



DMSV-PLANT

(THERMOLYSIS-PLANT)

PLANT FOR GENERATOR GAS
MANUFACTURING VIA SOLID WASTE
UTILIZATION



28. September 2011

Anfrage zur Lieferung von Ersatzbrennstoffen

Sehr geehrte Damen und Herren,

die DEUSA International GmbH ist ein Salz herstellendes Unternehmen aus Nordthüringen. Mit dem innovativen Verfahren der heißen Solung von Carnallit werden Düngemittel als auch Winterdienstsalze gewonnen. Um das Unternehmen vom derzeitigen Energieträger H-Gas unabhängiger zu machen, wurde eine Energieträgerumstellung beschlossen. Demnach beabsichtigt die DEUSA International GmbH im 4. Quartal 2012 die Betriebsaufnahme eines Mehrstufenvergasers zur thermischen Verwertung hochkalorischer Ersatzbrennstoffe.

Unsere Anlage arbeitet nach dem Prinzip der Luft-Querstrom-Vergasung mit nachgeschalteter Brenngasreinigung.

Durch das gewählte Verfahrensprinzip sind wir in der Lage Brennstoffe mit hohen Heizwerten von 20 - 40 MJ/kg als auch Stoffe mit Chlorgehalten von 1 - 6 Ma.-% zu verarbeiten.

Wir würden es sehr begrüßen, wenn Sie sich unsere Anlagenofferte einmal näher ansehen.

Sollten Sie Rückfragen haben, so stehen wir Ihnen gern zur Verfügung.

Als unseren Verfahrenspartner für die Luft-Querstrom-Vergasung haben wir die VER Verfahrensingenieure GmbH, mit Sitz in Dresden, beauftragt uns in den Fragen der Brennstoffbereitstellung, der Brennstoffqualitätsbewertung, der thermischen Verwertbarkeit sowie bei der Vorbereitung der Produktionsaufnahme unserer Anlage, zu unterstützen.

Die VER Verfahrensingenieure GmbH handelt in unserem Namen und Sie können sich daher auch vertrauensvoll in allen Fragen zur thermischen Verwertung Ihrer Brennstoffe an die Fachleute der VER Verfahrensingenieure GmbH wenden.

Gern erwarten wir Ihre Fragen und freuen uns auf eine künftige Zusammenarbeit.


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Introduction of **DEUSA** International GmbH

DEUSA International GmbH is a rich in tradition Potash Company based in Thuringia-Germany. At the Chemical Industrial Park at Bleicherode **DEUSA** International GmbH produces salt products (potassium chloride, magnesium chloride, common salt, different brines technical quality) under consideration of most modern ecological specifications. The **DEUSA** International Company is easily accessible - with its own rail connection to the network of Deutsche Bahn AG and a direct access to the motorway A3.

By the productions of new products like mineral feed for animals, **DEUSA** International opened up new markets in the years 2003 and 2005.

By the employment of own raw materials and environment-friendly technologies the company produces products of top quality and trades globally with high-quality salt products.



Figure 1: Salt storage of **DEUSA** International GmbH

The biggest cost factor in the production with over 40% is the energy sector in the company. Until now, natural gas is used to generate energy in the own power plant. To counter the developments in the energy sector and the associated additional cost explosion, **DEUSA** International GmbH built the DMSV-plant (**DEUSA** Multi Stage Gasifier) to produce a fuel gas from solid waste.

Introduction of VER Verfahrenstechnik GmbH

VER Verfahrenstechnik GmbH is working on the development and implementation of innovative processes and projects in energy and raw materials sectors. VER can look back on many years of experience in process development and plant operation for future/modern projects. VER offers the know-how in thermal process development, plant construction and operation to you. Therewith, the company can bring a long-standing and extensive experience in the field of waste processing and gasification of residual and waste materials in the project of the **DEUSA** International GmbH.

Aim of the project - DMSV plant (Thermolysis)

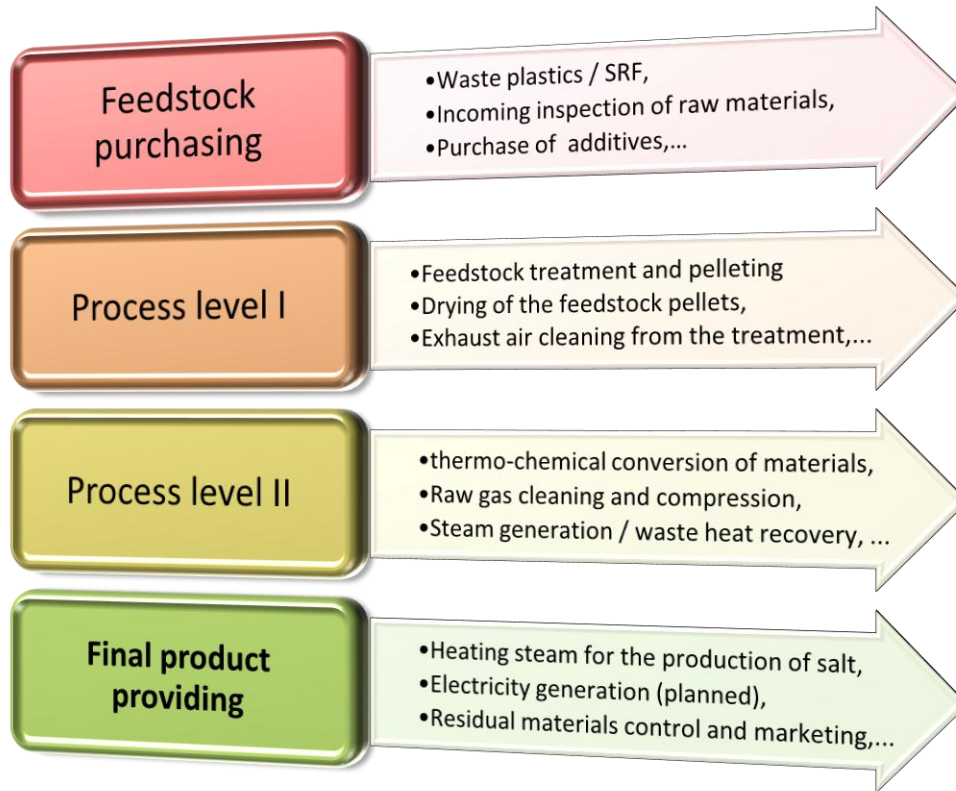
The project goal is to develop further technologically and constructively the already pre-planned plant for **DEUSA** International GmbH for generating energy from waste materials so that a plant for the gasification of high caloric waste plastic arises. This new plant will represent in the future with more than 7500 h/a the solid and predictable basis for the energy supply of the **DEUSA** International GmbH.

Technologically, the task is to implement an optimized gasification technology, with which it is possible to use the total energy content of plastic waste in the medium power range (up to 25 MW feedstock power) and to produce heat, electricity and manufactured gas.

Another important goal of the project realization is the demonstration of a reference plant for gasification of plastics and alternative feedstock with chlorine content of 1-6 wt.-%-for such feedstock currently exists in Germany no comparable technology. Thus, this plant will open up a much needed national market gap, activate regional economic cycles and create new jobs.

Process flow

The built in DEUSA International GmbH residue and waste recycling plant is divided into the following process flow:



The feedstock purchasing will be organized and carried out from DEUSA International GmbH by the central waste management system (AMM).



The feedstock delivery is carried out by truck (walking floor) from the respective customer either not fixed or pressed into bales. The material is delivered after the acceptance inspection (if necessary analyses are carried out in house laboratory) directly into the appropriate Deloadern, unloaded and then delivered in the following two line feedstock treatment plant.

Figure 2: View of the delivery place of the feedstock

The feedstock passes through the treatment plant with steps of crushing, homogenization and pelletizing. This feedstock is stored intermediately in silos and then fed into the gasifiers via the gasifier-entry-system.



Figure 3: Pellets from DSD-material

The feedstock (DSD-plastic pellets or alternative fuels) is thermal-chemical converted with gasification air in the DMSV-gasifier. For this conversion, equilibrium temperature of about 700 °C (1292 °F) in the gasifier is expected. During the first step of gasification, using cross-flor-air, the feedstock will be converted into coke and raw gas. After this the both intermediates are supplied to the gasification grate (second step). This grate attend to guarantee the almost completely conversion of the coke into raw gas and ash.



Figure 4: View at the gasifier

Result of this double-staged gasification is the almost absolutely utilization of the fuels with simultaneous homogenization of the raw gas at the gasifier.

VER Verfahreningenieure GmbH has developed a special raw gas treatment unit with the following steps: fluidized bed cooling, dust removal, after-cooling with simultaneous hydrochloric acid (HCL-) washer, gas compression and filtration with activated carbon. In this treatment unit the raw gas is cleaned of dust, tar and other pollutants.

The cleaned, compressed and cooled generator gas is feed into the steam generation unit. The created gas is burnt in special reducing NO_x burners. The exhaust gas is treated according to the 17. BImSchV (BundesImmissionsSchutzVerordnung-german law for immission control).

At least 100.000 MWh/a, produced on the base of solid recovered fuel/plastic pellets, will be provided at the main process of DEUSA International GmbH - the production of salt.

The innovative DMSV-technique for generating energy from waste connects the advantages of the LQV[®]-method (protected by patents, Luft-Querstrom-Vergasung/air-crossflow-process) with the traditional and longstanding approved stoker-fired furnace. This technique is qualified to use input materials with high pollutant contamination and varying quality.

A system operation with low demand of appliance and the multifunctional capabilities of the generated gas are giving divers options to the project partners. They can acquire continuative and special applications and bring the technique for the first time in an industrial benchmark for future.

The technical realization of the individual process units from the DMSV-system has been all-embracing thermo-dynamic calculated and experimental tested before the project starts.

Material inventory/conditions for acceptance

The circular flow economy-/ and waste management-law as well as the Technical Instructions on Municipal Waste allow landfilling of organic waste only after a mechanical-biological and/or chemical-physical treatment since 2005. This applies to the ways of recycling materials of the packaging industries.

In addition to the useful materials are significant amounts of residual materials that can only be thermally utilized as solid recovered fuels. On the basis of their calorific value the solid recovered fuels (SRF) are divided into lower- up to average-caloric SRF (< 16 MJ/kg) and high-caloric materials (> 16 MJ/kg). The DMSV-plant (thermolysis-plant) is going for target value from 28 till 32 MJ/kg of the fuel. This range lies in comparison to calorific value of coal at a similar level.

Input for the gasification-plant of **DEUSA** International GmbH is most of all DSD-material (DSD-Duales System Deutschland/dual system Germany). This DSD-material is delivered under designation "mixed plastics – plastic and rubber" (191204-waste code number).

The DSD-materials are specified products of the DKR (Deutsche Gesellschaft für Kreislaufwirtschaft und Rohstoffe mbH - German Corporation for circular flow economy and raw material). They have to consist of not less than 90 wt.-% plastics (mixed-) and only 10 wt.-% extraneous materials maximum are allowed.

To increase the security of supply, in addition to the DSD materials is possible the utilization of other substances at the DMSV-plant of **DEUSA** International GmbH.

Following material groups are possible corresponding to BlmSch-approbation number 08/10 from 15.03.2011:

Table 1: Catalog of acceptance materials for the DMSV-plant

waste code number	Denomination
191204	plastic and rubber
150102	plastic packaging
150106	varied packaging
170203	plastic
191210	combustible waste

Delivery is possible workday 06:00 till 21:00 per truck.

The feedstock has to meet the following criteria:

1. Mechanic specification, delivery form

- bale (0,8 m x 1,2 m x 1,2 m)
- closed walking-floor-trucks, fluff transport
- grain size ≤ 800 mm
- bulk density (arithmetic average) 350 kg/m³
- over length are not allowed
- texture: solid, free fluid is not allowed
- extraneous material ≤ 10 mass-% (ceramic, sand, porcelain, glass, ferrous- und nonferrous metal)
- no hazardous waste

2. Combustible spezifikation

parameter	abbr.	unit	Target value
calorific value	H _u	MJ/kg dry matter	28 - 32
moisture content	H ₂ O	wt.-% dry matter	≤ 9
ash content	ash	wt.-% dry matter	≤ 40
organic part	organic	wt.-% dry matter	≤ 20
synthetic part	KS	wt.-% dry matter	≥ 80
chlorine	Cl	wt.-% dry matter	≤ 5

Other limits will be adjusted with the prospective provider for fuel.

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