Water & Wastewater

Dams • Water Transfer and Diversion Tunnels • Irrigation and Drainage Networks • Water and Wastewater Treatment Plants • Water Transmission Lines • Sewerage Collection and Transmission Lines
Building a Better World for Future Generations

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Dams • Water Transfer and Diversion Tunnels • Irrigation and Drainage Networks • Water and Wastewater Treatment Plants • Water Transmission Lines • Sewerage Collection and Transmission Lines
Mission
To Provide World-Class Management, Engineering, Procurement & Construction Services Through People & Organizational Development to Improve the Quality of Life

Values
- Respecting People, Their Values & Rights
- Observing Professional Ethics and Adhering to all Obligations
- Commitment to Health, Safety and Environment
- Commitment to Providing Desired Quality
- Cherishing Creativity, Initiative and Innovation Culture
- Promoting Continual Technical & Managerial Improvements
- Commitment to Win-Win-Win Relationship

Services
- Project Development
- Project Management
- Engineering
- Procurement
- Construction
- Financing
- Investment
- Operation and Maintenance

Divisions

Civil
- Parks & Harbors
- Airports
- Roads, Elevated Highways & Tunnels
- Bridges

Water and Wastewater
- Dams
- Water Transfer and Diversion Tunnels
- Irrigation and Drainage Networks
- Water and Wastewater Treatment Plants
- Water Transmission Lines
- Water Consumption Collection and Transmission Lines (by Pipejacking Method)

Railway Transportation Systems
- Railways
- Urban Railways
- Monorails

Housing and Buildings
- Mass Housing
- Residential Complexes
- Townships
- Infrastructure Facilities & Landscaping
- Commercial & Office Complexes
- Sports, Recreational, Cultural & Medical Facilities

Oil, Gas and Industry
- Refineries & Petrochemical Plants
- Pumping & Compressor Stations
- Power Generation Plants, Power Transmission & Substations
- Industrial Manufacturing Plants
- Pipelines & Tank Farms
- Gas Injection Projects

Health, Safety and Environmental Policy
As a general contractor, Kayson is committed to safeguarding the health and safety of its staff and other stakeholders (such as subcontractors, partners, neighbors, visitors, etc.) and protecting the environment.

To achieve these goals, all levels of the organization and subcontractors shall adhere to the following commitments:
- Creating a safe and healthy workplace
- Minimizing the impact on the environment
- Minimizing disruption in the daily life of people and society
- Complying with legal requirements (local, national and international), and clients’ HSE requirements
- Formulating, updating, and implementing suitable and creditable models for the Company’s HSE management system
- Providing training for managers and supervisors and securing their active participation in the implementation of basic HSE principles
- Training and encouraging personnel at all levels of the organization and obliging them to abide by basic HSE principles
- Providing training for subcontractors and obliging them to comply with basic HSE principles
- Recording, investigating, researching near misses, accidents and hazards and their causes in order to eliminate them, and, if not possible, minimize the possibility of their recurrence
- Continually improving the performance of the company’s HSE management system

Quality Policy
In Concern with our Mission and to Achieve our Vision and Objectives, with Observing Values and Adhering to all Specifications and Requirements Agreed upon in Contracts, National and International Regulations and Standards, with all Staff Involvement, Kayson is committed to:
- Continual Monitoring and Improvement in Quality of Design and Construction of Projects
- Continual Improvement of Efficiency and Effectiveness of Processes based on Results of Audits, Evaluations and Performance Measurements and Organizational Improvement Management Feedbacks
- Ensuring Efficient Provision and Allocation of Resources to Execute Processes Effectively
- Empowering, Developing and Enhancing Knowledge of Employees and Increasing their Involvement in the Effective Development and Implementation of Management Systems and Knowledge and Experience Transference
- Understanding and Meeting Stakeholders’ Requirements and Expectations based on Sustainable Development and Mutual Benefit
Siah Bishe Pumped Storage Project
Upper & Lower Dams and Related Installations

Project Outline
Pumped storage hydroelectricity is one of the most efficient methods for providing balance in power grid to supply high peak demands. The Siah Bishe Pumped-storage Hydroelectric Power Project and its dams are located in Mazandaran Province, over Chaloos River, 125 km north of Tehran. It is also adjacent to Chaloos Road, 10 km north of Kandovan Tunnel (75 km from Chaloos City). It has an installed capacity of 1000 MW. In comparison to country’s other projects, which are in the primary stages or under construction, this project is unique on behalf of operation of pumped storage and type of dams. This project consists of building the first pumped storage plant and the first Concrete Face Rockfill Dam (CFRD) in the country. The project is basically intended to supply electricity at times of peak demand and create a safe consumer for the entire Iran power grid during the hours of low electrical demand.

Decline in the annual costs of depreciation of thermal power plants up to $19 M, creation of an entertaining and touristic environment for foreign and domestic tourists and employment in the project area during the period of its execution and operation are some of the other objectives of the present project.

In a tender held on 2003, the Siah Bishe Project was awarded to selected contractors, within the framework of two design-build contracts. On Aug. 3, 2003, Beta, Soils Engineering Services (SES) and Kayson Company entered into a joint venture agreement, with the last-named party as the leader of the consortium, to carry out contract A which includes designing and building of the body of two concrete-face dams as well as the main parts of the headrace tunnels and related installations. In June 2010, construction of the complementary operations of the two dams was notified to the parties.

The design of CFRD dams and the related structures was done by a team of Iranian designers and the Swedish Pöyry company (Elcowatt).

Scope of Work
■ The second phase of the project and the joint venture’s sphere of work involve detailed design, construction of two Concrete Facade Rock Fill Dams (CFRD), the concrete-face upper and lower dams, and completion of headrace tunnels. The power plant’s up and down pumped-storage reservoirs respectively have a storage volume of 4.3 and 6.9 million cubic meters, stand 82.5 & 102 meters high and 436 & 332 meters across the crest.
■ Each of the two headrace tunnels which link up the two dams is 2000 meters long, with approximate excavation diameter of 7m and final diameter of 5.7m. The tunnels will have a 40 cm thick concrete lining.

Key Statistics
■ Excavation in Rocky Ground Conditions: 2,100,000 m³
■ Excavation in Normal Ground Conditions: 4,443,000 m³
■ Rockfill: 4.9 million m³
■ Tunnel and Gallery Excavation: 190,000 m³
■ Shotcrete: 27,000 m³
■ Anchor Bars (Rock bolts): 260,000 m
■ Grout Holes: 200,000 m
■ Reinforcement: 19,000 t
■ Formwork, F1 Type: 200,000 m²
■ Movable Formwork: 75,000 m²
■ Concrete Placement: 175,000 m³
■ Length of each Headrace Tunnel: Approximately 2,000 m

Get More Info...
Siah Bishe Pumped Storage Project Upper & Lower Dams and Related Installations
The Hamedan urban sewer project was carried out by a joint-venture of Kayson and the Kuwaiti-based company Mushrif. The scope of work of the joint-venture involved supply, procurement, installation, testing, and operating polymer concrete pipes through pipejacking method. The total length of pipelines was 7,048 m with pipes of 1,200 mm and 1,400 mm diameters, of which 5,954 m was laid using pipejacking and microtunneling techniques. Because of inappropriate geological conditions of Hamedan City, 812 m of pipelines were constructed using open trench approach, while the remaining 282 m were installed via hand shield technology. In this project, special polymer concrete pipes were used. To supply the project with pipes from domestic resources, a factory belonging to Kayson Company was established and came online. For lack of experience and specialty knowledge in choosing proper machineries, the pipejacking technique was not applied successfully in the country, until this project was done. The Kayson-Mushrif joint venture was able to successfully complete this project with the help of the client, consulting engineers and project managers. This endeavor would not have been possible without the cooperation and forbearance of the people of Hamedan and the city authorities.

Key Statistics
- Reception & drive shafts: 64
- Manholes: 64
- 1,200-mm diameter pipes: 5,329 m
- 1,400-mm diameter pipes: 1,564 m
- 600 - 1,200 mm diameter branch pipes: 155 m
- Excavation: 60,000 m³
- Concrete: 8,000 m³
- Formwork: 12,000 m²
- Reinforcement: 628 t
Al-Teymour (Mashhad) Wastewater Treatment Plant

Project Outline
The contract of Al-Teymour Wastewater Treatment Plant includes design, procurement, construction as well as one year operation & maintenance, after the receipt of Operational Acceptance Certificate. The project will be completed within three stages; the first stage includes design, procurement and performance of the project and will be done within 30 months, the second stage lasts 6 months and consists of training, precommissioning and testing. The last stage is a period of 12 months dedicated to operation and maintenance services.

The plant is located in the area of Al-Teymour in east of Mashhad city and is defined to treat 80,000 cubic meters of urban sewage per day which is extendable up to 167,000 cubic meters/day. In its first phase, this project intends to build a model to disinfect the wastewater produced by approximately 472,000 people. If fully operated, this project will be able to account for the needs of 1,000,000 people in Mashhad.

The wastewater is treated using MLE (Modified Ludzack – Ettinger) method and the main units of the plant include coarse & fine screen, aerated grit chamber, primary and secondary sedimentation tanks, aeration tank, sludge treatments units, control and monitoring centre, as well as units of storage, administration, workshop building.

This plant is defined based on the needs of the client on the following criteria:
- Environmental improvement of Mashhad
- Achieving national sanitation standards
- Using the plant outlet for irrigating 4,445 hectares of agricultural lands

Scope of Work
- Designing of Wastewater Treatment Plant in disciplines such as Processing, Architecture, Civil, Mechanical, Electrical and Instruments & Control of the plant
- Procurement of special equipment
- Construction and installation of the plant
- Operation for one year

Key Statistics
- Earthwork: 220,000 m³
- Concrete: 27,000 m³
- Formwork: 60,000 m³
- Reinforcement: 2,800 t
- Administrative and auxiliary buildings: 1,100 m²
Project Outline
The main objective of East Anzali Wastewater Treatment Plant is to stem the increasing pollution of Anzali lagoon, rivers, and the Caspian Sea. The plant’s daily sewage treatment capacity stands at 12,000 cubic meters and it is designed to treat the household sewage of 57,000 of the city’s population which can be increased to serve a population of up to 120,000 in the future.

Anzali Wastewater Treatment Plant employs an activated sludge process and has an A2O biological system. The plant comprises two grit and grease removal, two circular primary sedimentation tanks, a wastewater pumping station, two biological units, two secondary sedimentation tanks and two coagulation unit tanks, four gravity sand filter units and finally UV disinfection basins. Units of coagulation tank, gravity sand filter (as complementary filtration) and odor removal system are what make this wastewater treatment plant distinctive compared to the other plants which are being designed and constructed in the country.

Treatment Process
Usually the first unit in a wastewater treatment plant is the “screening unit”. In Anzali Wastewater Treatment Plant, this unit is located in the pumping station outside the plant area. After screening unit, the wastewater flows into two parallel, aerated grit and grease removal chambers. When the grits are removed, the wastewater gets into two parallel “circular primary settling tanks” where 50% of suspended coarse particles are removed. Now the wastewater is ready to be biologically treated by aeration tanks. After biological treatment, wastewater flows into two parallel chambers known as “circular secondary settling tanks” where secondary sedimentation takes place. At the end of the process, effluent is transferred to four gravity sand filters (Aquazur V) where all the remaining suspended particles are removed and the wastewater is ready to be disinfected by two UV sets of lamps. The wastewater is now clear, disinfected and free from any hazardous bacteria and can be safely discharged into Anzali lagoon that is one of the most valuable and important lagoons all over the world, having the international ecological aspect.

Key Statistics
- Concrete: 9,100 m³
- Formwork: 21,000 m²
- Reinforcement: 725 t
- Light & heavy steel work: 155 t
- Earth & sludge removal: 70,000 m³
- Earthfill: 150,000 m³
- Rubble masonry: 8,190 m³
Siah Buhe Pumped Storage Project Upper & Lower Dams and Related Installations
Project Outline
Ahwaz city is divided into two eastern and western parts via Karoon River which is the only navigable river in Iran. The river not only supplies Ahwaz inhabitants with drinking water but also provides the water required for agriculture and industries in the area. Maleh stream, 5 km from the city, is located in north - south direction and ultimately pours into Shâdegân lagoon after traversing some 80 kilometers. Human sewage which pours into this stream, got water and sewer authorities of Ahwaz city provide the requirements to stem the entrance of wastewater into the stream; they also planned to treat the wastewater and discharge it into the stream.

The plant's daily treatment capacity is 112,000 cubic meters which serves a population of 522,000 inhabitant in eastern part of Ahwaz city. The project applies the advanced technology of Sequencing Batch Reactor (SBR).

Treatment process
- **Primary treatment unit**: This unit is comprised of screening as well as grit & grease removal basin which separates coarse particles (e.g. sticks, plastic materials, stone, etc.) as well as fine components (grease, gravel and sand) to stem the processes that might damage treatment equipment. The maximum daily treatment capacity of the plant is 190,800 cubic meters.
- **Biological treatment**: This part of treatment is done in the SBR tank.
- **Final treatment**: This unit is design to disinfect the water before being amplified into the stream. The disinfection process is done by UV machine.
- **Sludge unit**: This section consists of sludge holding tank, floating pump station, sludge thickener unit, disinfection & filtering basin and sludge dewatering area. The processed sludge is used in agriculture and etc. This is the first time in the country that an urban wastewater treatment plant is built with such dimensions using SBR technology.

Key Statistics
- **Earth work**: 420,328 m³
- **Total concrete**: 40,000 m³
- **Reinforcement**: 3,000 t
- **Formwork**: 70,000 m²
- **Metal work**: 1,200 t
Al-Nasseriya Water Treatment Plant and Transmission Lines Project

**Client:** Ministry of Municipalities and Public Works - Water Directorate

**Type of Contract:** Turnkey, EPC (Engineering, Procurement, Construction)

**Contract Period:** 840 days + one year for Operation & Maintenance

**Location:** Dhi Qar Province, Iraq

**Status:** Under Construction

**Scope of Work**
Water Treatment Plant, booster station and Transmission pipeline (Network), including: detail design, purchasing of equipment, construction, installation and 1 Year operation and maintenance (EPC, Turn-Key)

**Project Outline**
- Treatment Capacity: 10,000 m³/h (220,000 m³/day)
- Population under Coverage: 1,470,000 People/day

**Project Main Functions**
- Pipeline: 118 km
- Concrete: 48,000 m³
- Reinforcement: 4,900 t
- Formwork: 102,000 m²
- Administrative & auxiliary Building: 1,950 m²
- Earth work (Kias & TP): 794,000 m³
Al-Kifil Water Treatment Plant and Transmission Lines Project

Scope of Work
Water Treatment Plant & Transmission pipe Line (Network), Including: detail design, purchasing of equipment, construction, installation and 1 Year operation and maintenance (EPC, Turn-Key)

Project Outline
- Treatment Capacity: 4,000 m³/hr (88,000 m³/day)
- Population under Coverage: 560,000 People/day

Project Main Functions
- Pipeline: 56 km
- Concrete: 19,500 m³
- Reinforcement: 2,000 t
- Formwork: 15,000 m²
- Administrative & auxiliary Building: 1,880 m²
- Earth work (lines & TP): 193,000 m³

Client: Ministry of Municipalities and Public Works, Water Directorate
Contract Period: 730 days + one year for Operation & Maintenance
Type of Contract: Turnkey, EPC (Engineering, Procurement, Construction)
Location: Babylon Province, Iraq
Status: Under Construction
Tehran Sewerage Pipeline Project by Pipejacking Method

Project Outline
With the successful experience of Hamedan Pipejacking project that Kayson had, the company was elected to deliver a part of Tehran sewage network project; the pipe lines are in Tehran municipality of districts 2, 3, 4, 5, 9.

According to contracts, the length of the project route is 8,782 meter, which are implemented by pipejacking (microtunneling) method. Polymer concrete pipes with 1,600 mm and 1,800 mm diameters are used in these projects. To accomplish the project on time and within budget, Kayson decided to set up a new manufacturing line to produce the required pipes in its subsidiary factories.

Scope of Work
- Receiving and checking aerial photogrammetry images, maps of urban installations and studies on the routes for establishing pipe lines.
- Doing different geological tests on conditions of the earth and tunnel excavation techniques.
- Obtaining related permissions from Wastewater Company, the municipality of districts 2, 3, 4, 5 & 9 as well as the Traffic Department.
- Designing and constructing reception & drive shafts.
- Establishing and installing equipment within and around drive shafts.
- Executing manholes.
Sattarkhan (Ahar) Clay Core Earth Dam & Related Facilities

Project Outline
Over the last decade Iran has made huge investments to develop its hydraulic infrastructures and to utilize the nation’s immense hydropower generation capacity, creating a vast and growing market for civil and hydraulic engineering projects. In line with its diversification strategy, and in view of its extensive experience in earthwork and civil engineering, as well as to considerable human and material resources, Kayson has sought to play a more active role in the development of Iran’s hydraulic infrastructures.

The Sattarkhan Dam which was built on the Ahar river in Northwestern Iran is intended to solve two crucial problems: to control recurring river floods and to create a reservoir to serve as the primary source of water supply for local residents. This water supply would be utilized, as well, to irrigate 12,000 hectares of newly assigned cultivation land.

Main Features
Standing 75 meters high and 350 meters across the crest, Sattarkhan storage dam has a reservoir capacity of 131 million cubic meters. Sattarkhan is an earth dam with an impermeable clay core and a catchment area of about 950 square kilometers.

A diversion Tunnel - 5.5 meters in diameter, 438 meters in length and a longitudinal slope of 0.8 to 1 percent - was build to divert the river. After completion of the dam, the tunnel is used for water intake and discharge purposes. The capacity of the lower discharge tunnel is such that, with the help of the intake tunnel, it can empty the reservoir within 24 days. The dam’s intake system is capable of providing 7.8 cubic meters of irrigation water and one cubic meter of urban water per second.

Key Statistics
- Rock excavation: 625,000 m³
- Earthwork: 4 million m³
- Formwork: 41,000 m²
- Concrete: 60,000 m³

Sattarkhan Dam came on stream on November 21, 1998, a year ahead of schedule.
Poldasht Irrigation & Drainage Network

Project Outline
Poldasht Irrigation and Drainage Network is located in West Azerbaijan Province, 25 km from the city of Poldasht. The area's irrigation system was based on traditional methods such as border ditch irrigation which resulted in a lot of surface run off. The main objective of the project was, therefore, to provide a modern irrigation and drainage system for 12,000 hectares of agricultural land. The entire project was divided into five sections. The contract for the first section which encompassed an area of nearly 3700 hectares was awarded to Kayson. In addition to the diversion dam, Kayson's scope of work called for the construction of 16 primary and secondary irrigation and drainage canals, plus the related auxiliary structures, in a triangular area each of whose side spanned nearly 20 kilometers.

The Main Objectives of the Project were as Follows:
- Disposal of wastewater and drainage of farmlands
- Construction of concrete-lined canals to improve the efficiency of the irrigation network.
- To implement an economical and effective irrigation water distribution system.
- Construction of a diversion dam across Zangebar river, 36 meters long and 3 meters from the river bed to regulate and transfer the water to the main irrigation and drainage canals.

Scope of Work
- Construction of the main canals and drainage network.
- Concrete-lined irrigation canals: 35 km
- Surface drainage network: 30 km
- Administrative buildings
- Construction of service roads
- Procurement and installation of hydro-mechanical Equipment
During the last several decades, introduction of trenchless technologies have brought about great changes in the installation of underground services, particularly in large cities. Trenchless technologies enjoy numerous technical, economic, safety, environmental, and social advantages. Technologies such as pipejacking and microtunneling have enabled engineers and contractors to overcome traditional limits of open trench pipe laying techniques and are becoming increasingly important in the installation of new service pipes and sewer pipes.

Pipejacking and microtunneling are defined as two systems of directly installing pipes within the ground which is excavated using special machines; while simultaneously, pipes are derived into the channels by hydraulic jacking from a driving shaft. Driving Shafts are created at the beginning of the path to enable carrying out operations such as establishment of jack and excavating machine, pipe deriving operations and their required controlling equipment. Another shaft called Receiving Shaft is built at the end of each passage where the equipment are taken back. In the controlling system of these techniques accurate equipment and a laser guidance system are used to maintain the direction and balance of the installation. The successful installation of a sewer pipeline using pipejacking or microtunneling techniques relies on a combination of planning, extensive geological investigation, technology, utilizing the right equipment, and experienced application.

Kayson has played a pioneering role in introducing trenchless technologies by implementing Iran’s first sewer transmission pipeline in the ancient city of Hamadan using pipejacking and microtunneling techniques under one of the world’s most difficult geological conditions. In Hamadan Sewer Pipeline Project, as well as its following project, Tehran Sewerage Pipeline Project by Pipejacking Method, Kayson used polymer concrete pipes and built a manufacturing plant to ensure a steady supply of quality pipes at the right time and cost. Polymer concrete pipes have many advantages, including durability, longer useful live, high compressive strength, corrosion resistance, reduced skin friction, smooth, even, non-porous outer pipe surface, ease of installation, and uniform distribution of jacking forces.

In a recent study, the International Pipejacking Association compared the environmental, social and economic aspects of open trench and pipe jacked sewer construction in a 100-meter long, 1200-mm diameter, 4-meter deep pipeline. The results were as follows:

<table>
<thead>
<tr>
<th></th>
<th>open trench</th>
<th>pipejacking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excavated width</td>
<td>2350 mm</td>
<td>1450 mm</td>
</tr>
<tr>
<td>Reinstatement width</td>
<td>2650 mm</td>
<td>none</td>
</tr>
<tr>
<td>Excavated volume per meter of pipeline</td>
<td>18.27 t</td>
<td>none</td>
</tr>
<tr>
<td>Number of 20-tonne lorry loads per 100 meter pipeline</td>
<td>330</td>
<td>21</td>
</tr>
</tbody>
</table>

Main Advantages of Pipejacking and Microtunneling Techniques:
- Earth moving is minimized, thus optimizing time and cost.
- No groundwater lowering is required, thus preventing dangerous settlements of building foundations and disruption of road services.
- Optimum protection for workers, general public, and environment.
- Traffic flow and nearby businesses are not affected.
- Construction work is not influenced by weather, enabling contractors to meet deadlines and budget constraints.
- Enables engineers to drive a curved alignment.
Sustainable Human Development & Social Responsibility

Creating spaces for living & working, building dams to produce hydropower and irrigate farmlands, transportation systems to link people means that Kayson operates in an environment where it is constantly surrounded by people, in urban and rural areas throughout Iran as well as overseas. We see our company as a member of communities in which we work, and we support them accordingly. We integrate the local community into our daily work as much as possible. Indeed, the entire Kayson family operates according to the conviction that we have to become a part of the community we serve in order to be successful. By community we mean the people who live and work close to our projects and who are affected, in one way or another, by what we build.

Kayson people view themselves as guests and partners in these communities and therefore consciously assume a long-term responsibility to people who live there. Accordingly, all of our project management teams pursue a clear policy of community involvement and take an active interest in community happenings. No matter where Kayson is executing a project, a key success factor is good relations with local residents and neighbors. For this reason, our operational units organize site visits and other informational events where local residents, end-users and other stakeholders can learn about the company’s projects. In some cases, a public relations expert is hired to liaise exclusively with the community.

Since its inception, Kayson’s fortunes as a company and its impacts on society have been inextricably linked. This simple idea of interdependence between business and society remains at the heart of our company. What has changed, however, is the size and scope of our Company and with it our social responsibilities.