Raw material economy and production monoblock glass factory Aktis – The Russian Federation

In recent years, IKON, Ltd. has designed several glass factories of glass packing in the Russian Federation. In all cases, the construction projects were in the range of the lower structure, the supporting steel structure and the sheathing. The presented and already realized construction of the Aktis glass factory is the largest in Europe in the quantity of its production 1300 t / day of the glass (bottles). The glass factory complex is comprised of 8 separate objects, each of which fulfils its specific role in the production process and they are closely interconnected with each other. For simplicity, the building can be divided into two building blocks - a raw material economy and a production monoblock.

The storage and preparation of the individual **Raw materials for the production** of the glass batch according to the technological recipe is carried out in the raw material holding. Its production is calculated on the production of 900 t / day of packaging glass in the newly realized monoblock, another 400 t / day is assumed for existing melting units. The batch is transported to the **Production monoblock**. Here are two melting aggregates, each with a capacity of 450 t / day. In the Production monoblock melting, shaping, cooling and packaging of finished production take place. There are auxiliary plants and warehouses of finished production. Fully automated operation is 24 hours a day. The glass factory is the part of Czech designers and technologists. The construction parts were implemented by an investor, the technological supplies are from the Czech Republic, with possible foreign subcontracts.

BASIC INFORMATION	
Name of the building	Glass factory Aktis
Investor	ОАО Фирма Актис
Place of construction:	Rostov na Donu, Russion Federation
Building blocks:	- Raw material economy - Production monoblock
Scope of project documentation:	base structure, steel structure, sheathing
Total weight of the steel structure:	5 900 t
Project processor and production docum-tion:	IKON, s. r. o., Frýdek-Místek
Author's and technical supervision:	IKON, s. r. o., Frýdek-Místek

STUDY AND VISUALIZATION

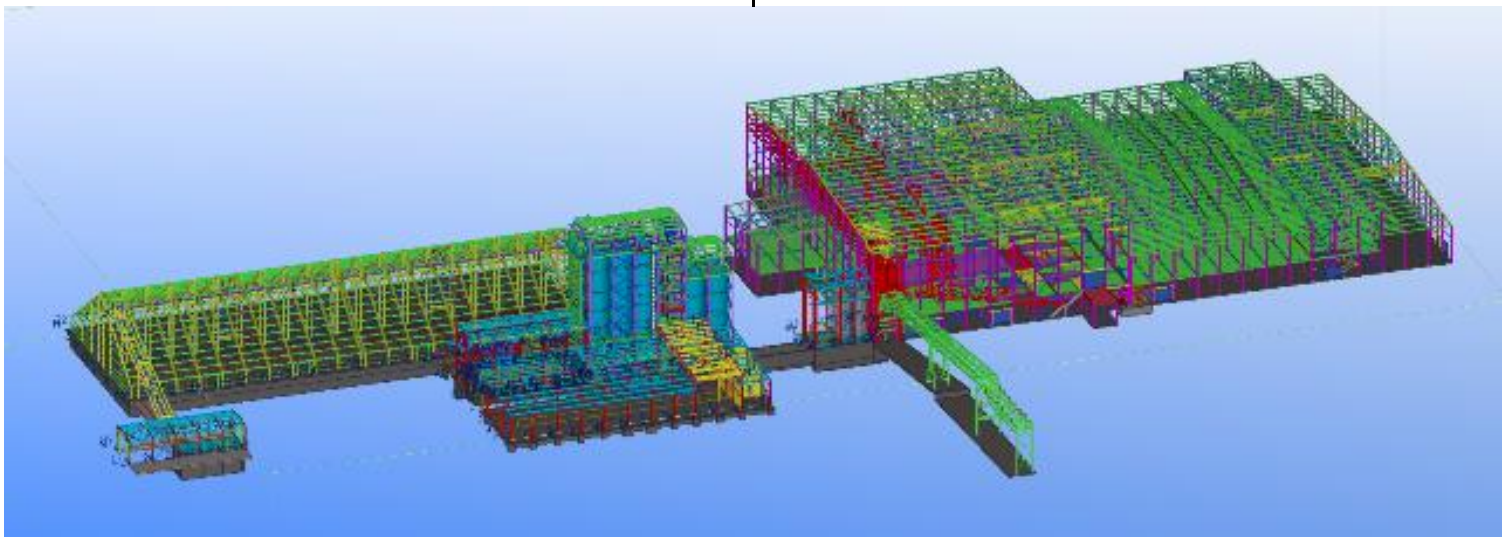
The basis for the **study** were technological requirements, including layouts and space requirements. Based on these, a 3D model of construction and a lower concrete structure were developed. Because it is a complicated building complex, it was necessary to harmonize the technology with the design of the structural solution of the buildings both spatially and functionally.

During the project implementation we appreciated the functionality of Tekla Structures software system. The spatial modelling of structural structures (steel structures and concrete foundations) allowed to accept the complex dispositional and functional requirements of the proposed technological equipment of the buildings. If necessary, technological elements were added to the building model, which helped to co-ordinate with the technological project, shortened the design time, and minimized collisions. Particularly useful in designing and implementing was the Tekla Web Viewer (a 3D view of a model can be seen and, the angle of view can be changed). Regular updating of the website model significantly improved communication between designers and clarified the design solution for the steel construction. After solving the spatial and structural arrangement of the buildings, the **visualization** was also processed. In particular, it served the investor to negotiate with the partners and organizations concerned. The dominating height of the Batch house (40 m high) from the Raw material plant specifically determines the architecture of the building.

Visualization

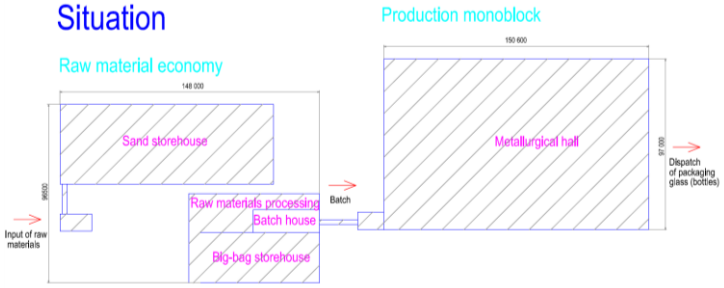
PROJECT INFORMATION

The project documentation has been dealt with during one-stage process, in close cooperation with the investor and



Model of Glass factory Aktis in Tekla Structures

technology designers, for 18 months. The requirements of the GOST and SNiP standards have been respected; the steel structure has been designed from Russian profiles based on statics developed by Scia Engineer. The Russian language was used. The project was licensed by the investor for the Russian Federation.



Scheme of the overall situation

TECHNICAL DESCRIPTION

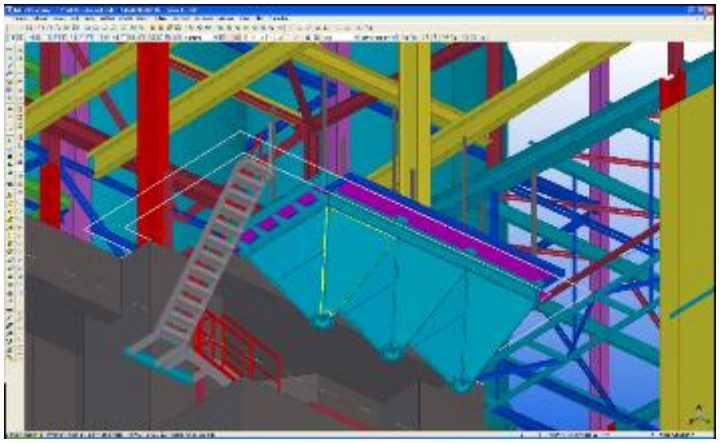
Raw material economy - total weight of steel structures 2600 t.

Raw material economy consists of separate objects that are technologically related:

- Sand storage
- Treatment of raw materials
- Big-bag storage
- Batch house

Raw materials are imported by rail. From the wagon they are poured into **hoppers** (truncated pyramid shape) which are placed under the tracks (maximum dimension 7.3 m x 11.5 m) and then distributed to the reservoirs of the raw material holding (cylinder shape) or loosely placed. The distribution is through a belt conveyor system and an elevator.

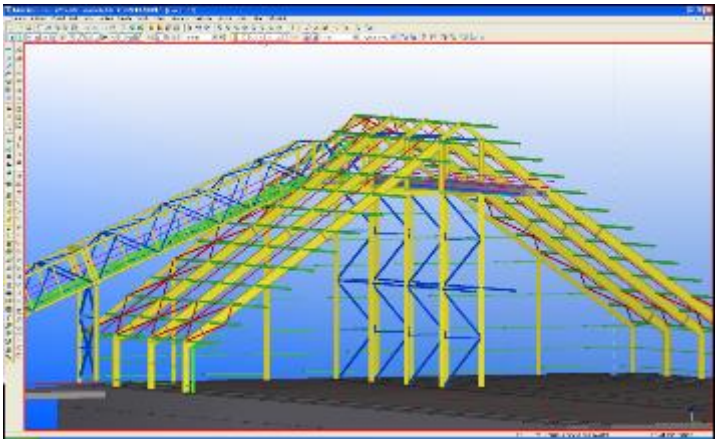
Hoppers beneath the rails - implementation



Model of hoppers in Tekla Structures

The sand, the heaviest raw material in bulk, is stored in the **Sand storehouse**. By a sloping conveyor it is conveyed under the ridge of the roof and then by a horizontal conveyor it goes along the entire length of the storehouse where it is stored. Depending on the production requirements, the track raiser distributes the sand onto the conveyors located in the channels below the floor level and by the elevators it is transported into the containers into the Batch house. The Sand storehouse is not an insulated hall building with a span of 45 m and a length of 121 m. The height in the ridge of the saddle roof is 19.5 m.

During the implementation of Sand storehouse

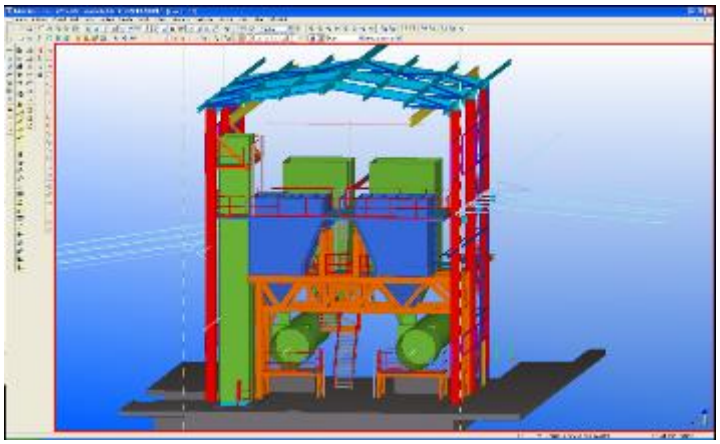


Model of Sand storehouse in Tekla Structures

The processing of raw materials is a technologically demanding building with a lot of technology, atypical containers and a number of service structures. The insulated building of the 21,7 m x 67,3 m ground plan and height in the ridge of the saddle roof 16 m is made up of frames hinged on reinforced concrete beams. Prior to the installation of the steel structure, the installation of a drying drum

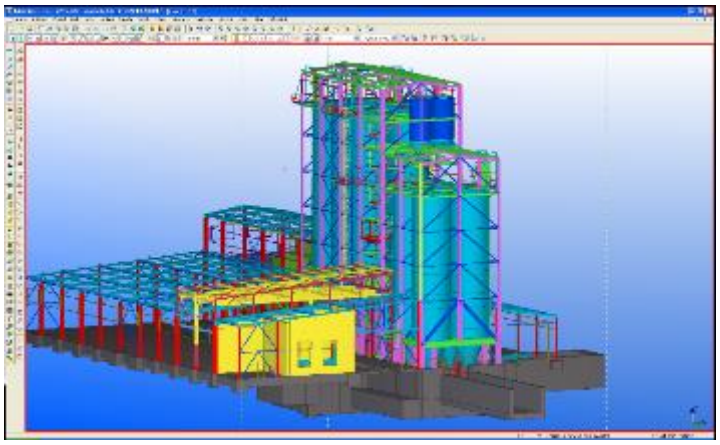
Technology in Raw materials processing - implementation

and containers was carried out. Dynamic effects of technology loads (crusher, vibratory feeders, etc.) were taken into account by dynamic calculation.



Technology in Raw materials processing - model in Tekla Structures

The packaged raw materials (in bags) are stored **in the Storehouse of big-bags**. Manipulation is ensured by cranes from unloading from wagons to distribution to a splicing machine, which is located in the Batch house on a platform at a level of 12 m, where it is poured into containers. An insulated Storehouse of big-bags is built and added to the Batch house. The top edge of the ramp roof is at a level of 12.8 m. The width of the building is 27.8 m, and the length is 67 m.



Big-bag storehouse, Batch house and Raw material modification - model in Tekla Structures

The sheathed Batch house and Big-bag storehouse

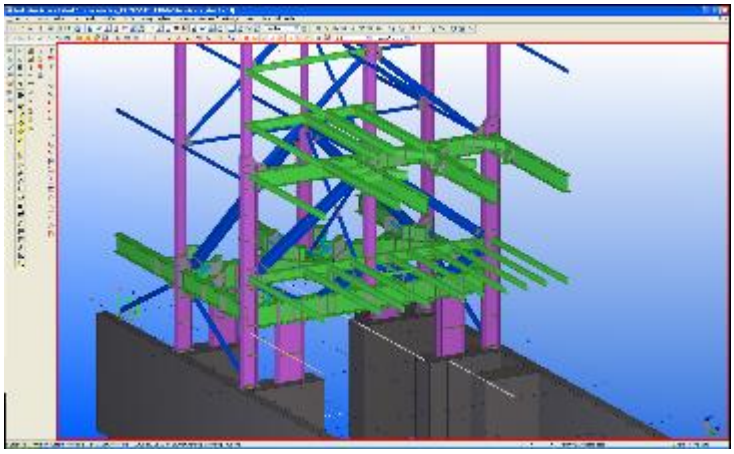
The Batch house is the highest building - with a height of 40 m and ground plan dimensions of 37.5 m x 13 m. It is insulated, and the temperature maintained. There are 19 containers in the Batch house. The largest ones have a diameter of 5.5 m (volume 580 m3, which represents a maximum mass of raw materials up to 850 tons). In the storage tanks there are stored shards, limestone, sand, soda, and other raw materials. The design of the containers is designed not only for the required loads but also for the friction and the angle of the raw materials at which it is poured out. The vibratory feeders are suspended under the containers. The raw materials are distributed to weighing machines and then by conveyors to mixers. The main supporting steel structure is made of welded T profiles. The column cross sections are up to 500 x 1200 mm. The steel framework is hinged on the concrete foundation structures. Under the Batch house there are a number of technological constructions.

The steel structure of the Batch house

Fundamental construction of the Batch house – implementation

On the basis of an engineering-geological survey, a proposal of **the foundations and the bottom structure** was made. A metallurgy backfill was made on which a reinforced concrete slab, beads, strips and walls were implemented. Flooring (1.PP) is designed for a payload of 3,000 kg / m2. Reinforced concrete ceilings at 0.0 mm are designed for a payload of 5,000 kg / m2.

The maximum depth of foundation was in the Batch house at the level of -6.8 m. The floor level was at -4.3 m. The maximum width of the base belt was 1300 mm. For the two steel structures shown below it was necessary do design a series of staircases, exchanges of steel profiles and auxiliary platforms, so that materials could be transported from one building to another by a underground conveyor belt.



Fundamental construction of the Batch house - model Tekla Structures

Production monoblock (metallurgical hall) - total weight of steel structures 3 300 t.

The metallurgical hall with ground plan dimensions of 150.6 m x 97 m has a maximum height in the ridge of a saddle roof of 27.7 m. In the longitudinal direction the hall is divided into two sub-units. One of them is one-storeyed with a four-storey building and the other, larger, is a two-storey building. Supporting concrete floor structures II. and higher above-ground floors are concreted into a lost formwork placed on steel ceilings and beams.

Production monoblock (Metallurgical hall)

The supporting steel structure consists of rows of pendulous columns, and in the horizontal direction of the girder and the ceiling of rolled or welded T-beams, the large-beam roof beams are trusses. Stability of the structure is provided by roof and wall

Production monoblock (Metallurgical hall)

stiffeners. The lightweight roof casing is carried by U-profile beams. The construction is screwed in joints, in some cases it is welded at assembly. Below the roof structure there are suspended crane slots for sliding cranes with a load of 3.2 t.

A number of auxiliary supporting steel structures, platforms, conveyor and technological bridges, including smaller containers, were designed in the interior of the Production monoblock. With their optimal layout and static design, the clarity and precision of the spatial modelling in Tekla Structures was again very positively influenced by the variant design and selection of the best solution.

In August 2010, the operation of the lasswork factory was successfully launched.

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Raw materials and production monoblock of the Aktis glass factory – the Russian Federation

In recent years, IKON, Ltd. has designed several glass factories of container ware in the Russian Federation. In all cases, projects of building components were in the range of under construction, supporting steel construction and cladding. The presented and already realized construction of the Aktis glasswork factory belongs to the largest in Europe in the quantity of its production of 1300 t / day of the container glass (bottles). The glasswork factory complex comprises eight separate buildings, each of which fulfils its specific role in the production process and they are closely interconnected with each other. For simplicity, the construction can be divided into two building blocks - a Raw material economy and a Production monoblock. Since it was a complicated building complex, it was necessary to harmonize the technology with the design of the structural solution of the buildings both spatially and functionally. During project implementation, we appreciated the functionality of Tekla Structures software system. The spatial modelling of building structures (steel structures and concrete foundations) accepts the complex dispositional and functional requirements of the proposed technological equipment of the buildings. The Tekla Web Viewer (and 3D view of a model can be seen and the angle of view can be changed) was especially useful when designing and implementing it. Regular updating of the website model significantly improved communication between designers and clarified the design solution for the construction of the steel structure.