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## BIM support for a construction project

Nur Sultan - 2020



**DIPCO LLP (Digital Industry Project Company)** has been engaged in design of civil and industrial facilities in Kazakhstan since 2010.

It has experience of joint design of complex engineering structures (tunnels, bridges, dams) and industrial facilities (plants, concentrators) using BIM technologies with Russian and Finnish partners.

The company has an experienced design team of 45 people who are constantly improving their skills.







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The company's strategy aims to manage the entire lifecycle of an object by providing its digital physical and functional characteristics.

The method concept implies a perfect, clear linkage of all the processes taking place between all those involved.



An integrated approach to project realization, based on a wide range of digital technologies: special software packages for design, modelling and data systematization, laser scanning, augmented and virtual reality technologies



## **BIM** support for the project

In the course of support implementation, BIM analysis of 2D drawings is carried out by creating a consolidated 3D model (including all sections) of the objects to be erected and reconstructed.

- Identification and elimination of geometric collisions - crossing of fixed fragments in the model, observance of permissible minimum distances and ergonomic requirements

- All project materials are uploaded to the Shared Data Environment (SDE) deployed with Autodesk BIM 360 DOCs software, providing all members of the project team with real-time access to the information.





## The benefits of BIM 360



REMOTE ACCESS No need for portable media and no need to update the files on it . Internet access is sufficient



VIEW Without installing special applications, you can view graphical, textual project files, as well as the properties of 3D model elements



NOTES AND APPROVALS Ability to comment on 2D drawings and 3D models. Task setting. Agreement on solutions in the project team hierarchy



FILE VERSIONS Save project iterations and the ability to compare 2D drawings of 3D models from different versions





## **4D MODEL**



**4D modelling** combines a 3D model of an object and its construction schedule, thereby indicating the existence of certain elements within a certain timeframe. The entire construction process is shown as an animated clip with the ability to pause and comment, to identify spatial and temporal collisions, and to optimize the work of machinery and construction workers. 4D modelling makes it possible to almost completely eliminate all kinds of collisions, including such complex spatial and temporal collisions, by building dynamic visualizations and automatically identifying intersections.

## 5D MODEL (COST)



## The benefits of using the new 5D calculation technology:

High speed of construction cost estimation

Minimization of cost estimation errors by eliminating human factor

Comparison of costs and quantities for various projects

Qualitative analysis of cost of the object at any stage

Quick recalculation of the cost of project variants and ability to shift to Design to Cost

Acceleration of internal approval processes for schedules and estimates

**6D MODEL** 



## The "Operational" information model includes data:

A structural-hierarchical model of the operational facility;

3D BIM model of the exploited object containing detailed information about the location and characteristics of its constituent elements;

Work documentation (drawings, diagrams, specifications, lists, etc.);

Design documentation (assembly drawings, diagrams, specifications, etc.);

Execution documents (certificates of certification, execution diagrams, results of inspections, etc.);

Operational documentation (regulations, passports, instructions, schedules of preventive maintenance, logbooks, etc.)



## **3D** scanning

Creation of a point cloud of existing objects, structures and equipment (from aerial survey and laser scanning), their subsequent processing and loading into a 3d model.











## =BIM in the construction phase

BIM 360 Layout is a service that allows engineers and surveyors on the construction site to work together with the office division





## **Opportunities for BIM during the construction phase**



Integration with BIM 360 Glue



Automatic transfer of control points



Bringing the 3D model onto the site



Integration with project applications



Access to the appliance via Wi-Fi



Automatic remote device configuration



## Integration of the operating model with ERP systems

The results can be used by various information systems to optimize business processes and are also the basis for the creation of a digital twin









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## Shore protection works of 4.5 km of the Ural River in Makhambet village, Atyrau region (client - Tokio ROUP LLP)

In 2019, the "Shore protection works" using the new ROCK BOX gabion structure technology was designed and approved by the State Expertise Commission of the Japanese Tokyo ROPE Corporation.



TOKYO ROPE MFG. CO., LTD.





## **Designing the redevelopment of fast food restaurants**

Within the framework of long-term cooperation with The Caspian International Restaurants Company LLP, projects for reconstruction and construction of fast food restaurants KFS, Costa coffee, Hardees have been implemented. Modelling of all sections, including design project, engineering networks, etc.





## 3D modelling of construction projects followed by adjustments to the design of JSC Zhairem Mining and Processing Plant





**Client: KAZZINC LLP** 



Period: 03.2019-09.2019.

**Object**: Zhairemsky mining and processing plant. Zhairem settlement. Karaganda region **Scope of work**: Modelling and correction of sections of the design: Production technology, systems of technological pipelines of main production buildings and elevated buildings:

- 1. Heat distribution network
- 2. External network of technological water pipelines.
- 3. Slurry pipelines
- 4. Acid water bypass
- 5. Process technology
- 6. Aspiration system
- 7. Air-supply
- 8. Process communications
- 9. Process water supply



Adjustment of the design and estimate documentation of the "Working Documentation" stage for the construction of the "Main Building of the Polymetallic Concentrator" in parts of the installation of reagent pipelines





**Client: KAZZINC LLP** 



Period: 01.2020-04.2020.

**Object:** Zhairem mining and processing plant. Zhairem settlement. Karaganda region

#### Scope of works:

- 1. 3D scanning of internal space of Main building
- 2. Correction of 3D design model to executive level (as-built)
- 3. Reagent pipeline routing with natural gradient to provide self-flow of chemicals
- 4. Correction and issuance of a set of 2-D drawings of the project
- 5. Author's supervision



## **OUR PROJECTS (industrial)**

• BIM design and construction support for the Shalkiya mining and processing plant



#### Work Architecture Архитектура работы СОД



Customer: Shalkiya Zinc Ltd.

**Period:** 03.2020 - now

**Site:** Mining and processing plant of Shalkiya deposit, Shalkiya settlement, Kyzylorda region

#### **Composition of works:**

BIM design support at stages "P" and "EP", including the creation of 3d model (LOD 200 stage "Project" and LOD 400 stage "Working Documentation") identification of conflicts, with subsequent model adjustments

ensuring automated calculation of the scope of work to determine the estimated cost of construction implementation and administration of Autodesk BIM 360 software

BIM consulting services for the project, development of the BIM standard for the project organization, the BIM implementation plan for the project organization, the BIM project implementation plan (BEP - BIM Execution Plan), organization of training and staff development in the field of BIM technologies





## Reconstruction of main building No. 2 Zhezkazgan concentrators No.1,2,3







### **Client: KAZAKHMYS Corporation LLC**

### Period: 08.2020 - present.

**Site:** Zhezkazgan Processing Plant. Zhezkazgan city. Karaganda Region

Scope of work:

- 1. 3D scanning of area to be reconstructed, correction of design estimates.
- 2. Modeling of project sections, creation of consolidated model, detection and correction of collisions.
- 3. Correction of drawings, creation of bill of materials, specifications
- 4. Drawing up construction schedules and resources
- Implementation and administration of BIM 360 cloud environment for teamwork between the project team and the client



## Development of design documentation for a gas-chemical complex with a railway dead-end at Baiterek No. 9 in the West Kazakhstan Region of the Republic of Kazakhstan".





**Client: Zhaik Petrolium Ltd.** 

Period: 06.2020 - present.

#### Scope of work:

Implementation and administration of BIM 360 cloud environment for organization of joint work of design team and the Customer

Aerial survey, generation of a point cloud of existing structures, terrain, forming the basis for the master plan model

Modelling the Technology of manufacturing based on initial data of the Customer, creating a consolidated model, detecting and eliminating conflicts

Modeling of general construction and special engineering divisions, including necessary calculations (reinforced concrete structures, metal constructions, architectural solutions, architectural and construction solutions, automation of production technologies, communications systems, electrical equipment, etc.) Construction set Design and Estimated Documentation for the State Expertise BIM support for construction (4d,5d,6d)



## **City streets and main roads**



#### **Client: BI Group**



Period: 2018-2020

#### Scope of work:

- 1. Modelling sections of the project
- 2. Creating a consolidated model
- 3. Collision detection in all sections
- 4. Detecting discrepancies between design data on road pavement layers, earthworks and actual data from the information model
- 5. Drawing up bill of materials, bills of material
- 6. 3D visualization of projects and execution plans.
- 7. Support of the model during the construction phase



## **External engineering networks**







Supporting the model during the construction phase

**Client: BI Group** 

#### Period: 2018-2020

#### Scope of work:

- 1. Modelling sections of the project
- 2. Creating a consolidated model
- Detection of conflicts between utilities in the project and other sections
- Correcting the project for collisions before construction
- 5. Drawing up bill of materials, specifications
- 6. 3D visualization of projects and shop drawings
- Support of the model during the construction phase





#### TEMIRKHANOV ORYNTAY

**Project Coordinator** 

A dynamic individual with 12+ years of experience in FEED, Detail & basic Engineering, Client Relationship Management. Design, Planning, 3D Modeling, coordination, and controlling of the Piping, Pipeline and Layout Engineering activities in accordance with Project requirements within the assigned budget, time schedule and quality standards.

Projects participation

NCOC Projects: OPF Waste Water Streams Additional Sampling Points Installation; Fuel Gas Start-up line to Stabilizer; PW Clust. SWS On-line Analyzer Installation; PW Clust. PWS Solids Treatment Mods; PW Clust. SWS PH Control Mods; Reboilers

TCO Projects: SGP Water Handling Upgrade; Plant Firewater Upgrade Project; NERP; CaTRo

MAERSK Projects: Dunga Phase II Development Project.



#### AYAKOZ KENZHEGULOVA



**Senior Process Engineer** 

UCL (University College London, UK) Master's student with an engineering background and 5 years working experience as a Process Engineer. I am looking for a position in Chemical Engineering, where I could apply my skills.

Projects participation:

TCO Projects: Manifold upgrade project; Plant boiler house project; WTF/WRF (Wastewater Treatment Facility/Water Recycling Facility) upgrade; Fuel gas supply; MWP (Multi- Well Pad) and Single Well Pad; Fire Water Unit.

KPO Projects: Onshore upgrade of oil treatment system project in Western Kazakhstan;



#### ASLAN SHULMAGAMBETOV



Principal Process Engineer

+10 years' experience in process design engineering. Application of international codes (API, ASME) and Environmental standards. Familiar with Process Simulation softwares like Aspen HYSYS, Unisim, Flaresim, MySep. Working knowledge in plant design and HAZOP analysis.

**Projects participation** 

TCO Projects: WRF Lifting Station (RA Package); Main Diesel Fuel Storage expansion; WRF Lifting Station; NGGS Hydrocarbon Drain System at Main Manifold, Phase 3 (Cancelled); Plant Air System Upgrade, Phase 3; T-7252 to MS-26 Flow Line Replacement, Phase 3&4; SGP Permanent Facility for Antifoulant, Phase 4; MS-35 HPFG&HCD (Fuel gas high pressure protection); SGP Water Handling Upgrade Project, Phase 3; Water Recycling Facility, Phase 4.

NCOC Projects: Turbo-expander seal gas mods; RGI (Raw gas injection) recycle line mods; RGI Control and Safeguarding mods; Well re-injection conversion mods; TGTU (Tail gas treatment unit) water segregation; Fuel gas start-up line to Stabilizer; Bursting disc Air Breathing System; PW Clust. PW Solids Treatment Mods.



#### SAMUEL STEPHEN



Lead Stress Engineer

About 16 years of professional experience in the oil & gas and refinery in various aspects of Piping conceptual, pre FEED, FEED, detailed engineering, commissioning assistance, construction management, etc.

Projects participation:

Geo Energi Group project: Gas Separation Unit, Kazak

Shell project: Early Production Facilities, Iraq

EBGD Co. project: Gulf of Suez NGL Plant , Egypt

HPC project: JIHAR STAGE 3 PROJECT, Sriya

Saudi Aramco projects: Qatif Gas Oil Separation Plant; Khuff Condensate Splitter Plant.

ITC, India project: ITC Bhadrachalam Paperboards Ltd.,





#### IVAN BYCHKOV



Lead Piping Engineer

18 years experience in Piping design and Engineering aspects for FEED, detailed design in brown field and green filed for oil and Gas industry projects in Kazakhstan.

PFU (Plant Firewater Upgrade) - Created Pits (HDPE), Hydrants and Fire Monitors

#### Projects participation

TCO Projects: FG Tengiz FGP Wellhead Pressure Management Programme LP Assessment for pipe supports; K3 Waste Water Upgrade Project; SGP Critical Tank Sparing Project; SGP Water Handling Upgrade; Unit 800 SWS AREA, Unit 9100. WTP AREA: FEED FGP Assessment of existing facility supports;

NCOC Projects: PW CLUST. PWS SOLIDS TREATMENT MODS; PW CLUST. KO DRUMS-AMINE LINE MODS; RGI CONTROL AND SAFEGUARDING MODIFICATION: A-island wellhead sov replacement; KUT WTP unit 500 tubing and process utilities upgrade.

MAERSK Oil Kazakhstan: Dunga phase II FEED phase

KPO: KATS Dual filters. Detailed design; WWT Oil Upset FEED



JAILYBAYEV AIBAR

**Principal Piping Engineer** 



12 years years experience in the development and realization of projects in the oil and gas sector

#### Projects participation:

TCO Projects: Main Diesel Fuel Storage Expansion ST-2; LCR HVACUpgrade; SGP DHC Laterals upgrade; SGP U300 Metallurgy Upgrade; SGP F-340D Sour Gas Coalescing Filter; SGP LP Flare Header Upgrade; Turn Around 2020, Regulatory Approval Packages; KTL Fire fighting system upgrade (Kanban system); KTL-2 Turn Around 2018; KTL Seasonal Gap Reduction; SGE Capacity and Reability; Water Recycling Facility (including subprojects; Early works (Site preparation), Feed water buffer ), Phase 3 (FEED).



#### YERLAN ZHUPKALIYEV



Principal Piping Engineer

About 17+ years of experience in piping engineering, mechanical engineering, basic technical analysis and support, review design drawings, purchasing, creation and implementation of piping blueprints, management of construction activities, data evaluation using 3D piping models, project Manhour estimation, Piping Specification preparation.

Projects participation:

TCO Projects: Orken Village Project; Future Growth Project; Sour Gas Flaring Project; Gas Utilization Project.

AGIP KCO's Projects: Eskene West Rail Project

#### ANUAR JETPISSOV



Senior Piping Engineer

Over 12 years of piping design experience. Experience includes equipment arrangements, piping layouts, isometric and GA drawings, material take-offs, checking, verification and design.

Projects participation:

TCO Projects: PFU (Plant Firewater Upgrade), SGP Critical Tank Sparing Project, SGP DHC System Upgrade, SGP Flare Header Upgrade, SGP F-340 Filter Replacement





#### DAUREN TOKKUZHIYEV

**Senior Piping Designer** 



10 years experience in the development and realization of projects in the oil and gas sector. FEED as well as detailed design project (EPC) of Brownfield & Greenfield, H2S processing projects, Oil Terminal tankage, Wellhead module piping & Tie-ins activities.

PFU (Plant Firewater Upgrade) - Created Pits (HDPE), Hydrants and Fire Monitors

TCO Projects: CSC (Crude Shipment Capacity - Feed), SGP WHU, FGP project (Early works), Well Pad and Multi WellPad, NERP Project (Feed, Bridging)



#### **KASHKYNBAYEV ISSATAY**

**Discipline Admin Support** 



A dynamic individual with 8+ years experience of front-end (FEED) as well as detailed design project (EPC) of Brownfield & Greenfield, execution of Refineries, Petrochemical, Chemicals, H2S processing projects, Oil Terminal tankage, LNG cryogenic piping, refinery tank farm, Wellhead module piping & Tie-ins activities.

NCOC Projects: TA Scope Project 2018, Additional Duplex Filter,

TCO Projects: North & East Ring Project (NERP); FGP (Future Growth Project)

ANPZ Projects: Atyrau Refinery & CPA Project



#### YERZHAN NIGMETOV

**Principal CSA Designer** 



+18 years years experience in the development and realization of projects in the oil and gas sector Projects participation:

TCO Projects: KUT HP Steam Permanent Solution; LCR HVACUpgrade; KUT HP Steam Pipeline; Chemical Laboratory Access and Air Extraction Points Modification; OPF HVAC Intake Weather Protection: Replacement of Muster Area Doors in Module 11/12: RGI Barge F and G Detector Access Mods; Flash Gas Compressor Replacement Offshore; RGI Barge F&G Detector Access Mods; PW Clust SWS PH Control Mods; Future Growth Project; NGGS Supplementary RIE.



#### **CHENDEVA NATALYA**

**Senior CSA Designer** 



12 years years experience in the development and realization of projects in the oil and gas sector Projects participation:

TCO Projects: Future Growth Project; SGP Water Handling Upgrade; SGP water handling upgrade; K3 waste water upgrade; TCO Plant Firewater Upgrade; Tengiz WTF Construction; Wastewater Treatment Facility:

NCOC Projects: Oil Spillage Response Environmental Base.



#### **ZINKEVYCH ALEXANDR**



Lead CSA Engineer

14 years years experience in the team management of Civil / Structural / Architectural engineers and designers. Using of norms and regulations, project's codes and standards, drawings, specifications and contract documents. Design of reinforced concrete and steel structures, industrial site plans and development projects of construction. Projects participation:

TCO Projects: MS-12/MS-14/MS-19 Manifolds Upgrade; Plant DMC Crude Oil Lines Replacement: TP16 Skema 660V MCC Replacement:

EmbaMunaiGas Projects: Construction of a multiphase pump stations of S.-E. Novobogatinsk and S.-W. Kamyshytovoe fields; Construction assembly point of Karsak oil field; Construction of the pipeline from S.-W. Kamyshitovoe field to S.Balgimbaeva GPP with the installation of booster compressor: Construction of 2 steam boilers with 50 T/hour capacity at Atvrau Oil Refinary: Construction of desalination and cooling of the effluent from the installation BWTP workshop №8 Atyrau Oil Refinery.





**CHAIKA DMITRIY** Project Manager

Experience: 13 years in design and expertise for infrastructure and industrial projects.

Project coordination and control, BIM application, presentation at Autodesk University 2019 Participation in projects (BIM):

"Reconstruction of the road of republican importance "Karabutak - Komsomolskoye - Denisovka -Rudny - Kostanay" section 427-457"km, "Construction of Tauelsizdik Ave. in section from No. A43 street to Husein ben Talal street with construction of bridge over Esil river in Nur-Sultan city. Reconstruction of the road of republican significance "Usharal-Dostyk" 60-120km, "Construction of continuation of Kunayev Avenue (from the beginning of crossing construction with the railway to Dambovaya Street) in Shymkent city", "Construction of engineering networks of E305 street from Sarayshik str. Sarayshyk Street to Syganak Street", "Reconstruction of main building No. 2 of Zhezkazgan concentrators No. 1,2,3", "Construction of concentrator with productive capacity of 4 million tones of ore per year at Shalkiya deposit".



#### ZHETYBASSOV ALTYNBEK Roads engineer

Experience: 22 years in infrastructure project design (roads)

#### Participation in projects:

Construction of BRT in Almaty city, Construction of roads in Almaty city district, International corridor "Western Europe-Western China". Almaty-Ust-Kamenogorsk road, Omsk-Maikapshagai km 541-580, Taskesken-Bakhty km 100-146, Petropavlovsk Bypass, Airport reconstruction in Kyzylorda, Kokshetau, Taraz, Uralsk, etc. Taldykorgan, Uralsk, etc. BIM: "Reconstruction of road of republican significance "Karabutak-Komsomolskoye-Denisovka-Rudny-Kostanay" section 427-457"km, "Construction of Tauelsizdik Ave. in section from A43 street to Husein ben Talal street with construction of bridge over Esil river in Nur-Sultan city. Nur-Sultan", "Reconstruction of "Usharal-Dostyk" road of national importance 60-120"km, "Construction of continuation of Kunayev Avenue (from the beginning of crossing construction with the railway to Dambovaya Street) in Shymkent city".



#### **KASHKIMBAYEV SAKEN** Design engineer, BIM coordinator

Experience: 5 years in infrastructure and industrial design.





Reconstruction of Kabanbay Batyr Ave. Kabanbay Batyr in Astana city (roadway), Construaction of roads and networks in Komsomolsky Zh., Construction of main road Ugolnava Street - Beisekova Street.

BIM: "Reconstruction of "Usharal-Dostyk" road of republican significance, km 60-120, "Construction of continuation of Kunayev Avenue in Shymkent city", "Reconstruction of main building No. 2 of Zhezkazgan Processing Plant 1,2,3", "Construction of processing plant with capacity of 4 mtpa at "Shalkiva" deposit



#### **BAIMUKHAMBETOV ASSET** Infrastructure project engineer (external

and internal networks)



Experience: 6 years in infrastructure and industrial design.

#### Participation in projects:

Reconstruction of roads in micro-districts of Almaty city: Punching of Saina Street from Ryskulov Avenue to Akan Sera Street, Construction of BRT and LRT line

BIM: "Construction of Tauelsizdik Ave. in the section from A43 UI. to Husein Bin Talal St. in Nur-Sultan town", "Reconstruction of "Usharal - Dostyk" road of republican importance km 60-120 "Construction of extension of Kunayev Ave. in Shymkent town", "Construction of engineering networks of E305 UI. Construction of engineering networks of E305 street to Syganak street", "Reconstruction of main building No. 2 of Zhezkazgan concentrators 1,2,3", "Construction of concentrator with capacity of 4 million tons of ore per year at "Shalkiya" deposit".



#### CHERNYSHOV VLADIMIR Roads engineer

Experience: 13 years in infrastructure project design (roads)



#### Participation in projects

Construction of internal roads to five block apartment buildings in Atbasar, Akmola region, Reconstruction of road of republican significance Usharal - Dostyk. Section 120-150 km, Reconstruction of the road of republican significance Usharal - Dostyk. Second Stage - Reconstruction of Section km 150 - km 184

BIM: "Reconstruction of the road of republican significance "Usharal - Dostyk" 60-120 km





Anuar Kozhanov BIM Coordinator

Experience: 8 years in BIM design of civil and industrial buildings.





#### **Zangar Aitmatov** 3D scanning specialist

Experience: 5 years in 3D point cloud scanning, digital terrain and terrain models, highly detailed 3D models



The main tasks of the BIM coordinator are: Development of rules for checking the quality of information models; Carrying out checks on information models; Generating reports based on validation results. Participated in coordination of project "Construction of concentrator with productive capacity of 4 mln tons of ore per year at Shalkiya deposit"; "Reconstruction of main building No. 2 of Zhezkazgan concentrators 1,2,3"; Coordination of multiple buildings and facilities in Nur-Sultan; "Stadium for 7,000 seats in Turkestan city". Any modern building is inseparable from ultra-modern technology, which has become part of the architecture. And we can no longer imagine buildings without high technology that has become part of aesthetics. And the machines we use for this purpose can bring this technology to aesthetic perfection.

12 years of experience in the field of architecture design using information modelling technology. Experience in designing both civil and industrial buildings.

Has participated in:

"BI City Tokyo", "Capital Park", "FreeDom"; "Stadium for 7,000 seats in the city of Turkestan";

"Construction of water pipeline in Akmola region";

"Construction of a concentrator with an annual production capacity of 4 million tonnes of ore at the Shalkiya deposit.



Aset Sambaev BIM designer, architect



Experience: 12 years in BIM design of civil and industrial buildings.

Any modern building is inseparable from ultra-modern technology, which has become part of the architecture. And we can no longer imagine buildings without high technology that has become part of aesthetics. And the machines we use for this purpose can bring this technology to aesthetic perfection.

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"Stadium for 7,000 seats in the city of Turkestan";

"Construction of water pipeline in Akmola region";

"Construction of a concentrator with an annual production capacity of 4 million tones of ore at the Shalkiya deposit.



Nurlan Kozhakhmet BIM designer, structural designer

Experience: 8 years in BIM design of civil and industrial buildings.



Approximately 8 years of professional experience in creating the information model and design of design sections in Autodesk Revit. Experience in producing design and working documentation in BIM. Calculation of steel structures and reinforced concrete in the Revit - LIRA link.

Has been involved in:

"Construction of concentrator with productive capacity of 4 million tons of ore per year at Shalkiya deposit";

"Reconstruction of main building No. 2 of Zhezkazgan concentration plants No. 1,2,3"; "Stadium for 7,000 seats in Turkestan city;