the melting temperature light stability agent
- ▶ this value had been 28 -32°C and required was around 40°C.



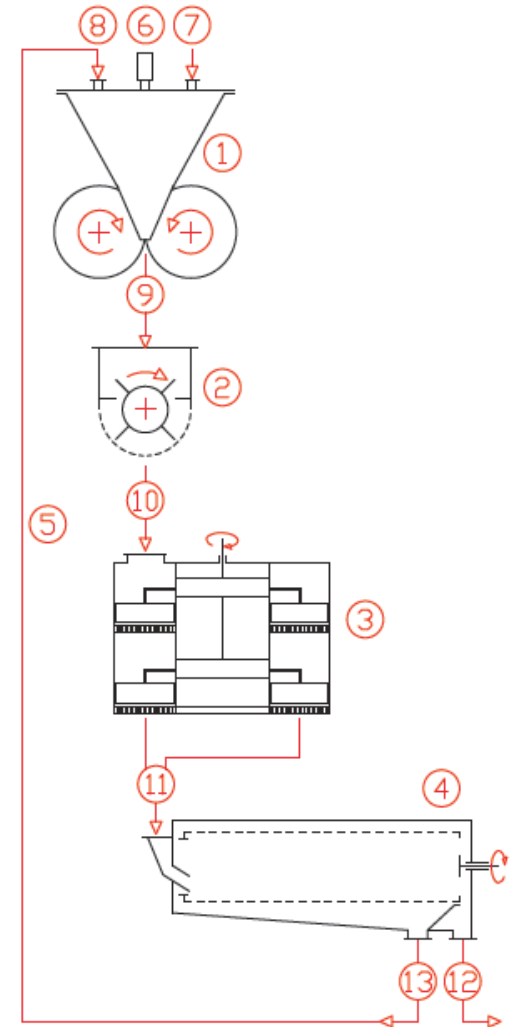
Chemical product extrusion. 1. extruder, 2. extruder for agglomeration, 3. cooling drum, 4. polymer, 5. chemical product, 6. mixture, 7. warm granules, 8. cooled granules, 9. cooling water input, 10. cooling water output, 11. cooling air

Agglomeration of the Light Stability Agent Roll Pressing

- ▶ agglomeration by the roll pressing with the following crushing and screening
- ▶ the main problem of technology was an explosion risk of the concentrated powder
- ▶ that was reason why the whole technology had to be sealed and the inside space of all equipment was under nitrogen

Clear chemicals roll pressing.

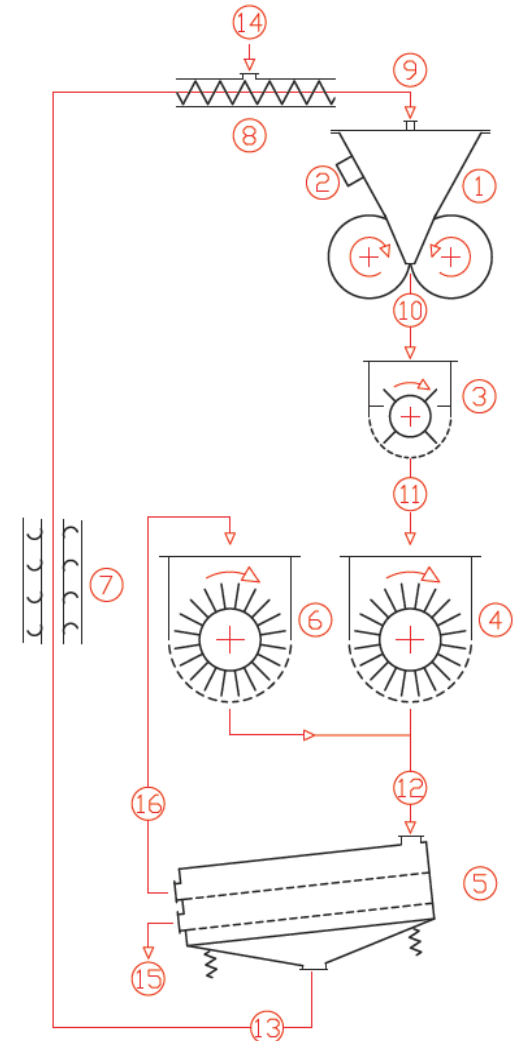
1. roll press, 2. breaker, 3. crusher with the two screens,
4. sorter, 5. pneumatic haulage, 6. filter, 7. new material,
8. powder input, 9. pressed material, 10. crushed material,
11. product, 12. granules, 13. powder



Agglomeration of Sodium Hydrogen by the Roll Pressing

- ▶ problem appeared when the technology started to work
- ▶ **LABORATORY**
 - ▶ material was delivered in the paper bags and had been storage for a long time before transport to our laboratory
 - ▶ processing in laboratory was without problems

Chemicals roll pressing. 1. roll press, 2. vibrator feeding, 3. breaker, 4. hammer granulator, 5. sieving, 6. hammer granulator for oversize, 7. recykel - vertical conveying, 8. recykel - horizontal conveying, 9. raw material for pressing, 10. ribbon, 11. broken ribbon, 12. Granules, 13. undersize particles, 14. raw material, 15. product, 16. oversize particles for another granulation.



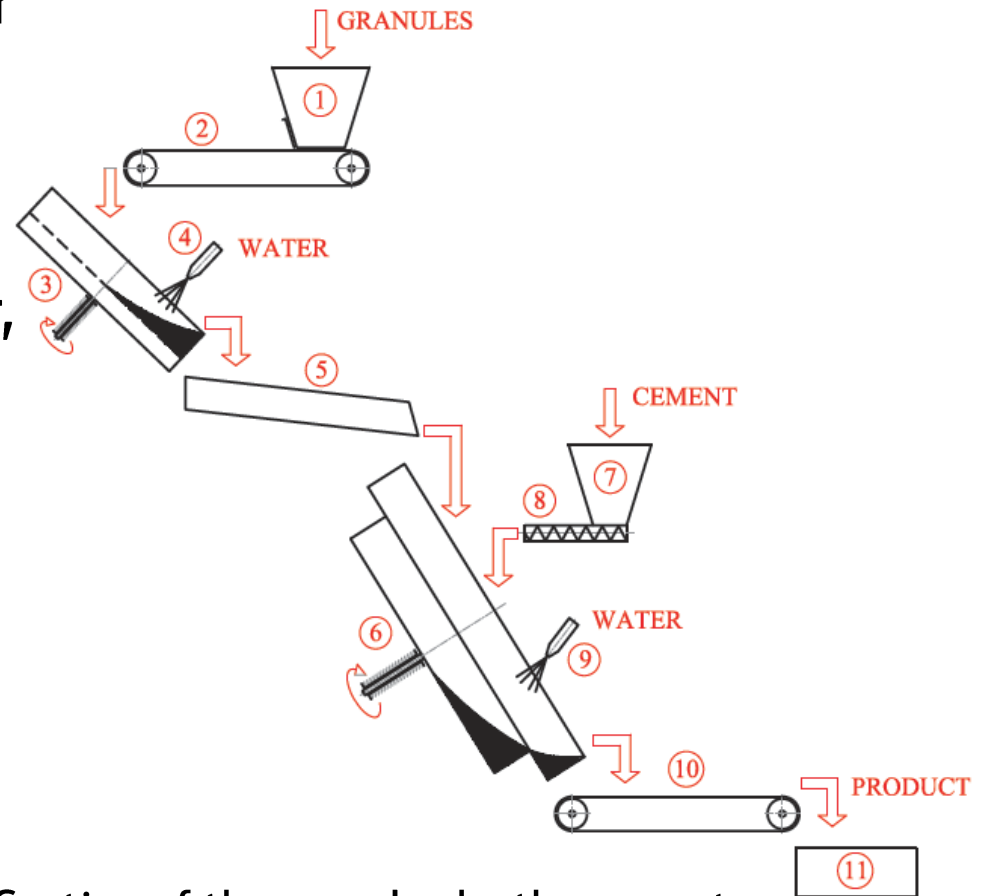
Agglomeration of Sodium Hydrogen by the Roll Pressing

▶ FACTORY

- ▶ material for processing went straight from a dryer into the feeder hopper of roll press
- ▶ particles covered by an air and the material properties were very different
- ▶ bad feeding of material between the rolls and low presses
- ▶ there was not possible to make the belt of the pressed material
- ▶ this situation was solved by vibration exciter

Drum Granulation

- ▶ The principle of drum granulation was applied on a pilot plant for testing a technology for the coating of gravel. The customer was the construction company Volker Linsel Bauingenieur, Germany.

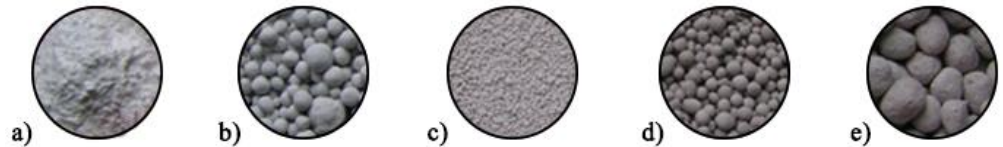
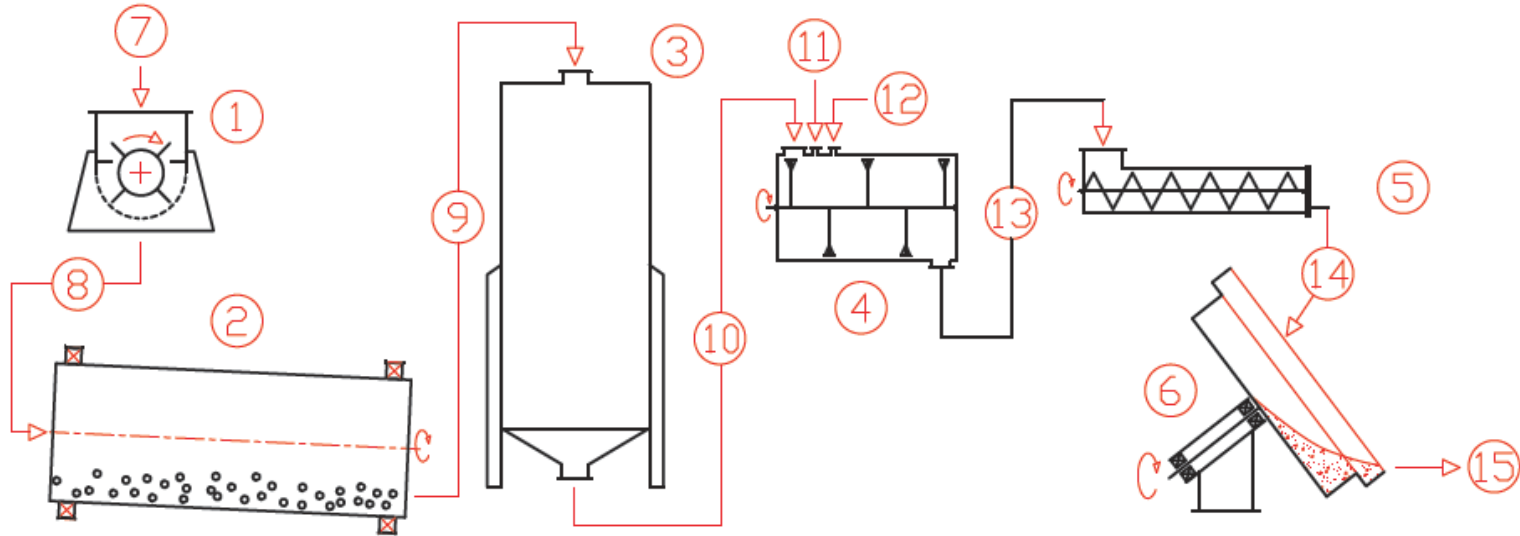


Coating of the granules by the cement.

Agglomeration of the Waste Glass in the Form of Powder

- ▶ The ecological project was the research and design of the glass powder agglomeration technology. The glass powder was made from old glass that was established for recycling.
- ▶ The base of technology is extrusion of glass powder in the form of paste with following granulation in rotating disc. The old glass recycled by this way is used in building industry as the thermal insulation.

Agglomeration of the Waste Glass in the Form of Powder

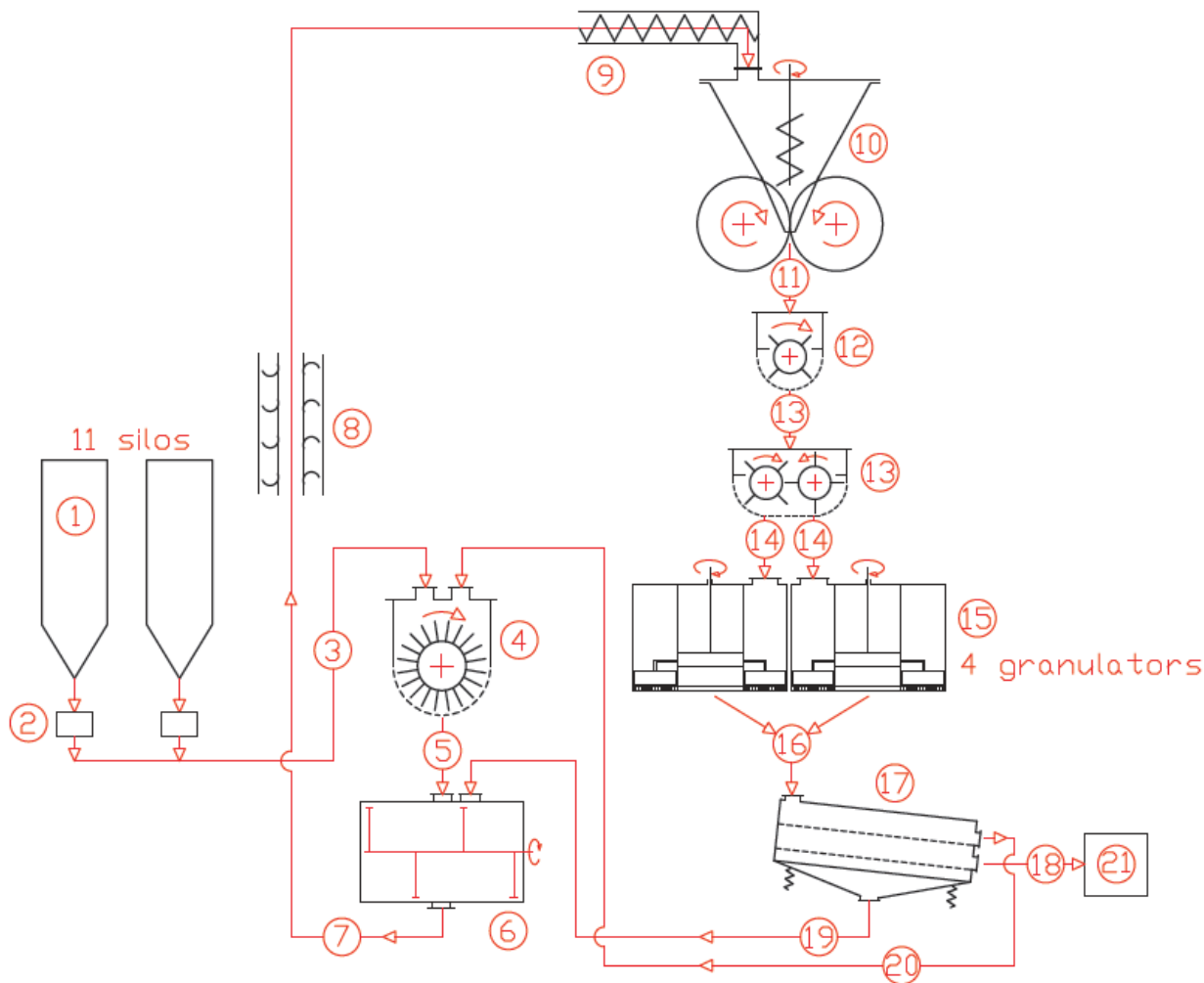


Glass powder agglomeration.

1. breaker, 2. drum mill, 3. bin, 4. mixer,
5. extruder, 6. rotating disc, 7. glass, 8. crushed glass, 9. glass powder, 10. glass powder for processing, 11. expander, 12. water, 13. paste, 14. extruded material, 15. oval granules.

From powdered glass to thermal insulation. a) powdered glass, b) wet and coated granules before thermal expansion, c) d) e) final product with various particle sizes

Research of Agglomeration and Preparation of the Primary Documents for the Production Line of Special Fertilizers



Agglomeration of the special fertilizers. 1. silos for raw material, 2. scale, 3. raw material for milling, 4. pin mill, 5. powder, 6. mixer, 7. powder blend for compacting, 8. bucket conveyor, 9. screw conveyor for filling the roll press hopper, 10. roll press, 11. compacts, 12. breaker, 13. coarse granulation, 14. granules, 15. fine granulation, 16. product with the recycle, 17. sieving, 18. final product, 19. undersize granules for mixing, 20. oversize granules for milling, 21. packing

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Calcium carbide briquetting

- ▶ The aim of briquetting was the ecological return of a powder fraction into a technology of an acetylene production. According to the experiments results the briquette roll press was designed by the company Bepex Hosokawa GmbH.

Granulation research of special colour additives for textile

- ▶ Granulation research of special colour additives for textile for Huntsman GmbH Basel, Switzerland was the newest project. Some new kinds of dyes were granulated using the roll press compaction with following granulation and sieving.

Design of Equipment

- ▶ In addition to research in the field of mechanics of particular materials and granulation, the group also design entire granulation technologies, which include:
 - ▶ design of technology based on the results from laboratory experiments
 - ▶ preparation of design specifications
 - ▶ complete documentation as a basis for the production of equipment
 - ▶ contracting production of equipment at home or abroad
 - ▶ selection of equipment from suppliers
 - ▶ participation in the implementation and start up of technology
 - ▶ consulting and advisory

Thank you for your attention...



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