Design and implementation of intelligent systems operating in large networks

Design and implementation of intelligent dispatch-ing monitoring systems

Design and implementation of maintenance systems using artificial intelligence (compliant with asset management) (RCM, PM, PdDM, EM)

Designer, consultant and implementer of energy consumption optimization projects

Khorasan Science and \mathbf{Q} Technology Park (KSTP). Mashhad . Iran

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Think to Summit



BEHPOUYAN AMIN MONTAZE

Experience productivity with us

OF A COMPANY INTRODUCTION

Knowledge-based Behpooyan Amin Montazer Company was established in YooA with the aim of improving productivity in the field of operation, design and planning using emerging technologies in important organs and industries of the country . With divine blessings and more than a decade of operational experience and carrying out

- THINK TO SUMMIT...

more than YY₀ projects in various fields and industries and utilizing committed experts in various fields, Behpooyan Company has succeeded in developing a new approach in creating integrated platforms to improve productivity in the field. Operations, operation, planning and design are based on mathematical modeling and artificial intelligence . Close cooperation with prestigious universities in the country and the definition of

postdoctoral projects and study opportunities in operational projects has led to a relationship with industry and academia through the company and improving the quality of services and gaining knowledge in intelligence and engineering design projects of the company.

Shrek proud Bhpvyan is to provide the following services to customers honorable act : Create smart decision structures Design and implementation of intelligent dispatching Design and implementation of advanced maintenance structure and system Performing services in the field of energy, redesign and implementation of facilities

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- The first knowledge-based company in the field of energy efficiency services in the country
 - Achieving the top research rank in the Ministry of Energy in 1397 •
- Acquiring the top rank of knowledge-based companies in Khorasan Razavi province in 1996 and 1998
 - Company elected national festival of al-Khwarizmi in 1395 •





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Soft Computing

Decisions to operate in large structures such as operation of water, electricity and gas networks, money supply operations to branches and ATM In banking structures, shortterm production planning in refinery units, planning operations in the field of firefighting, purchasing planning and cost control in chain restaurants , etc. , need to create and make specialized decisions on how to plan , Exploitation and redesign , which is also currently being done by experts .

Smart Yar decision systems using AI And mathematical modeling using different modules and observing all operational and executive constraints, provides the best scenario for operation and planning operations as an intelligent assistant; In addition, considering the capability of learning this system, it can be used as an operational structure of knowledge management in the field of operation as well as operator train-

Chapter 1



INTELLIGENT NETWORK



INTELLIGENT NETWORK COMPONENTS

Creating the optimal decision to implement requires an integrated structure in which different modules can work together to perform the tasks of modeling, forecasting, optimization, evaluation . The following figure briefly describes some of these modules

BI Business 7 Intelligents

Normalization and compilation of technical indicators and preparation of reports and management dashboards for integrated management and zoom capability of information.



5 Decision Support System

Creating a decision-making system based on physical and data models in parallel with optimization algorithms, in order to stabilize system performance and reduce operating costs is a guarantee of the optimality of the decisions made.



4 Optimization

In this module, according to the problem and using linear, meta-innovative, etc., methods, optimization algorithms, considering the criteria and operational constraints, optimal performance decisions will be made.



6 Dispatching

In this module, the whole system operation and the results of module analysis are displayed and it is possible to send resources, refer to the agenda and send commands.



3 Mathematical Model

In addition to the physical model, using data mining methods, the governing mathematical model of the system is designed for optimization analysis in this section.

2 Forecast & pattern recognition

In this module, using machine learning algorithms, the desired system change algorithms are analyzed and predicted with high accuracy in the required time period and operating conditions.



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In this module, using data validating methods, if the accuracy of the data is uncertain, they are reconstructed.

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The use of artificial intelligence and optimization algorithms along with mathematical models in the form of integrated intelligent decision support systems is required in any subject where decision-making is required in large networks. Some applications of this structure are briefly described in different sections.

SCOPES

R. Water and Wastewater Industry -

Intelligence of water supply, transmission and distribution operations in metropolitan cities due to the vastness of the network and high water consumption, need to choose the best source and route for water transfer and reservoir balance and network pressure management to provide sustainable quality water, reduce water without Income, reduction of energy and operation costs, etc. are commensurate with the current consumption and restrictions



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Oil, Gas, Petrochemical and Refinery

Gas network

Due to the sharp changes in gas consumption in different seasons and days and on the other hand, the dependence of the amount pack Line, leakage as well as installation life to pressure, can be done by forecasting hourly consumption and using the hydraulic balance model of the main networks, to optimally adjust the outlet pressure TBS Acted within the permitted range . Implementing an integrated and intelligent structure of gas network operations can reduce gas and other operating costs.





Oil Refining Industries

Intelligent short-term and long-term production planning using structure DVR And optimization algorithms and creating intelligent management dashboards, upgrading the maintenance structure and intelligent repairs based on artificial intelligence are among the applications of intelligent discussion in oil refineries .



Process Industries

steel industry

Intelligent operation of arc furnace as the heart of a steel complex based on optimal models and algorithms, optimal and intelligent supply chain management is an example of intelligent applications in the steel industry that in addition to increasing production, reduces costs, manages operations knowledge And ... becomes .

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Restaurant

Optimizing the issues of purchasing, warehousing and monitoring the performance of cooking and sales in accordance with the forecast of purchasing and optimization algorithms, in an integrated structure, while reducing costs and preventing losses, leads to the implementation of knowledge management in various sectors.

Post

The issue of picking up and sending the consignment from the destination to the warehouses and from there to the destination, considering the observance of all existing parameters and restrictions, including capacity and dimensions of goods, traffic restrictions (time, volume of passage) , etc., is a very complex and very costly issue. Is a vector . Using Analytical and meta-innovation algorithms in the subject of routing (VRP) , And integrated and intelligent scheduling and management can significantly reduce the cost of these services and increase customer satisfaction .

Health

Supply chain management in the field of goods as well as health professionals, especially in times of crisis is one of the basic needs that can make the right decisions in the field of allocation and planning of equipment development using mathematical models and advanced algorithms .

Load forecast

One of the tasks of regional distribution and electricity companies is to forecast the amount of load consumed on an hourly basis . The use of advanced algorithms in this field can increase accuracy, improve development planning , operation, especially in the field of load response and operation .

Production

In order to determine the optimal combination of production in different power plants, considering all the operational limitations of each power plant and considering the amount of losses, the use of optimization algorithms, along with forecast modules and electrical models of transmission network, can generate production costs and Establish transmission while generating sustainable electricity. Also, using this system, load and shutdown response programs can be formulated and applied optimally



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Transportation and traffic

Proper fleet management to improve headway Routes, as well as relief

and monitoring the fleet performance in an integrated and intelligent

structure according to the demand, traffic and the use of optimization

algorithms, while increasing revenue and satisfaction, reduces the pas-

senger without income, reduces fuel consumption and reduces the need

for Purchasing a new fleet will maximize the efficiency of fleet operation .







Smart economy

Smart tax structure

Accurate taxation of any taxpayer in order to promote social justice requires complex and integrated structures regarding DVR, Data mining, predicts that while identifying the source of money, each person's economic portfolio can be kept updated . Carrying out activities of detecting tax evasion, handling, issuing identification cards , issuing and notifying notices up to the actions taken in the field of collection can be done in an integrated intelligent tax structure .

Smart banking

Activities in the field of banking, including loan allocation, branch money, management ATM(Investing, choosing the type of terminal, etc.) and ... can reduce costs with intelligent systems while increasing satisfaction . For example with intelligent management systemATM Can be accurately predicted by the amount of demand in each ATM, While reducing the cost of sleeping money, reduce costs associated with feeding and defiance of terminals .



The received data, as the main bases of monitoring systems and intelligent decision-making systems, should be highly reliable . systemDVR Using different algorithms, it validates and reconstructs corrupted data and provides clean data, while detecting sensor failure, etc. are other features of this system .

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PL4Demand

PREDICTION & LEARNING FOR DEMAND

In order to design as well as the optimized and secure a system , know exactly what the future's going to happen is vital . Using data mining algorithms, the behavior of the system (or any desired parameter) can be identified from the organization's database . This identification can be very useful in improving long-term and short-term planning .

- Possibility to perform forecast calculations for various time periods (hourly, daily, etc.)
- Ability to define the parameter of the factors affecting the event
- Ability to define an algorithm And compare their results
- Nose and compare it with the status of a parameter
- Ability to detect the completion of missing data in the data stack
- Learning and adapting to interest conditionsVector over time
- Data recognitionToss and delete itl



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- Data accuracy detection using network physical specifications and artificial intelligence algorithms
- Discover the parameters affecting the data using statistical processes
- Ability to define trees and process relationships dynamically using the form builder
- Use parameters affecting network behavior to identify and reconstruct abnormal data
- Reconstruction of invalid data based on artificial intelligence techniques
- Use of error minimization techniques and data correction based on network mathematical model

DATA VALIDATION & RECONCILIATION

• Use sensor data to calculate non-sensor points (Soft Sensor)

Due to the development of intelligent structures as well as dispatching systems in the country and the need to create a platform for testing the performance of these systems, dispatching and intelligence laboratory in collaboration with Behpooyan Company and Khorasan Science and Technology Park, designed by Behpooyan Company in Khorasan Science and Technology Park And implemented .



Objectives:

- Establish a proper infrastructure for testing dispatching systems
- Creating the necessary platform to test integrated decision systems
- Create a demonstration structure to better understand the application of intelligent integrated systems in different areas



Equipment :

- Ability to test dispatching systems with three layers of operator
- and video (dimensions 7 * 3 meters)
- Parallel server with the following specifications :

DECISION SUPPORT SYSTEM

Stability of system performance and reduction of operating costs are among the concerns of all organs and organizations . Create a decision support system (Decision Support System) Based on physical models and data parallel algorithms as a system optimizerDSS It is a guarantee that the decisions made are optimal

Accurate knowledge of the system

mathematical modeling

modules

Extract functional and program constraints

• Estimation and identification of optimization potentials

• Creating an integrated platform for the operation of various









Specifications of operating systems and software:

- HPE-ESXi-6.5
- Windows Server 2019
- Sql Server 2019

LABORATORY





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Chapter 2



DISPATCHING SYSTEM

FEATURES



- Communication with structures SCADA, And industrial protocols Profibus, Modbus And ...
- Display based on graphical schematic maps GIS Based
- Ability to define the level and how to display alarms and alerts
- Ability to convert alarms to references in the organization structure
- Ability to provide a graded display structure tailored to the access level

Sahand system as a native hierarchical dispatching with the ability to communicate with optimization models and intelligent algorithms as well as alarm features, job referrals, hierarchical display, etc. The ability to display conditions and performance indicators as well as optimal scenarios applicable to managers Brings.

- Has the ability to report and report in accordance with the organizational structure
- Ability to receive and display data at high rates
- Ability to create scenarios for the organization's operations and send resources
- Possibility of communication with mathematical models and optimization













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In accordance with the standard Isiri- IEC 60300-3-11 keeping Concentrated On Ability confidence (RCM) Method For Identification And Selection Line Policy of management Occurrence Breakdown Is until the To To Effect the part And Work To safety, Readiness And Economy Interest Vector Hand Found Be.



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Maintenance and repair of equipment and facilities is one of the major costs in most organizations . Upgrading the maintenance structure using new advanced algorithms increases productivity in this area .

Chapter 3



PdM PREDICTIVE MAINTENANCE



Among the capabilities of Behpooyan Company's maintenance management system:

- Ability to plan emergency, preventive, predictive maintenance and repair activities for the equipment and machinery of the organization
- Ability to record equipment reliability data based on ISO 14224: 2016 standard
- Ability to plan activities to monitor the status of key equipment of the organization according to ISO 17359: 2018 standard
- DETECTION and DIAGNOSIS of automatic equipment malfunctions
- Ability to define and assign health indicators to equipment and monitor them based on input data
- Predicting the occurrence of failure conditions of key equipment of the organization based on deviation from the condition of the equipment base
- Ability to develop advanced algorithms to analyze the cause of key equipment failure of the organization (RCFA)
- Automatic prioritization of agendas based on the importance of the device and the desired activity, operating conditions of equipment and ...

- and functional status of the teams and ...
- dicators of human resources

TECHNICAL **FEATURES**

Behpouyan Company maintenance and repair system is designed to manage different areas of the net in organizations. In this system, all processes and procedures in the field of maintenance and repairs of the organization can be implemented and executed.

In addition, in this system, artificial intelligence algorithms and advanced scientific methods have been used to increase reliability and reduce the costs of the net sector.







• Management dashboard to monitor the overall status of maintenance and repairs of the organization using technical and cost indicators



• Evaluate the performance of forces based on the performance in-



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Chapter 4

Asset Management

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The diversity of organizational assets, including physical, software, etc., on one hand, and the numerous parameters affecting organization performance and assets, on the other hand, challenge the managers with a concern that how much the equipment and facilities deviate from the optimum during the .life cycle

An asset management system based on ISO 5500 systematically ensures the efficiency of assets. The system analyzes all the asset life cycle stages, including plan, acquire, use, maintain, and dispose to improve efficiency and .availability and reduce process stops





Group 3

Life Cycl Deliverv

11. Technical Standards & Legislation 12. Asset Creation & Acquisition 13. Systems Engineering 14. Configuration Management 15. Maintenance Delivery 16. Reliability Engineering 17. Asset Operations 18. Resource Management 19. Shutdown & Outage Management 20. Fault & Incident Response 21. Asset Decommissioning & Disposal

Group 6

Risk & Revie

31. Risk Assessment & Management 32. Contingency Planning & Resilience Analysis 33. Sustainable Development 34. Management of Change 35. Asset Performance & Health Monitoring 36. Asset Management System Monitoring 37. Management Review, Audit & Assurance 38. Asset Costing & Valuation 39. Stakeholder Engagement

Asset Management

The objectives and strategies of an organization regarding asset management and planning comply with the business environment and the internal and external environment to effec implement an asset management system in the organization. Consequently, the organiza tional procedures and processes are revised according to 39 asset management sub-.jects, following the system recognition phase and Gap analysis

Behpouyan Company develops an integrated platform consisting of different components, and each component acts as a helpful tool to implement the 39 asset management subjects. Through employing intelligent structures, the efficiency of different areas, including use, maintenance, etc., can be optimized using optimization algorithms, and sys-.tem implementation can be facilitated



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strategies .



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Reducing pollution, limiting fossil resources and increasing the share of energy in the cost basket, has raised concerns about improving energy efficiency in a comprehensive manner . Performing technical audit of energy and implementation of energy management structures are among the main steps in continuous improvement of energy consumption in each sector . The interaction of parameters affecting energy consumption in the process or comfort complicates the identification and analysis of improved opportunities, which requires analysis based on calibrated models . Participate in Pouyan by providing methods Calibrated Model Energy Audit Trying to maximize the accuracy of technical and economic analysis to implement improvement strategies.

Behpooyan Company with more than 14 years of experience and carrying out numerous projects in the field of increasing energy efficiency in the country, the complete chain of the process of improving productivity in the areas of implementing energy management structure basedISO50001Performs detailed energy audits in the industrial and construction sectors, implements energy observatories to monitor energy performance, and implements optimization

Chapter 5



Asset Management





tries and by benefiting from a combination of technical and managerial expertise .

- Some projects to implement the energy management system :
- Kharg Petrochemical, Mahabad
- Gas company of South Khorasan, Hamedan, Qazvin, Hormozgan
- Mashhad Water and Sewerage Company, Hamadan Province,
- Pegah Dairy Company

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ENERGY MANAGEMENT (ISO50001-2018)

Ensuring energy efficiency requires the implementation of a continuous improvement structure in the organization, which is achieved by creating an integrated structure of monitoring, control and review . Implement such a structure according to the standardISO50001 It can be implemented under the name of energy management structure .

The close relationship between the managerial and technical aspects of this standard distinguishes it from other standards in the field of ISO, which shows the need for its implementation by an expert and experienced team in the field of energy.

Danesh Bonyan Behpooyan Company has succeeded in implementing this system in various organizations and industries due to its experience in energy auditing in various fields and indus



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South Khorasan Province, Zanjan Province and ...

mance of installations and equipment engineering studies about the idea on the evaluation and ways to improve energy efficiency are identified and assessed .

- Analysis of energy consumption records
- Field data collection with engineering equipment
- Simulation of the current situation (process, electrical, hydraulic, mechanical, etc.)
- Model calibration
- Investigate deviations from the standard and determine loss points
- Technical analysis and determination of the effectiveness of solutions
- Rial estimation of implementation of improvement strategies
- NPV, ROI)
- Preparation of optimization scenarios
- Prepare and compile energy audit report



• Economic analysis of improvement strategies (calculationIRR, TECHNICAL ENERGY **AUDIT PROCESS**



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BUILDING **ENERGY AUDIT**

The building as the largest energy consumer in the country and on the other hand due to the direct relationship with the field of health and personal hygiene has always been considered and is an energy audit process to conduct technical and economic feasibility studies with the aim of quantifying energy flow inside Building, recognizing weaknesses, recognizing and evaluating savings potentials along with improvement strategies and technical and economic analysis of these solutions based on accurate energy simulation and finally determining implementation scenarios for improvement strategies in the areas of building shell modification, air conditioning systems, Engine room installations, electrical installations, indoor and outdoor lighting

systems, etc. are in the form of technical energy audit reports .

Some building energy audit projects

- Gachsaran Oil and Gas Exploitation Company
- Iranian Oil Terminals Company
- Arvandan Oil and Gas Company
- Hamedan Gas Company
- Mashhad Water and Sewerage Company,
- Mashhad Municipality Passenger Terminals Organization
- Sistan and Baluchestan Regional Electricity Company
- Gilan Regional Electricity Company
- Yazd Electricity Distribution Company

Identify technical solutions and provide scenarios for implementing energy efficiency in industry depends on perceptions Precision Industry and the ruling is that it's important to study the history of design and analysis of operating conditions of the system and measure different parameters and meetings with managers and system operators Is obtained . Behpouyan Company in carrying out industrial energy audit projects, in addition to the equipment-oriented view, process-oriented solutions by performing technical simulations of each industry in specialized software (Aspen, WaterGems, EPanet, Digsilent, Dialux And ...) identifies and feasibility studies .

Some projects in the field of energy audit of industrial facilities :

- Industrial facilities of Arvandan Oil and Gas Company
- Cooling system of Isfahan refinery
- Ghadir Petrochemical facilities and equipment
- Stations and wells of water and sewage companies in Mashhad, Hamadan province, Ardabil province, Hormozgan province, Bushehr (rural), Kohgiluyeh and Boyer-Ahmad provinces, etc.
- Industrial facilities of Shargh Oil and Gas Company
- Pressure reducing stations of Hamedan and Hormozgan gas companies
- Industrial facilities of Birch Ceramic Factory



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INDUSTRIAL **ENERGY AUDIT**

BEHPOUYAN ENERGY EFFICIENCY MANAGEMENT SYSTEM

Increasing the share of energy costs in the total costs of the organization and on the other hand the multiplicity of energy consumption centers in organizations (buildings / facilities) shows the need to create an integrated energy monitoring structure and evaluate their comparative performance; Peyman system as a web-based system in addition to technical support for the implementation of ISO50001 standard; Provides various technical-managerial reports in this regard.

Due to the instantaneous changes in energy consumption in processes and industries, the use of online energy monitoring structure with the possibility of online monitoring of energy consumption with the baseline is required. Based on the Peyman and Sahand systems, Behpooyan Company has the possibility of creating an online monitoring structure for energy consumption in buildings as well as processes.



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Calculating energy labels (buildings, industry, etc.)

Calculate and draw the baseline

Calculate and determine prominent consumers at desired inter-

vals

- Ability to define and calculate consumption indicators and com-
- pare them at any time
- Ability to receive bills as a web service
- Proof measurement of the bow
- Support for ISO50001 deployment
- Monitor the implementation of improvement projects and their
- results
- Observation of renewable energy production
- Monitor the number and amount of energy consumption of ener-
- gy consuming equipment

Increasing energy consumption and environmental constraints have necessitated the use of renewable energy in the country's organizations, which due to the high cost of construction of these power plants, it is necessary to use accurate simulations to optimize the design of these facilities . Behpooyan Company uses renewable software in specialized fields and climatic files of each city to design renewable energy power plants .

In order to develop the use of renewable energy in Behpooyan Company in the form of a research project, the following books were compiled and the production and implementation of SA-MAP software (online system of solar water heater and geothermal heat pump) in collaboration with Khorasan Razavi Gas Company and the engineering system Has done : -

- Guide to designing, installing and maintaining a geothermal heat pump - Guide to designing, installing and operating a solar water heater pump

- Co-production (CHP, CCHP, CWP)
- Photovoltaic systems (PVsyst)
- Solar hot water production systems (SMAP, Polysun, SAM)
- Geothermal heat pump systems (GSHP) (GSHP calc)



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RENEWABLE ENERGY

In order to complete the chain of energy consumption optimization services, executive projects output energy audit reports as well as construction and construction projects are performed in this unit .



Implementation of energy consumption optimization strategies in the buildings of Sistan and Baluchestan Regional Electricity Company

- Implementation of mobile tunnel system to collect dust caused-PM Mashhad city train
- Implementation of lighting system in Haft Houd recreation area of Mashhad
- Implementation of optimization solutions in Ferdowsi study halls (Mashhad) and Allameh Dehkhoda (Bojnourd)
- Implementation of lighting system of Mehr and Razi sports halls of Mashhad Red Crescent



Some facility redesign projects:

- Redesign of air conditioning facilities of Amirkabir petrochemical buildinas
- Simulation and modification of cooling system of Isfahan oil refinery
- Redesign of ventilation ducting of the headquarters of the National Iranian Petroleum Products Distribution Company (Iranshahr Tower
- Design of groundwater drainage system of Benk pressure boosting station
- Redesign and optimization of Goreh oil pump house (heart of Iranian oil)
- Redesigned through three-dimensional lighting simulation of 35 Gachsaran oil and gas operating units

Changes in the performance of facilities and the development of structures cause the facility to be reviewed and modified from an engineering design perspective . Redesigning the facility based on simulating the current state of the system ensures this is important.

Behpooyan Company, with the help of engineering experts, accurately measures the performance of the system using engineering equipment and simulation of the existing state, calculates and estimates the necessary changes for the facilities to achieve the desired conditions through simulation and the required documents for Prepares and compiles the executive phase .









Implement optimization solutions



Implementation of gray water recirculation system

Due to water stress and the use of renewable water resources and also limits water supplies in many cities in the country, the company Behpouyan the design and implementation of greywater systems fast installation for recycled gray water WC for feeding Flash Tanks as well as water supply has irrigated the green space .

- Ability to install quickly
- Requires minimal changes to the building
- Can be installed on the ground or buried
- Very easy to operate
- Has five-layer filtration with activated carbon
- Has two filters to replace and prevent system malfunctions

EXECUTIVE UNIT



LABORATORIES & EQUIPMENT -

Measurement:







Laboratory :

Materials and Energy Laboratory

- Heat treatment furnace with a temperature of 1000 degrees
- Digital scale with an accuracy of •/I mg

Intelligence Lab

- Dispatching test room
- Parallel processing server with specifications

In order to enrich the company's projects, the research unit, as the company's communication route with the university and research centers, is responsible for monitoring the technologies and equipment required by itself and related industries, and undertakes and defines research projects that effectively communicate in this direction. With the university in the following ways and gives .

- Defining a project to create study opportunities for university professors
- Defining and attracting postdoctoral courses for company projects
- Close relationship with the university and its research institutes and laboratories to attract energy
- Or carry out joint projects with universities
- Defining the project and concluding a contract with the university for implementation,

It should be noted that according to the structure of the engineering unit and the execution unit, several projects are designed as internal or absorbed projects and reach the final product stage, including the gray water system, mobile tunnel collecting dust from the city train and ... pointed out .



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RESEARCHS & DEVELOPMENT



