



GODIŠNJI
IZVEŠTAJ
ANNUAL
REPORT

30 GODINA

delta 
inženjering
2019

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Uvod

Nije bilo jednostavno započeti samostalni put uspeha pred kraj 1989. godine i poslovati u devedesetim godinama koje su bile uslovljene teškim ekonomsko-političkim prilikama. Izazov je bio razlog za prvi korak, a svi ostali koraci su napravljeni zahvaljujući entuzijazmu i stvaralačkoj energiji, uz mnogo mudrosti i znanja prvog čoveka Delta Inženjeringa.

Prvi ugovor kojim je mlada firma zakoračila u poslovne vode odnosio se na projekat detekcije smeša opasnih i toksičnih gasova sa vazduhom u centralnom postrojenju za prečišćavanje otpadnih voda grada Kragujevca. Odmah potom smo slične projekte uradili i za desetak pogona metalurškog kombinata Smederevo, kao i za veći broj punionica tečnog naftnog gasa Naftne industrije Srbije Novi Sad. Projektovanje u oblasti gasne tehnike tada nas je definitivno obeležilo i dugo bilo naša primarna delatnost. Poslovi i investitori su se nizali dok smo mi sazrevali i rasli, sticali prijatelje, postali home engineering kompanija za mnoge velike investitorske kuće, što nam je bila ulaznica da pređemo naše i državne granice i zakoračimo u svet. Uspehe smo postizali kroz male i velike ugovore i uspeli da osvojimo i zadržimo jednu od najboljih pozicija u oblasti industrijskog inženjeringa.

Danas imamo 150 zaposlenih, od toga 120 diplomiranih inženjera. Uspešne godine poslovanja dokazuju činjenice da je promet u prethodnoj godini bio 7.674.400 miliona evra, a da će promet ove godine iznositi 15 miliona evra. Možemo da se pohvalimo da vodimo projekte svih investicija od kapitalnog značaja u državi. Među našim najvećim investitorima su EPS, Srbijagas, NIS, Klinički centar Srbije, Alumil, Messer, Henkel.

Sa Srbijagasom smo potpisali i završili ugovor za projektovanje gasovoda na deonici Niš-Dimitrovgrad, a potom radimo na izradi kompletne projektne dokumentacije trase gasovoda od Bugarske do Mađarske granice. Na projektu rekonstrukcije bloka A2 u termoelektrani Nikola Tesla u Obrenovcu, zajedno sa nemačkom firmom VPC, pružamo konsultantske usluge. Istovremeno intenzivno radimo na razvoju uloge FIDIC inženjera, tačnije Delta Inženjering ima ulogu FIDIC inženjera zajedno s nemačkom firmom DMT na projektu BTO u Kostolcu koji je završen nakon tri godine. Delta inženjering je FIDIC inženjer i na novodobijenom ugovoru izgradnje postrojenja za odsumporavanje u termoelektrani Nikola Tesla u Obrenovcu, blok B. Angažovani smo na poslovima izrade nostrifikacije projekta za izvođenje i dopunskih rudarskih projekata sa kompanijom CMEC iz Kine. Izrađujemo proračune, usklađujemo dokumentaciju sa važećom domaćom regulativom i konačno pakujemo projekte u skladu sa Zakonom o planiranju i izgradnji i Zakonom o rudarstvu i geološkim istraživanjima.

Delta Inženjering radi na rekonstrukciji Kliničkog centra Srbije. Izvođač radova je konzorcijum, koji čine Delta Inženjering i GH Holding, koji vrši radove na fazi dogradnje, rekonstrukcije i adaptacije Kliničkog centra Srbije u Beogradu. Radovi će trajati 32 meseca. Poseban projekat na ovom objektu je pristupni put od zgrade Hitne pomoći do Kliničkog centra.

Tokom svih ovih godina stekli smo veliko iskustvo na projektima ključ u ruke, kao što su fabrika sladoleda Nestle, Alumil, Volvo i Husqvarna. Veliku pažnju poklanjamo projektima iz oblasti ekologije – tretman otpadnih voda i otprašivanje.

Brojni uspešno završeni projekti u protekle tri decenije odaju sliku kako se uspešno održavamo na tržištu uz strogu konkurenciju. Trideset godina je dovoljno dug period za sve što smo postigli, ali kratak za sve što još nameravamo da postignemo.



Introduction

It was not easy to start an independent path of success towards the end of 1989 and to do business in the 1990s that was conditioned by difficult economic and political circumstances. The challenge was the reason for the first step, and all the other steps were made thanks to the enthusiasm and creative energy, with a lot of wisdom and knowledge of the Delta Inženjering's first man.

The first contract by which the young company stepped into business waters concerned a project to detect mixtures of hazardous and toxic gases with air at the central wastewater treatment plant of the city of Kragujevac. Immediately thereafter, we did similar projects for a dozen plants of the Metallurgical Kombinat Smederevo, as well as for a large number of LPG filling plants of NIS, Novi Sad. Designing in the field of gas technology then definitely marked us and for a long time was our primary activity. Jobs and investors followed each other as we matured and grew, made friends, and became home engineering company for many large investor houses, which was our ticket to cross our borders and to enter the world. We have achieved success through small and large contracts and have managed to win and maintain one of the best positions in the field of industrial engineering.

Today we have 150 employees, of which 120 are graduated engineers. Successful years of business are evidenced by the fact that the turnover in the previous year was 7,674,400 euros, and that the turnover this year will amount to 15 million euros. We can boast of running projects of all capital investment in the country. Among our biggest investors are EPS, Srbijagas, NIS, Clinical Center of Serbia, Alumil, Messer, Henkel.

We signed and completed a contract with Srbijagas for the design of the gas pipeline on the Niš-Dimitrovgrad section, and then work on the preparation of complete project documentation for the pipeline route from the Bulgarian to the Hungarian border. On the project for reconstruction of Unit A2 in Nikola Tesla thermal power plant in Obrenovac, together with the German company VPC, we provide consulting services. At the same time, we are intensively working on the development of the role of FIDIC engineer; more precisely Delta Inženjering plays the role of FIDIC engineer together with the German company DMT on the ECS project in Kostolac, which was completed after three years. Delta Inženjering is a FIDIC engineer and on a newly awarded contract for the construction of a desulphurisation plant in the Nikola Tesla thermal power plant in Obrenovac, block B. We make calculations, harmonize documentation with current domestic regulations, and finally pack projects in accordance with the Law on Planning and Construction and the Law on Mining and Geological Surveys.

Delta Inženjering is working on the reconstruction of the Clinical Centre of Serbia. The Contractor is a consortium consisting of Delta Inženjering and GH Holding, which performs works on the phase of appendage, reconstruction and adaptation of the Clinical Centre of Serbia in Belgrade. The works will take 32 months. A special project at this facility is the access road from the Emergicenter to the Clinical Centre.

During all these years we have gained extensive experience in turnkey projects such as for Nestle ice cream factory, Alumil, Volvo and Husqvarna. We pay great attention to projects in the field of ecology - wastewater treatment and dedusting.

Numerous successfully completed projects over the past three decades give us the picture of how we are successfully maintaining ourselves in the market with strict competition. A period of thirty years is long enough for all that we have achieved, but short for all that we still intend to achieve.



1 Finansijski pregled

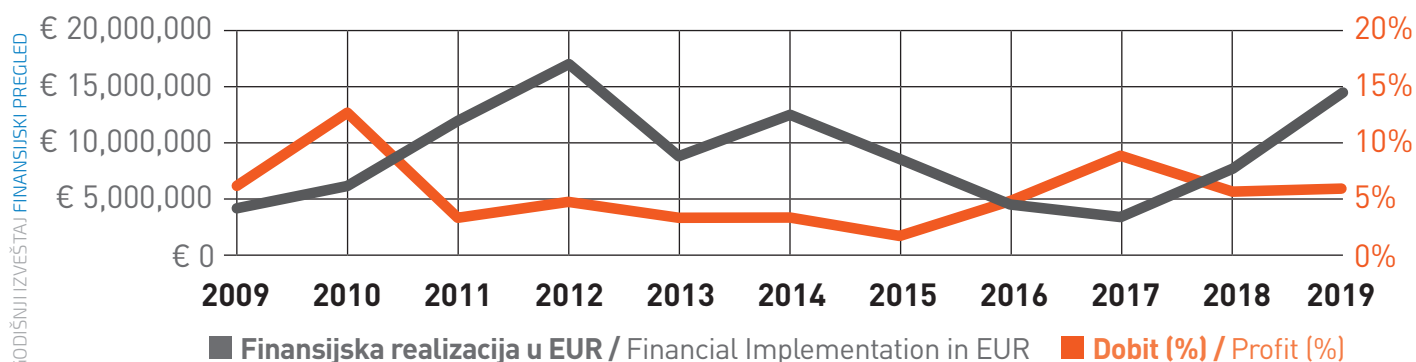
Financial Summery



Pregled realizacije i dobiti

Overview of the Implementation and Profit

Godina Year	Finansijska realizacija u EUR Financial Implementation in EUR	Dobit u EUR Profit in EUR	Procentat % Percentage %
2009	€ 4,142,354	€ 254,771	6.15 %
2010	€ 6,182,608	€ 778,260	12.59 %
2011	€ 12,014,345	€ 382,260	3.18 %
2012	€ 17,102,226	€ 800,000	4.68 %
2013	€ 8,851,000	€ 296,000	3.34 %
2014	€ 12,500,000	€ 420,000	3.36 %
2015	€ 8,600,000	€ 150,000	1.74 %
2016	€ 4,528,057	€ 219,370	4.85 %
2017	€ 3,428,891	€ 300,000	8.80 %
2018	€ 7,674,400	€ 419,410	5.47 %
2019	€ 14,975,941	€ 891,955	5.96 %





Analiza poslovanja u 2019. godini

Poslovanje u 2019. je nastavak pozitivnog trenda iz prethodnih godina. Ostvaren je rezultat od 14.975.941 evra prihoda i 891.955 evra dobiti, čime su ispunjeni planski zadaci postavljeni biznis planom.

U 2019. godini je proširena lepeza naših velikih klijenata. Sada se pored tradicionalno najvećeg EPS-a pojavljuju KC Srbije, Srbijagas i CMEC. Osim toga, u toku su i veliki ugovori EPS-a: modernizacija i ekološko unapređenje postojećih termoelektrana, otvaranje rudnika litijuma u okolini Loznice, izgradnja gasovoda Niš-Dimitrovgrad i drugo.

Očekujemo da će Delta Inženjering na većini ovih projekata učestvovati u nekom njihovom delu, bilo projektantskom, konsultantskom ili nadzoru.

14,975,941

Prihod u EUR
Income in EUR

891,955

Dobit u EUR
Profit in EUR

Business Analysis in 2019

Business in 2019 is a continuation of the positive trend from previous years. The result was 14.975.941 euros in revenue and 891.955 euros in profit, what fulfilled the planned tasks set by the business plan.

In 2019 the range of our major clients was expanded. Now, in addition to the traditionally largest EPS, appear Clinical Center Serbia, Srbijagas and CMEC. In addition, major contracts of EPS are in progress: modernization and environmental improvement of the existing thermal power plants, opening of the lithium mine neraby the city of Loznica, construction of Niš-Dimitrovgrad gas pipeline, and more.

We expect that Delta Inžering on most of these projects participate in some part, whether design, consultation or supervision.



Pregled najvećih investitora u 2019. godini

Review of the Major Investors in 2019

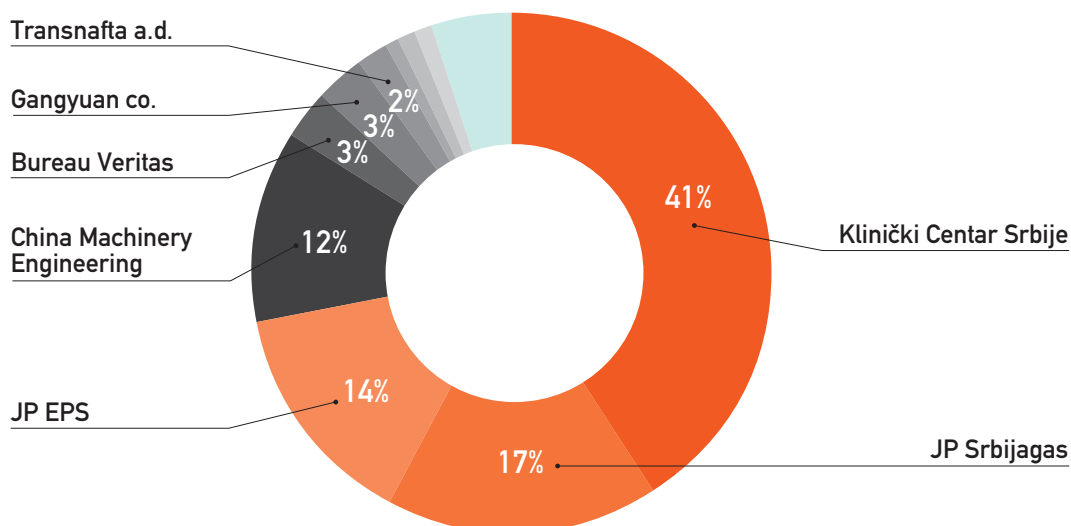


Naši najveći investitori u 2019. godini bili su: Klinički centar Srbije, Srbijagas, JP Elektroprivreda Srbije, Ogranak China Machinery Engineering Corporation, Bureau Veritas, Gangyuan co., Transnafta a.d. Pančevo, Johnson Electric Niš, Istrabenzplini d.o.o. Beograd, Hemofarm AD Vršac i ostali.

Our main Investors in 2019 were: Clinical Center of Serbia, Srbijagas, JP Elektroprivreda Srbije, Branch office China Machinery Engineering, Bureau Veritas, Gangyuan co., Transnafta a.d. Pančevo, Johnson Electric Niš, Istrabenzplini d.o.o. Beograd, Hemofarm AD Vršac and many more.

NAJVEĆI INVESTITORI U 2019. GODINI / THE MAIN INVESTORS IN 2019

Investitor / Investor	RSD	EUR	%	
Klinički Centar Srbije / Clinical Center of Serbia	729.603.121	6,197,417 €	41 %	●
JP Srbijagas, Novi Sad	294.820.917	2,504,277 €	17 %	●
JP Elektroprivreda Srbije	250.419.292	2,127,119 €	14 %	●
China Machinery Engineering Corporation	205.130.814	1,742,428 €	12 %	●
Bureau Veritas	49.178.569	417,734 €	3 %	●
Gangyuan co.	48.150.873	409,005 €	3 %	●
Transnafta a.d., Pančevo	35.905.438	304,989 €	2 %	●
Johnson Electric, Niš	20.366.999	173,002 €	1 %	●
Istrabenz plini d.o.o., Beograd	12.434.646	105,623 €	1 %	●
Hemofarm AD, Vršac	10.935.047	92,885 €	1 %	●
Ostali / Others	106.126.472	901,462 €	5 %	●
UKUPNO / TOTAL	1.763.072.188	14,975,941 €	100 %	○





Pregled kadrovske strukture u 2019. godini

U 2019. godini smo se značajno kadrovski ojačali, tako da trenutno zapošljavamo preko 100 licenciranih inženjera. Pored kadrovskog osnaživanja, fokus razvoja je bio i na softverskoj podršci kroz nove pakete programa koje zahteva tržište, a koji ujedno značajno ubrzavaju izvršenje naših usluga.

142

Ukupan broj zaposlenih
Total number of employees

100

Diplomiranih inženjera
Graduate engineers

Summary of the Personnel Structure in 2019

In 2019 we significantly strengthened our staff, so we currently employ over 100 licensed engineers. In addition to staff empowerment, the focus of development has been on software support through new software packages required by the market, which also significantly accelerate the execution of our services.

Godina Year	Zaposlenih Employees	Struktura Structure
2016	80	60 licenciranih inženjera
		60 licensed engineers
2017	92	64 diplomirana inženjera, 10 tehničara
		64 graduate engineers, 10 technicians
2018	131	83 diplomirana inženjera, 12 tehničara
		83 graduate engineers, 12 technicians
2019	142	100 licenciranih diplomiranih inženjera
		100 licensed engineers

Organizaciona jedinica Organizational Units	Broj zaposlenih na kraju 2019. Number of employees at the end of 2019
Menadžment / Management	4
Projektovanje / Design	85
Inženjering / Engineering	31
Konsalting / Consulting	3
Računovodstvo i finansije / Accounting and Finance	5
Opšti poslovi / Administrative work	14
UKUPNO / TOTAL	142



Zaključak

30-godišnjica poslovanja Delta Inženjeringa obeležena je stabilnim operativnim i finansijskim poslovanjem, te čvrstom pozicijom na tržištu, pre svega projektantskih usluga.

Učestvovali smo u svim velikim projektima iz oblasti modernizacije i revitalizacije energetskeg sistema Srbije. Osim toga, posebna pažnja bila je usmerena na dalje jačanje sektora inženjeringa, gde se posebno ističe projekat rekonstrukcije i nadogradnje zgrade Kliničkog centra Srbije. Takođe, značajno smo osnažili kadrovski i organizacioni potencijal u svim segmentima našeg poslovanja.

Osim kvalitetnim znanjem i iskustvom, Delta Inženjering raspolaže i sa dugoročnim ugovorima kako u oblasti projektovanja, tako i u oblasti gradnje. Njihova vrednosti i trajanje garantuju stabilnost poslovanja i u narednim godinama. Osim toga, u toku je pribavljanje i novih, visokovrednih ugovora. To sve obezbeđuje pokriće troškova poslovanja, ali i omogućava investicije u unapređenje poslovanja i dalji razvoj celokupne organizacije.

U 2020. godinu ulazimo sa oko 20 miliona evra potpisanih ugovora i novih poslova, što nam daje optimizam i sigurnost da možemo da planiramo prihod u 2020. godini na nivou 20 miliona evra i neto dobit u iznosu od dva miliona evra. Zadatak nam je da u 2020. godini obezbedimo ugovore čija će prenesena vrednost za 2021. godinu biti na nivou 20 miliona evra, i tako stvorimo osnovu za dalje bezbedno poslovanje naše kuće.

Uz podršku koja stiže iz bankarskog sektora, a koja nesumljivo počiva na ugledu koji posedujemo, očekujemo ostvarenje značajnih rezultata u 2020. godini.

Conclusion

The 30th anniversary of Delta Inženjering was marked by stable operational and financial business, and a firm position in the market, above all in design services. We have participated in all major projects in the field of modernization and revitalization of the Serbian energy system. In addition, special attention was paid to further strengthening the engineering sector, where the project of reconstruction and upgrading of the Clinical Center of Serbia building is particularly emphasized. Also, we have significantly strengthened our personnel and organizational potential in all segments of our business.

In addition to quality knowledge and experience, Delta Inženjering also has long-term contracts in the field of design and construction. Their values and duration guarantee the stability of the business in the

coming years. Furthermore, acquisition of the new high-value contracts is in progress. All this provides coverage of business expenses, but also enables investments in business improvement and further development of the entire organization.

We are entering with about 20 million euros in contracts and new deals in 2020, which gives us optimism and assurance that we can plan our revenue in 2020 at the level of 20 million euros and our net profit of two million euros. Our task in 2020 is to secure contracts with transferable value of 20 million euros for the year 2021, thus creating the basis for further safe operation of our company.

With the support coming from the banking sector, which is undoubtedly based on the reputation we have, we expect to see significant results in 2020.



2 Članice grupe

The Group Members



Privredno društvo za konsalting, projektovanje i inženjering



Company for consulting, design and engineering

Privredno društvo za pružanje konsalting i inženjering usluga u oblasti zaštite od požara, eksplozija i havarija



Company for consulting and engineering services in the field of fire, explosion and accident protection

Privredno društvo za proizvodnju čistih soba



ANAKVADRAT PLUS DOO BEOGRAD

Clean Room Manufacturing Company

Privredno društvo za projektovanje i izvođenje radova u oblasti metalurgije



Metallurgical Design and Construction Company

Sertifikati i licence

Pored sertifikata 9001, 14001 i 18001 koje imamo godinama, stekli smo nove sertifikate: 27001 koji se odnosi na sistem menadžmenta bezbednosti informacija i 50001 za energetska efikasnost.

Delta Inženjering je inovirao veliku licencu tako da su u potpunosti pokrivena sve aktivnosti u kojima posluje.

Certificates and Licences

In addition to the 9001, 14001 and 18001 certificates which we have for years, we acquired the new certificates: 27001 which relates to the information security management system and 50001 for energy efficiency.

Delta Inženjering has innovated the company license for construction and design so that it fully covers all the activities it operates in.





3 Prve dve decenije

The First Two Decades



→ **Prvi ugovor kojim je nova firma Delta Inženjering zakoračio u poslovne vode odnosio se na projekat detekcije smeša opasnih i toksičnih gasova sa vazduhom u centralnom postrojenju za prečišćavanje otpadnih voda grada Kragujevca.**

Odmah potom smo slične projekte uradili i za desetak pogona MKS Smederevo (sada železara HBIS) kao i za veći broj punionica TNG (tečnog naftnog gasa) NIS Novi Sad.

Projektovanje u oblasti gasne tehnike nas je tada definitivno obeležilo, dugo bilo naša primarna delatnost i ostalo naša specijalnost. Mnogobrojne instalacije prirodnog gasa prema našim projektima su izvedene u IMT Novi Beograd, Ikarbus Zemun, Brodogradilište Beograd i Zmaj Zemun, pa su usledili veći projekti za naftnu industriju Krajine i FRA Čačak, a zatim za Bijeljину, Jagodinu, NIS Promet gasa Novi Sad, Eurogas, Ekspres gas i mnoge druge.

Čak je i ideja za osnivanje Kontrolne organizacije začeta u toku mnogobrojnih pregleda i ispitivanja rezervoara TNG od 5 do 1000m³ tokom narednih godina u Srbiji, Republici Srpskoj i na Kosovu.

Da nismo postali i ostali firma koja se bavi samo gasarstvom dokazivali smo mnogobrojnim projektima za investitore kao što su rudnik bakra Majdanpek, MKS Smederevo (idejni projekti postrojenja za korišćenje otpadne toplote), fabrika Bela stena iz Boljevca na Ibru (postrojenja za dobijanje magnezijuma iz livničke šljake), a povremeno smo se otiskivali i u vode poljoprivrednog inženjerstva projektujući Genetski centar za koze Aradac, živinarsku farmu V. Šiljegovac itd.





The First Contract with which the new company Delta Inženjering entered the business streams referred to the mixtures of hazardous and toxic gases detection project with air in the central waste water treatment plant in the city of Kragujevac.

Soon after, we developed similar projects for about ten plants of MKS Smederevo (now ironworks HBIS), as well as for a large number of LPG (liquefied petroleum gas) filling stations NIS Novi Sad.

Designing in gas engineering has definitively marked us then, having long been our primary activity and remained our specialty.

Numerous installations of natural gas, according to our designs have been implemented at IMT Novi Beograd, Ikarbus Zemun, Brodogradilište Beograd and Zmaj Zemun followed by larger projects for Krajina oil industry and FRA Čačak then for Bijeljina, Jagodina, Nis Promet gasa Novi Sad, Eurogas, Ekspres Gas and many others.

Even the idea of setting up an Inspection Authority has been conceived in the course of numerous tests and examinations of the LPG tanks with the capacity of 5 to 1000m³, anticipating to be operative in the coming years in Serbia, Republika Srpska and in Kosovo.

That we have not become and remained a company handling only gas business we have proved by numerous projects for the Investors, as for instance, the copper mine Majdanpek, MKS Smederevo (conceptual designs of the waste heat utilization plants), Bela Stena factory in Boljevac on the River Ibar (plants for obtaining magnesium from foundry slag), and from time to time we delved into the waters of agricultural engineering by designing the Genetic center for goats Aradac, the Poultry farm V. Šiljegovac, etc.





Nestlé

Fabrika NESTLÉ - DELTA sladoled

Kompletan projekat po sistemu ključ u ruke fabrike za proizvodnju sladoleda u Staroj Pazovi.

Delta Ice Cream - Factory Nestle

Complete project on the turn key basis for ice cream factory in Stara Pazova.

Alumil

Kompletan projekat po sistemu ključ u ruke fabrike za proizvodnju aluminijumskih profila Alumil Yu Industry, fabrike za obradu i bojenje aluminijumskih profila Alumil Coating Srb i novog pogona za ekstruziju aluminijumskih profila.

Complete project on the turn key basis for aluminum profile production factory Alumil Yu Industry, factory for treatment and coating of aluminum profiles Alumil Coating Srb and the new plant for extrusion of aluminum profiles.



ALUMIL
Building excellence every day



Henkel Indija

Kompletan projekat po sistemu ključ u ruke Henkelove fabrike građevinskih adheziva i projektovanje i izvođenje postrojenja za proizvodnju tečnih proizvoda.

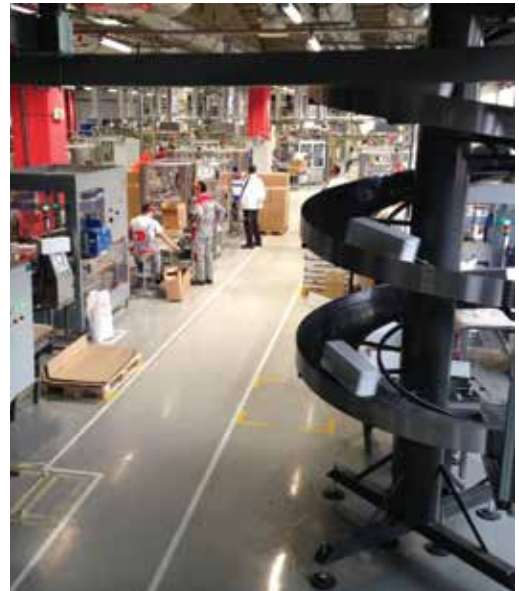
Complete project on the turn key basis for construction adhesives and the design and construction of facilities for the production of liquid products - wet production.

Henkel Kruševac

Kompletan projekat na bazi ključ u ruke za ugradnju top filtera u fabrici deterdženta.

Projektovanje objekta SVR (Superior Value Rimblock) – proizvodnja bref kuglica za negu i osvežavanje toaleta, kao i transportnog mosta gotovih proizvoda.

Complete project on the turn key basis for installation of the top filter in detergents production plant.
Design of the SVR (Superior Value Rimblock) facility – production of brief pellets for care and refreshing the toilets.





Husqvarna

Husqvarna

Delta Inženjering je imao ulogu projektnog menadžera, projektanta i generalnog izvođača radova regalno-skladišnog prostora, administrativno-upravnog i servisnog objekta distributivno-servisnog centra u Staroj Pazovi.

Delta Inženjering was entrusted a tripple role: project manager, project designer and general contractor for shelving and storage space, and office and service facilities of the distributive-service center in Stara Pazova.

Volvo

Projektovanje i izgradnja servisno-prodajnog centra za kamione volvo u Novim Banovcima.

Design and construction of service and sales center for Volvo trucks in Novi Banovci.



Železara Smederevo

Glavni i izvođački projekat postrojenja za sekundarno otprašivanje konvertorskog i mikerskog dela čeličane.

Main and construction design for secondary dedusting plant in the converter and mixer section of the steel mill.

Arcelor Mittal Zenica

Izrada glavnih projekata sistema otprašivanja livne platforme visoke peći i puštanje u rad celog sistem.

Main designs for the dedusting system of a blast furnace casting platform and commissioning of the whole system.



Messer Group

Kompletno vođenje projekta fabrike za razlaganje vazduha ASU (Air Separation Unit) u Dnjepropetrovsku u Ukrajini.

Complete project management for the Air Separation Unit in Dnipropetrovsk, Ukraine.

MESSER 





Rafinerija nafte Pančevo

Modernizacija sistema snabdevanja tehničkim gasovima i izvođenje kompletne mašinske i elektroinstalacije sistema; izrada idejnog projekta rekonstrukcije postrojenja FCC (Fluid catalytic cracking).

Oil Refinery Pančevo

Modernization of the technical gases supply system and execution of complete mechanical and electrical installation of this system; preparation of preliminary design for reconstruction of FCC (Fluid catalytic cracking) plant.



FIAT

Kompletna rekonstrukcija fabrike FIAT.

Complete FIAT factory reconstruction.



Podzemno skladište gasa Banatski Dvor

Građevinski radovi, elektroenergetsko napajanje i instaliranje merno-regulacione opreme na izgradnji novog postrojenja – linija za proizvodnju gasa.

Underground Gas Warehouse in Banatski Dvor

Civil works, electric power supply and installation of control and measuring equipment within the construction of the new plant – Gas Production Line.



Rudarski basen Kolubara

Projektovanje tehnoloških kompleksa i složenih uređaja, izvođenje radova na postrojenju za automatsko gašenje požara vodom (drenčerska instalacija), izvođenje radova na savremenom magacinu i poslovnoj zgradi za smeštaj stručnjaka površinskog kopa Zapadno polje i izrada delova novog bagera ThyssenKrupp.

Mine Basin Kolubara

Designing technological complexes and complex devices, construction of a plant for automatic fire extinguishing by water (drench installation), construction of a modern warehouse, as well as an office building for accommodation of personnel of the Zapadno Polje open pit mine and construction of vital components of a new ThyssenKrupp excavator.





4 Aktuelni projekti

Actual Projects



Konsultantske usluge na rekonstrukciji Termoelektrane Nikola Tesla A2

Delta Inženjering uspešno razvija sektor koji se bavi konsultantskim uslugama.

U okviru ovog sektora potpisali smo nekoliko ugovora sa EPS-om.

Jedan od njih je i ugovor za konsultantske usluge na rekonstrukciji bloka A2 u Termoelektrani Nikola Tesla u Obrenovcu. Na ovom projektu modernizacije bloka A2 Delta Inženjering vrši konsultantske usluge zajedno sa nemačkom firmom VPC.

Planirana je rekonstrukcija blokova A1 i A2 čime će EPS dobiti dva nova bloka sa većim kapacitetima za proizvodnju energije. Modernizacija podrazumeva podizanje proizvodnih kapaciteta i prilagođavanje ekološkim i evropskim standardima.



Consulting Services on Reconstruction of Nikol Tesla A2 Thermal Power Plant



Delta Inženjering successfully develops a consulting services sector.

Within this sector, we have signed several contracts with EPS.

One of them is a contract for consulting services for the reconstruction of A2 unit at the Nikola Tesla Thermal Power Plant in Obrenovac. In this A2 unit modernization project, Delta Inženjering performs consulting services together with the German company VPC.

The reconstruction of the units A1 and A2 is planned, giving EPS two new units with larger capacity for energy production. Modernization involves raising production capacity and adapting to environmental and European standards.



Konsultantske usluge za projekat ODG TENT B

Cilj projekta je izgradnja postrojenja za odsumporavanje dimnih gasova (ODG) na termoelektrani Nikola Tesla B (TENT B) koje će redukovati količine SO₂ i drugih štetnih produkata sagorevanja uglja, a samim tim znatno umanjiti negativne efekte na životnu sredinu.

Termoelektrana Nikola Tesla B nalazi se na desnoj obali reke Save na udaljenosti 18 km od Obrenovca i 12 km uzvodno od termoelektrane Nikola Tesla A.

TENT B čine dva bloka B1 i B2, instalisane snage 1240 MW (2 x 620 MW), a pušteni su u pogon 1983, odnosno 1985. godine. Predviđeno je da se u budućnosti izgrade još dva identična bloka. TENT B koristi ugalj iz kolubarskog basena.

Sagorevanjem uglja nastaju velike količine pepela i šljake (koje se deponuju na otvorenim odlagalištima), kao i velike količine dimnog gasa koje se, posle prolaska kroz elektrofiltersko postrojenje, odvođe do dimnjaka odakle se ispuštaju u atmosferu. Termoelektrane pri sagorevanju uglja emituju u atmosferu velike količine zagađujućih materija kao što su: azotni oksidi (NO_x), sumpor-dioksid (SO₂), ugljen-monoksid (CO), nesagoreli ugljovodonici, leteći pepeo i čađ. Sumpor-dioksid (SO₂) je najopasnija komponenta dimnog gasa iz termoelektrane, jer veoma štetno utiče na ljudsko zdravlje (izaziva respiratorne i kardiovaskularne bolesti). Naročito su opasne „kisele kiše“ koje nastaju kao posledica reakcije oksida sumpora i atmosferskih voda.





Projektom je predviđeno da se odsumporavanje dimnih gasova na TENT B vrši vlažnim tretiranjem dimnog gasa uz korišćenje krečnjaka kao reagensa. Izabrani postupak je u skladu sa najboljim dostupnim tehnologijama BAT (Best Available Technologies) za velika ložišta u referentnom EU dokumentu (LCP Bref Document).

Odsumporavanje dimnih gasova se vrši posle prolaska i prečišćavanja u elektrofilterskom postrojenju, odakle se gasovi od vode ventilatorima u apsorbere gde dolazi do samog procesa prečišćavanja, odnosno odsumporavanja. Dimni gasovi se u apsorbere uvode u donjem delu apsorbera odakle struje naviše i dolaze u kontakt sa raspršenom suspenzijom krečnjaka u vidu finih kapljica koje padaju naniže sa nekoliko gornjih nivoa za raspršivanje. Kapljice suspenzije krečnjaka su optimalne veličine

i lako apsorbuju sumpor-dioksid iz dimnog gasa. Kako je prečišćeni dimni gas na izlazu iz apsorbera zasićen vlagom, on potom prolazi kroz eliminator kapi kako bi se iz njega uklonile suvišne kapljice vode, a pre ulaska u novi zajednički dimnjak, odakle, tako prečišćen, izlazi u spoljnu sredinu.

Efikasnost smanjenja sadržaja SO₂ iz dimnog gasa u postrojenju za vlažno odsumporavanje direktno zavisi od odnosa količine suspenzije krečnjaka raspršene u apsorberu i količine tretiranog dimnog gasa. Efikasnost smanjenja SO₂ može da iznosi od 85% do čak 95%.

Kao rezultat reakcije dimnog gasa sa suspenzijom krečnjaka i sa vazduhom nastaje kalcijum sulfat tj. gips. Ovakav gips daljim tretmanom može da se koristi u komercijalne svrhe.

EPS je za projekat izgradnje postrojenja za ODG na TENT B sklopio Ugovor za konsultantske usluge (FIDIC Engineer) sa konzorcijumom koji čine: Delta Inženjering d.o.o. (Lider konzorcijuma), RWE Technology International GMBH, Essen, SEEC d.o.o. Beograd, Delta Preving d.o.o. i NDC d.o.o. Beograd. Ugovor je potpisan u julu 2019. sa rokom završetka radova (projekta) od 40 meseci.

Konzorcijum (kao konsultant) se obavezao da EPS-u (naručilac ili inestitor) uradi:

- ▲ Izrada projektnog priručnika - „Project Manual“;
- ▲ Izrada konceptijskih rešenja postrojenja za odsumporavanje;
- ▲ Podrška prilikom izrade tehničke specifikacije, uslova tenderske dokumentacije i modela ugovora;
- ▲ Učestvovanje u pripremi tenderske dokumentacije i evaluaciji ponuda u tehničkom delu;
- ▲ Pregled idejnog rešenja i idejnog projekta sa studijom opravdanosti;
- ▲ Pregled i odobravanje investiciono-tehničke dokumentacije urađene od strane Izvođača radova (PGD-projekat za građevinsku dozvolu, PZI-projekat za izvođenje, PIO-projekat izvedenog objekta);
- ▲ Praćenje izvođenja radova (da se projekat realizuje kvalitetno, na vreme i u okviru zadatog budžeta);
- ▲ Praćenje preuzimanja postrojenja i izdavanje potvrde o preuzimanju – „Taking Over Certificate“
- ▲ Praćenje probnog rada i rada u garantnom periodu;
- ▲ Završno ispitivanje i konačno preuzimanje;



Consulting Services for the Project FGD TENT B

The aim of the project is the construction of a flue gas desulphurisation plant (FGD) at Nikola Tesla B (TENT B) thermal power plant that will reduce the amounts of SO₂ and other harmful products of coal combustion, and thus significantly reduce the negative environmental effects.

Nikola Tesla B thermal power plant is located on the right bank of the Sava River at a distance of 18 km from Obrenovac and 12 km upstream of Nikola Tesla A thermal power plant.

TENT B consists of two units B1 and B2, with an installed capacity of 1240 MW (2 x 620 MW) and were commissioned in 1983, i.e. 1985. Two more identical blocks are planned to be built in the future. TENT B uses coal from the Kolubara basin. Coal combustion produces large quantities of ash and slag (which are deposited in open landfills), as well as large quantities of flue gas which, after passing through an electrostatic precipitator, are discharged to the stack from where they are released into the atmosphere. During coal combustion thermal power plants emit large quantities of pollutants into the atmosphere, such as nitrogen oxides (NO_x), sulfur dioxide (SO₂), carbon monoxide (CO), unburnt hydrocarbons, fly ash and soot. Sulfur dioxide (SO₂) is the most dangerous component of flue gas from a thermal power plant because it has a very harmful effect on human health (causes respiratory and cardiovascular diseases). Particularly dangerous is the "acid rain" that results from the reaction of sulfur oxide and atmospheric water.

The project plans flue gas desulphurisation on TENT B by wet treatment of flue gas using limestone as a reagent. The chosen procedure is in accordance with the best available technologies BAT for large combustion chambers in the reference EU document (LCP Bref Document).

The flue gas desulphurisation is carried out after passing and purification in the electrostatic precipitator, from which the gases are discharged by the fans to the absorbers, where the purification or desulphurization process takes place. The flue gases are introduced into the absorbers in its lower part from where stream upwards and come into contact with the dispersed limestone suspension in the form of fine droplets falling downwards from several upper levels for dispersion. Limestone suspension droplets are of optimal size and easily absorb sulfur dioxide from the flue gas. As purified flue gas is saturated with moisture at the outlet of the absorber, it then passes through a droplets eliminator to remove excess droplets of water from it, and before entering a new common stack, from where, thus purified enters into the external environment.

The efficiency of reducing the SO₂ content of the flue gas in a wet desulphurisation plant depends directly on the ratio of the amount of limestone suspension dispersed in the absorber and the amount of flue gas treated. The efficiency of SO₂ reduction can range from 85% to even 95%.

As a result of the reaction of flue gas with limestone suspension and with air, calcium sulphate, i.e. plaster is produced. Such plaster may be used for commercial purposes by further treatment.



EPS has entered into a Consultant Services Agreement (FIDIC Engineer) with a consortium consisting of: Delta Inženjering d.o.o. (Consortium Leader), RWE Technology International GMBH, Essen, SEEC d.o.o. Belgrade, Delta Preving d.o.o. and NDC d.o.o. Belgrade. The contract was signed in July 2019 with a completion period of 40 months.

The consortium (as a Consultant) has committed to services for EPS (Client or Investor) as follows:

- ▲ Creating a Project Manual;
- ▲ Conceptual solutions of desulphurization (FGD) plants;
- ▲ Support in the preparation of the technical specification, conditions of the tender documentation (Client's requirements) and contract model;
- ▲ Participation in preparation of tender documentation and evaluation of bids in the technical part;
- ▲ Review of Conceptual solutions for location conditions and Preliminary design with Feasibility study;
- ▲ Review and approval of the Designs prepared by the Contractor (PGD-project for a building permit, PZI-project for execution, PIO--As built design);
- ▲ Monitoring of the execution of works (that the project is implemented in requested quality, on time and within the set budget);
- ▲ Monitoring of plant takeovers and issuance of a Taking Over Certificate
- ▲ Trial monitoring and defect liability period's monitoring;
- ▲ Final examination and Final acceptance;



Sektor za upravljanje projektima Delta Inženjeringa

Glavne aktivnosti sektora su:

- ▲ Planiranje i upravljanje projektima;
- ▲ Upravljanje dokumentacijom na projektu (arhiviranje celokupne dokumentacije tokom realizacije projekta);
- ▲ Pregled i odobravanje tehničke dokumentacije;
- ▲ Konsultantske usluge u pripremi tenderske dokumentacije (uputstvo ponuđačima, opšti uslovi ugovora, modeli ugovora, tehničke specifikacije...);
- ▲ Konsultantske usluge u postupku tenderske procedure (pružanje odgovora i pojašnjenja u vezi tehničkih specifikacija, pomoć u evaluaciji ponuda...);
- ▲ Uspostavljanje projektnih procedura kao što su: početni sastanak, projektni priručnik, komunikacija i upravljanje dokumentima, organizacija gradilišta, dinamički planovi, planovi nabavke opreme, materijala i radne snage, odobravanje crteža i ostale tehničke dokumentacije, organizovanje sastanaka, izveštavanje, testiranje i inspekcija, upravljanje zahtevima za dodatne radove i varijacije, preliminarna i finalna ispitivanja i puštanja u pogon, primopredaja objekta, procedure bezbednosti na radu i zaštite životne sredine, zatvaranje projekta...);
- ▲ Konsultantske usluge tokom izgradnje kao što su: nadzor nad pripremom i organizacijom gradilišta, pregled i odobravanje crteža i tehničke dokumentacije, pregled i odobravanje dinamičkih planova za izvođenje radova, nadzor tokom izvođenja radova (u smislu praćenja kvaliteta i količine radova u predviđenim rokovima i u okviru predviđenog budžeta), odobravanje zahteva za izmenama na projektu, organizacija radnih sastanaka, obezbeđenje poštovanja sistema kvaliteta, kontrola i odobravanje faktura i naplate, praćenje fabričkih testiranja za ključnu opremu, praćenje probnog rada i završnih ispitivanja i dokazivanja projektovanih kapaciteta, učestvovanje u tehničkom pregledu objekta, odobrenje projekta izvedenog objekta, praćenje primene bezbednosti i zdravlja na radu, praćenje primene mera zaštite životne sredine, kontrola i odobravanje okončanog obračuna i primopredaja završenog objekta.



The Project Management Section in Delta Inženjering

The main activities of the section are:

- ▲ Project planning and management;
- ▲ Project documentation management (archiving all documentation during project implementation);
- ▲ Review and approval of technical/construction documentation;
- ▲ Preparation of tender documentation such as instructions to bidders, general terms of contract, contract models, technical specifications, etc;
- ▲ Involvement in the tendering procedure (providing answers and clarifications regarding technical specifications, assistance in the evaluation of tenders...);
- ▲ Establishment of project procedures such as: kick-off meeting, Project Manual, communication and document management, construction organization, time schedules - programme, procurement plans for equipment, materials and manpower, approval of drawings and other technical documentation, organization of meetings, reporting, testing and inspection, managing requests for change orders and variations, preliminary and final testing and commissioning, handover of the facility, safety and environmental procedures (HSE), project closeout, etc;
- ▲ Construction consultancy services such as: supervision of site preparation and organization, review and approval of drawings and technical/construction documentation, review and approval of time schedules for works, supervision during works (in terms of monitoring the quality and quantity of works within the scheduled deadlines and within budget), approval of requests for changes to the project, organization of meetings, ensuring compliance with the quality system, control and approval of invoices and billing, monitoring of factory acceptance testing for key equipment, monitoring of trial and final testing and proving of design capacity, participation in technical inspection of the facility (project's handover), approval of as-built design, monitoring of the implementation of safety and health at work, monitoring the implementation of environmental protection measures, control and approval of the final certificate and handover of the completed facility.



Magistralni gasovod (interkonektor) od granice Bugarske do granice Mađarske

Delta Inženjering i JP Srbijagas 18.05.2019. potpisali su ugovor o izradi Projekata za izvođenje (PZI) za potrebe izvođenja radova na projektu - Magistralni gasovod (interkonektor) od granice Bugarske do granice Mađarske.

Dužina projektovane deonice trase magistralnog gasovoda (interkonektor) granica Bugarske – granica Mađarske na teritoriji Srbije iznosi cca 400 km od početne tačke na granici sa Bugarskom do konačne – na granici sa Mađarskom.

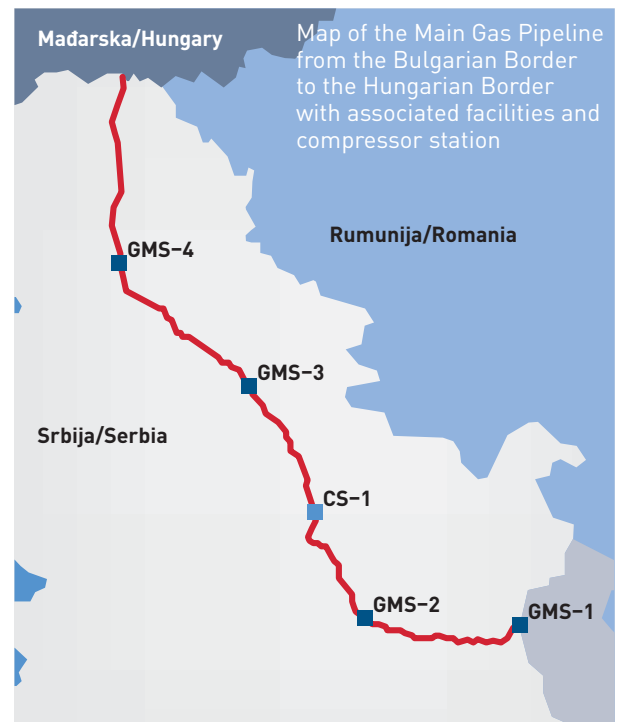
Početna tačka trase magistralnog gasovoda na teritoriji Republike Srbije je na bugarsko-srpskoj granici cca 10 km jugoistočno od grada Zaječara. Krajnja tačka magistralnog gasovoda na teritoriji Republike Srbije je na srpsko-mađarskoj granici 4 km severoistočno od mesta Horgoš.

Trasa magistralnog gasovoda na teritoriji Republike Srbije obuhvata šest deonica čija je izgradnja planirana fazno i to:

- ▲ **Deonica 1:** od bugarsko-srpske granice (okolina Zaječara) do Žabara, dužine cca 147 km;
- ▲ **Deonica 2:** od Žabara do Kovina, dužine cca 48 km;
- ▲ **Deonica 3:** od Kovina do Gospođinaca, dužine cca 112 km;
- ▲ **Deonica 4:** od Gospođinaca do srpsko-mađarske granice (u blizini Horgoša), dužine cca 92 km;
- ▲ **Deonica 5:** kompresorska stanica sa pomoćnim objektima u blizini Velike Plane;
- ▲ **Deonica 6:** Priključni gasovod i merna stanica (MS3) kod Pančeva (obrađena posebnom planskom dokumentacijom).

Projektovani magistralni gasovod je dvo-smeran, za transport gasa iz Bugarske ka Mađarskoj, kao i iz Mađarske ka Bugarskoj, prečnika DN1200 i maksimalnog radnog pritiska MOP=74 bar.

Mapa trase magistralnog gasovoda granica Bugarske – granica Mađarske sa pripadajućim objektima i kompresorskom stanicom



Na trasi magistralnog gasovoda granica Bugarske – granica Mađarske projektom je predviđena izgradnja:

- ▲ Blok stanice (BS) koje su predviđene za zatvaranje sekcija linijskog dela gasovoda sa mogućnošću pražnjenja deonica gasovoda;
- ▲ Čistačke stanice - otpremne (OČS) i prihvatne (PČS) predviđene za potrebe čišćenja i vršenja dijagnostike unutrašnjosti cevi;
- ▲ Merne stanice (MS) predviđene za komercijalno merenje protoka gasa između transportnih sistema Bugarske i Srbije.
- ▲ Kompresorska stanica (KS) kod mesta Velika Plana.

Delta Inženjering je izradio PZI dokumentaciju za deonice 2 i 3, dok se završetak PZI dokumentacije za deonice 1 i 4 očekuje u maju, odnosno 5 i 6 u julu 2020 godine.

Main Gas Pipeline (interconnector) from the Border of Bulgaria to the Border of Hungary

Delta Inženjering and JP Srbijagas 18.05.2019 have signed a contract for the development of a construction design (CD) for the purpose of carrying out works on the project - Main Gas Pipeline (Interconnector) from the Bulgarian Border to the Hungarian Border.

The length of the projected section of the main gas pipeline (interconnector) the Bulgarian border - the Hungarian border in the territory of Serbia is approximately 400 km from the starting point on the border with Bulgaria to the final point - on the border with Hungary.

The starting point of the main gas pipeline route on the territory of the Republic of Serbia is at the Bulgarian-Serbian border about 10 km southeast of the city of Zaječar. The final point of the main gas pipeline on the territory of the Republic of Serbia is at the Serbian-Hungarian border 4 km northeast of the village of Horgoš.

The main gas pipeline route on the territory of the Republic of Serbia includes six sections which construction is planned in phases, namely:

- ▲ **Section 1:** from the Bulgarian-Serbian border (Zaječar area) to Žabar, approximately 147 km long;
- ▲ **Section 2:** from Žabar to Kovin, approximately 48 km long;
- ▲ **Section 3:** from Kovin to Gospodinci, approximately 112 km long;
- ▲ **Section 4:** from Gospodinci to the Serbo-Hungarian border (near Horgoš), approximately 92 km long;



- ▲ **Section 5:** compressor station with ancillary facilities near Velika Plana;
- ▲ **Section 6:** pipeline connection and measuring station (MS3) near Pančevo (processed by special planning documentation).

The designed main gas pipeline is two-way, for gas transporting from Bulgaria to Hungary, as well as from Hungary to Bulgaria, with DN1200 diameter and maximum operating pressure MOP = 74 bar.

On the main gas pipeline route the project planned the construction of:

- ▲ Block stations, which are intended to close the sections of the line part of the gas pipeline with the possibility of emptying the sections of the pipeline;
- ▲ Pig Traps – Launching trap and receiving trap intended for cleaning and diagnostics of the pipe interior;
- ▲ Metering stations intended for the commercial measurement of gas flow between the transport systems of Bulgaria and Serbia.
- ▲ Compressor station near Velika Plana.

Delta Inženjering has prepared the construction design documentation for sections 2 and 3, while the completion of the construction design documentation for sections 1 and 4 is expected in May, respectively sections 5 and 6 in July 2020.



Nadzor nad magistralnim gasovodom od granice sa Bugarskom do granice sa Mađarskom

U maju 2019. godine Delta Inženjering potpisao je ugovor sa kompanijom Bureau Veritas za pružanje usluga stručnog nadzora nad izgradnjom transportnog gasovoda od granice sa Bugarskom do granice sa Mađarskom na teritoriji Republike Srbije.

Stručni nadzor se vrši nad radovima koji se izvode duž cele trase gasovoda, a koji obuhvataju radove za optički kabl i telekomunikaciju, geodetske i građevinske radove.

Trasa gasovoda je trenutno podeljena na deonice:

- ▲ **Deonica 1:** od bugarsko-srpske granice (okolina Zaječara) do Žabara, dužine cca 147 km;
- ▲ **Deonica 2:** od Žabara do Kovina, dužine cca 48 km;
- ▲ **Deonica 3:** od Kovina do Gospođinaca, dužine cca 112 km;
- ▲ **Deonica 4:** od Gospođinaca do srpsko-mađarske granice (u blizini Horgoša), dužine cca 92 km;
- ▲ **Deonica 5:** kompresorska stanica sa pomoćnim objektima u blizini Velike Plane;
- ▲ **Deonica 6:** Priključni gasovod i merna stanica (MS3) kod Pančeva (obrađena posebnom planskom dokumentacijom).

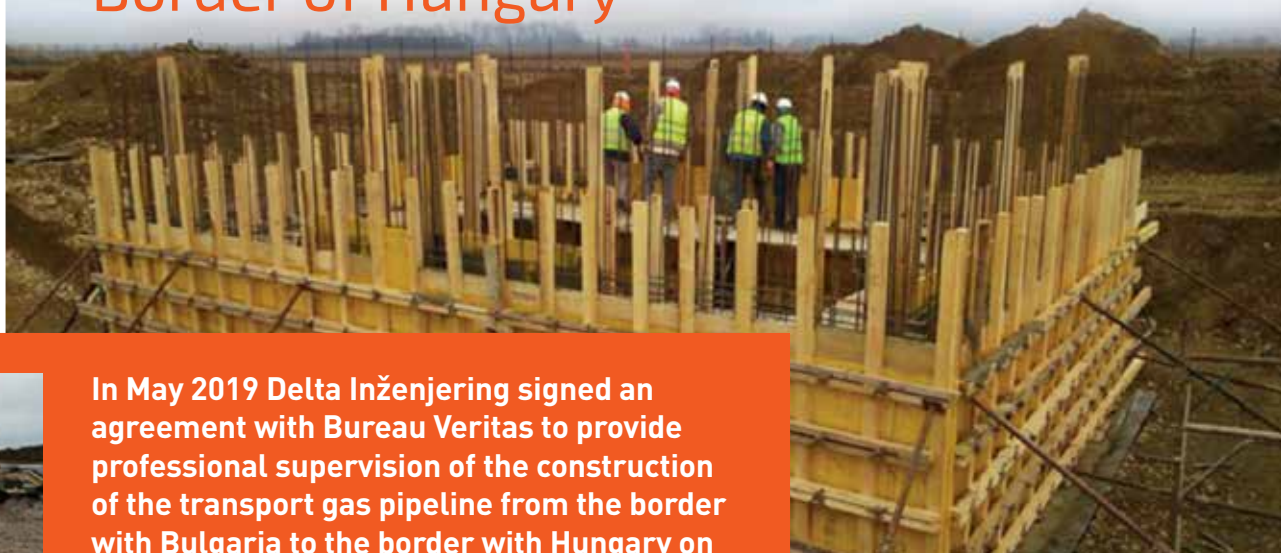
Delta Inženjering svoje nadzorne inspektore, kojih je bilo ukupno 15 od početka radova, organizuje prema planu i dinamici izgradnje magistralnog gasovoda, mernih i čistačkih stanica, blok stanica, kao i kompresorske stanice.

Za 2019. godinu su bili predviđeni pripremni radovi i polaganje cevovoda sa ukrštanjima, što je i urađeno sve uz kontrolu inspektora.

Za 2020. godinu se predviđa izgradnja merno-regulacionih stanica duž trase gasovoda, kao i kompresorske stanice, što će takođe biti urađeno pod nadzorom naših inspektora.



Supervision of the Main Gas Pipeline from the Border of Bulgaria to the Border of Hungary



In May 2019 Delta Inženjering signed an agreement with Bureau Veritas to provide professional supervision of the construction of the transport gas pipeline from the border with Bulgaria to the border with Hungary on the territory of the Republic of Serbia.



Expert supervision is carried out on works along the entire pipeline route, which include works for fiber optic cable and telecommunications, surveying and construction works.

The main gas pipeline route is currently divided into sections:

- ▲ **Section 1:** from the Bulgarian-Serbian border (Zaječar area) to Žabar, approximately 147 km long;
- ▲ **Section 2:** from Žabar to Kovin, approximately 48 km long;
- ▲ **Section 3:** from Kovin to Gospođinci, approximately 112 km long;
- ▲ **Section 4:** from Gospođinci to the Serbo-Hungarian border (near Horgoš), approximately 92 km long;
- ▲ **Section 5:** compressor station with ancillary facilities near Velika Plana;
- ▲ **Section 6:** pipeline connection and measuring station (MS3) near Pančevo (processed by special planning documentation).

Delta Inženjering organizes its supervisory inspectors, totaling 15 since the beginning of the works, according to the plan and dynamics of construction of the main gas pipeline, metering and traps, block stations as well as compressor stations.

For 2019, preparatory works and laying of the pipeline with crossings were planned, which was done with the supervision of the inspectors. The construction of metering and control stations along the pipeline route, as well as a compressor station, is planned for 2020, which will also be done under the supervision of our inspectors.



TE Kostolac B3 - CMEC

TE Kostolac B nalazi se na oko tri kilometra od desne obale reke Dunav, između sela Stari Kostolac i sela Drmno. Termoelektranu Kostolac B čine dva bloka, instalisane snage od po 348,5 MW, sa prostorom za novi blok. Novi blok će biti snage 350 MW i biće priključen na elektroenergetski sistem na naponskom nivou 400 kV preko dalekovoda i razvodnog postrojenja uz elektranu.

Za TE Kostolac B3 predviđen je protočni sistem hlađenja vodom iz Dunava. Predviđena je izgradnja novog postrojenja za hemijsku pripremu vode za blok B3. Novo postrojenje će se snabdevati sirovom vodom iz novog sistema bunara lociranih uz obalu reke Mlave.

Za ispuštanje dimnog gasa u atmosferu predviđena je izgradnja novog dimnjaka. Pre ispuštanja kroz dimnjak dimni gas će se prečišćavati u elektrofilterskom postrojenju za kontrolu čestičnog zagađenja i zatim u postrojenju za odsumporavanje dimnih gasova (ODG), koje omogućava kontrolu emisije SO₂. Predloženi postupak odsumporavanja dimnih gasova je vlažni krečnjak-gips postupak, sa krečnjakom kao sorbentom i gipsom kao krajnjim nusproduktom. Posle ODG predviđen je vlažni elektrofilter za odvajanje submikronskih čestica dimenzija 10µm i manje i zadovoljenje svih EU propisa. Krečnjak će u zrnastom obliku biti dopreman na lokaciju železnicom. U krugu elektrane je predviđen prostor za skladište krečnjaka zatvorenog tipa.

Pepeo i šljaka će se iz bloka B3 prikupljati u silose. Iz silosa pepeo i šljaka se ili ubacuju u sistem hidrotporta prema deponiji na površinski kop Drmno ili se isporučuju spoljnim korisnicima sredstvima drumskog transporta. Gips iz postrojenja za odsumporavanje će se izdvajati u obliku suspenzije. Predviđeno je da se suspenzija gipsa usmerava na postrojenje za sušenje, iz koga će se dobijati gips koji će se prihvatiti u zatvoreno skladište.

Ugalj sa kopa Drmno će se dopremati preko nove linije drobljenja i skladištenja, koja će imati mogućnost preuzimanja uglja sa postojećeg sistema skladištenja i dopreme kao mogućnost predavanja uglja postojećem sistemu dopreme uglja.

Na osnovu međudržavnog sporazuma o ekonomskoj i tehničkoj saradnji u oblasti infrastrukture sklopljenog između NR Kine i Republike Srbije, 2010. godine je zaključen opšti ugovorni sporazum i dva posebna ugovorna sporazuma sa kineskom kompanijom CMEC (China Machinery Engineering Corporation) o realizaciji paketa projekata u Termoelektrani i kopovima Kostolac.

U prvoj fazi planirana je rekonstrukcija bloka B1 sa rekonstrukcijom elektrofiltera, izgradnja sistema odsumporavanja u TE Kostolac B, izgradnja luke i izgradnja železničke pruge. Rekonstrukcija bloka B1 je završena, a sistem odsumporavanja dimnih gasova je pušten u rad.

JP EPS sa ogrankom TEK0 Kostolac je trenutno u postupku izrade projektne dokumentacije za realizaciju druge faze Paketa projekata TE Kostolac B, koja obuhvata izgradnju novog bloka snage 350 MW (Blok B3) na lokaciji TE Kostolac B. Projekat se realizuje uz finansijsku podršku i saradnju sa partnerima iz NR Kine.





Projekat bloka B3 je podeljen na funkcionalne celine, od kojih svaka obuhvata grupu tehnološko-mašinskih, elektroenergetskih i upravljačkih sistema, građevinskih konstrukcija i zgrada i svu neophodnu infrastrukturu. Ove celine odražavaju faznu realizaciju projekta koja se ogleda u faznoj izradi projektne dokumentacije i izgradnji samog objekta.



Kompanija Delta Inženjering, kao lokalni partner, u skladu sa potpisanim ugovorom sa kineskim kompanijama CMEC/SINOMACH angažovana je na poslovima izrade projekata za izvođenje i dopunskih rudarskih projekata, za koje su već urađene prethodne faze projekata i dobijene građevinske dozvole, na sistemima:

Funkcionalna celina 5 = DFE/PZI 050	→ Glavni tehnološki sistem
Funkcionalna celina 6 =DFE/PZI 061	→ Odsumporavanje dimnog gasa (ODG)
Funkcionalna celina 7 = DFE/PZI 062	→ Sistem krečnjaka
Funkcionalna celina 8 = DFE/PZI 070	→ Vlažni elektrostatički filter (WESP)
Funkcionalna celina 9 = DFE/PZI 080	→ Doprema uglja, SMD/DRP 081 – Spoljašnji sistem
Funkcionalna celina 10 = DFE/PZI 091	→ Unutrašnji transport pepela i šljake
Funkcionalna celina 11 = DFE/PZI 092	→ Spoljašnji transport pepela i šljake

Dokumentacija CMEC-a predstavlja podloge Delta Inženjeringu za izradu projekata za izvođenje i dopunskih rudarskih projekata, a za izradu tih projekata Delta Inženjering izrađuje proračune, usklađuje dokumentaciju sa važećom domaćom regulativom i konačno pakuje projekte u skladu sa Zakonom o planiranju i izgradnji i Zakonom o rudarstvu i geološkim istraživanjima.



Thermal Power Plant Kostolac B3 - CMEC

The thermal power plant Kostolac B is located about 3 km from the right bank of the river Danube, between the village of Stari Kostolac and the village of Drmno. The thermal power plant Kostolac B consists of two blocks, each with installed capacity of 348.5 MW, with space for the new block. The new block will be with capacity of 350 MW and will be connected to the electric power system at a voltage level of 400 kV via a transmission line and an electrical substation.

For the thermal power station Kostolac B3 is planned a flow system of cooling with water from the Danube. It is planned construction of a new water chemical treatment plant for the block B3. The new plant will be supplied with raw water from a new system of wells located along the Mlava River.

Construction of a new stack is planned for the discharge of flue gas into the atmosphere. Before discharging through the stack, the flue gas will be purified in the electro-filtering plant for control of particle pollution and then in the flue gas desulphurization plant (FGD), which enables control of the SO₂ emission. The proposed flue gas desulphurization process is a wet limestone-gypsum process, with limestone as sorbent and gypsum as final by-product. After FGD is planned a wet electrolytic filter for separation of sub-micron particles measuring 10 µm and less and satisfaction of all EU regulations. Limestone in granular form will be transferred by railway to the location. In the complex of the thermal power plant there is a space for the limestone storage of a closed type.

Ash and slag will be collected from the block B3 in the silos. From the silos ash and slag are either inserted into the hydrotransport system towards the landfill on the open-pit mine Drmno or delivered to external users by means of road transport. Gypsum from the desulphurization plant will be separated in the form of a suspension. It is planned that the gypsum suspension will be directed to a drying plant from which gypsum will be received and then admitted into a closed warehouse.

Coal from Drmno will be delivered through a new line of crushing and storage, which will have the possibility of taking coal from the existing storage and delivery system, as a possibility of coal transfer to the existing coal delivery system.

As a local partner, and in accordance with On the basis of an interstate agreement on economic and technical cooperation in the field of infrastructure between the People's Republic of China and the Republic of Serbia, in 2010 a general contractual agreement and two separate contractual agreements were concluded with the Chinese company CMEC (China Machinery Engineering Corporation) on the implementation of a package of projects at the thermal power plant and mines Kostolac.

In the first phase, the reconstruction of block B1 with the reconstruction of electrostatic precipitators, the construction of the desulphurization system in TPP Kostolac B, the construction of the port and the railway line are planned. The reconstruction of block B1 was completed and the flue gas desulphurization system was put into operation.

JP EPS with TPPs-OCMs Kostolac Branch is currently in the process of developing project documentation for the implementation of the second phase of TPP Kostolac B Project Package, which includes the construction of a new 350 MW unit (Block B3) at TPP Kostolac B. The project is implemented with financial support and cooperation with our partners from the PRC.



The Block B3 project is divided into functional units, each comprising a group of technological-mechanical, power and control systems, construction structures and buildings and all necessary infrastructure. These units reflect the phased realization of the project, which is reflected in the phased development of the project documentation and the construction of the facility itself.



The company Delta Inženjering, as a local partner, in accordance with the signed contract with the Chinese companies CMEC/SINOMACH is engaged in the preparation of construction and supplementary mining projects, for which the previous stages of projects have already been completed and building permits obtained, on the systems:

Functional Unit 5 = DFE/PZI 050	➔ Main Technology System
Functional Unit 6 =DFE/PZI 061	➔ Flue gas desulphurization (ODG)
Functional Unit 7 = DFE/PZI 062	➔ Limestone system
Functional Unit 8 = DFE/PZI 070	➔ Wet electrostatic precipitator (WESP)
Functional Unit 9 = DFE/PZI 080	➔ Supply of coal, DRP / SMD 081 – External coal supply system
Functional Unit 10 = DFE/PZI 091	➔ Internal transportation of ash and slag
Functional Unit 11 = DFE/PZI 092	➔ External transportation of ash and slag

Documentation of the company CMEC is the base for Delta Inženjering to prepare construction design and supplementary mining designs, and for preparation of those projects Delta Inženjering makes estimations, coordinates the documentation with applicable domestic regulations and finally packages projects in accordance with the Law on Planning and Construction and the Law on Mining and Geological Explorations.



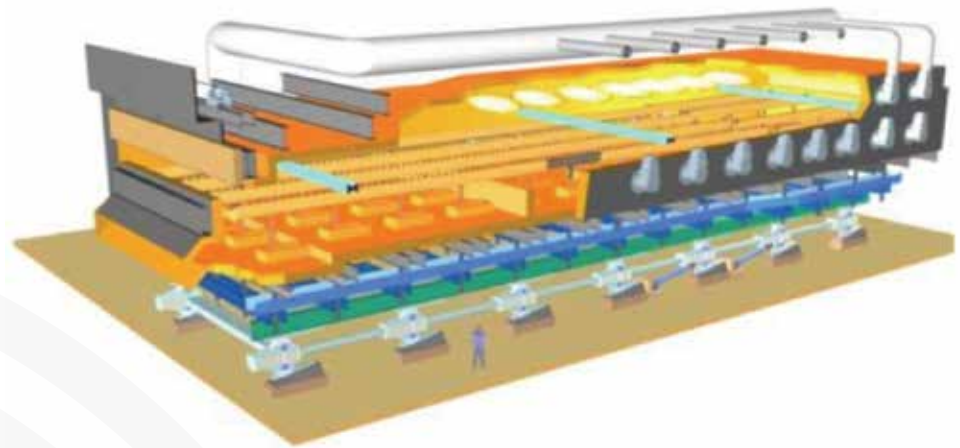
Koračna peć u smederevskoj železari

U okviru postojeće železare HBIS GROUP Serbia Iron & Steel d.o.o. Beograd - ogranak Smederevo, u pogonu tople valjaonice planirana je izgradnja koračne peći sa pratećim objektima kao i novog gasovoda za visokopećni gas od visoke peći do tople valjaonice.

Proizvodna linija toplog valjanja limova od 2.250 mm trenutno ima dve potisne peći, koje koriste mešani gas (mešavinu prirodnog gasa i visokopećnog gasa) kao gorivo. Potrošnja energije po toni je visoka i iznosi oko 2,16 GJ/t čelika. Da bi se uštedela energija, smanjila potrošnja i poboljšao kvalitet grejanja slabova, planirana je izgradnja peći regenerativno-koračnog tipa. U poređenju sa postojećim potisnim pećima, potrošnja energije po toni čelika u novoj koračnoj peći bi trebala da bude smanjena na 1,3 GJ/t.

Projektovani kapacitet nove peći je 1.690.000 t/god. Za postizanje rada tople valjaonice punim kapacitetom od 2.200.000 t/god potrebno je da se pored nove peći koristi jedna od dve postojeće peći.

Projekat obuhvata projekat koračne peći, prateće opreme (rolganga na strani utovara i strani pražnjenja, uređaja za punjenje i pražnjenje, sistema za hlađenje isparavanjem), objekta za ventilatore svežeg vazduha, trafostanice, objekta za ventilatore izduvnih gasova, objekta za prihvatanje povratnih slabova, gasovoda visokopećnog gasa u dužini od 900m.



Punjenje peći vrši se uređajem za punjenje koji hladan slab skida sa rolganga i prebacuje ga u peć. Peć je koračnog tipa sa mehanizmom koji pomoću hidrocilindara i valjaka pomera slabove unutar peći. Peć je tako projektovana da obezbeđuje odgovarajuću zagrejanost (temperaturu) slabova i pri tome minimizira oštećenje slabova tokom njihovog pomeranja. Pražnjenje peći se vrši uređajem za pražnjenje peći koji zagrejan slab izvlači iz peći i postavlja na rolgang linije za toplo valjanje.

Nova peć koristi visokopećni gas kao gorivo, primenjujući dualni vazdušno-gasni regenerativni grejni metod, temperatura izduvnog gasa se smanjuje na ~ 150°C, te je stoga recikliranje otpadne toplote dimnog gasa na maksimalnoj granici, čime se postiže ušteda energije i smanjuje potrošnja prirodnog gasa.

Stepper Type Furnace in Smederevo Steel Mill

Within the existing steel mill HBIS GROUP Serbia Iron & Steel d.o.o. Belgrade - Smederevo Branch, in the hot rolling mill is planned construction of a stepper type furnace with associated facilities, as well as a new pipeline for blast furnace gas from a blast furnace to a hot rolling mill.

The 2,250 mm hot rolling production line currently has two pusher type furnaces, which use mixed gas (a mixture of natural gas and blast furnace gas) as fuel. Energy consumption per ton is high and amounts about 2.16 GJ/t steel. In order to save energy, reduce consumption and improve the heating quality of slabs, it is planned construction of a regenerative and stepper type furnace. Compared to the existing pusher type furnaces, the energy consumption per ton of steel in the new stepper type furnace should be reduced to 1.3 GJ/t.

The design capacity of a new furnace is 1,690,000 t/year. In order to achieve hot rolling mill operation with a full capacity of 2,200,000 t/year, it is necessary to use one of the two existing furnaces in addition to the new furnace.

The project includes a stepper type furnace project, associated equipment (roll gang on loading and unloading side, filling and discharging equipment, evaporative cooling system), fresh air fan facility, substation, exhaust fan facility, backflow receiving facility, and blast furnace gas pipeline in the length of 900m.

The filling of the furnace is done by a filling device which removes the cold slab from the roll gang and transfers it into the furnace. The furnace is a stepper type with a mechanism that moves the slabs inside the furnace by means of hydraulic cylinders and rollers. The furnace is designed to provide adequate heating (temperature) of the slabs while minimizing damage to the slabs during their movement. The furnace is emptied by a furnace emptying device which removes the heated slab from the furnace and places it on roll gang lines for hot rolling.

The new furnace uses blast furnace gas as fuel, using dual air-gas regenerative heating method, the exhaust gas temperature is reduced to ~ 150 ° C, and thus recycling of flue gas waste heat is at the maximum limit, thereby saving energy and reducing natural gas consumption.





Gradilišni kamp na lokaciji Šajkaš

Radi izgradnje glavnog toka magistralnog gasovoda granica Bugarske – granica Mađarske na teritoriji Srbije, potrebno je postavljanje gradilišnih kampova privremenog karaktera, koji služe za smeštaj radnika, mehanizacije i potrebnog materijala do završetka radova na pomenutom gasovodu.

Delta Inženjeringu je povereno projektovanje gradilišnog kampa na lokaciji Šajkaš. Gradilišni kamp se sastoji iz tri celine: dela za smeštaj i ishranu radnika; stambeno-poslovnog dela i platoa za odlaganje cevi.

Objekti koji se nalaze u delu za smeštaj radnika su kontejnerskog tipa. U njima se nalaze smeštajne jedinice za tri ili za dva radnika sa sanitarnim blokovima i toaletom, kancelarije, arhiva i sala za sastanke, perionica veša, portirnica i ambulanta. U okviru stambeno-poslovnog dela se nalazi i teren za sport na otvorenom. Plato za odlaganje cevi služi za smeštaj gasovodnih cevi koji se polažu na šljunčanu uređenu podlogu.

Fasada objekata je od termoizolacionih samonosećih panela sa ispunom od kamene vune, debljine 13,0 cm, plastificiranih u RAL-u prema zahtevu investitora. Svaka montažna jedinica je dimenzija 606x244cm i dilataciono je odvojena od susedne. Moduli se sastoje od montažnih elemenata kako bi se pojednostavili procesi montaže na licu mesta i kako bi se omogućilo korišćenje nekvalifikovane radne snage. Svaka jedinica sadrži detaljna uputstva za sastavljanje i rastavljanje i pakovanje.

Jedinice mogu biti spojene zajedno na obe strane (duge i kratke) ili istovremeno na obe strane, a srednji paneli uklonjeni. Spojnica se izvodi pomoću namenskog priključnog kompleta, sa ugrađenim ili uklonjenim panelima, potpuno otpornim na vremenske prilike. Tip temelja zavisi od nosivosti tla. Temelji mogu biti betonska podna ploča za zgradu, ojačana kontinualnim ivičnim gredama ispod osa stubova ili izolovanim postoljem.

Glavna interna saobraćajnica unutar gradilišnog kampa je širine šest metara predviđena i projektovana kao prsten oko stambeno-poslovnog dela kampa. Interne saobraćajnice drugog reda su takođe projektovane prema nameni i vrsti saobraćaja koji se njima odvija. Sve saobraćajnice unutar gradilišnog kampa su predviđene za kretanje vatrogasnog vozila. Interne saobraćajnice u delu kampa koji je predviđen za skladištenje cevi (na otvorenom, podloga uređena sa završnim slojem šljunka) projektovane su za kretanje teške mehanizacije (cevopolagača), koja opslužuje utovar i istovar cevi.

Unutar gradilišnog kampa u okviru stambeno-poslovnog dela je predviđen parking za putnička vozila, kombi vozila kao i autobuse koji prevoze radnike do trase izgradnje gasovoda. Pešački pristup objektima predviđen je stazama.





The Construction Camp at the Šajkaš Location

In order to build the main stream of the main gas pipeline from the Bulgarian border to the Hungarian border on the territory of Serbia, it is necessary to set up temporary construction camps, which serves for the accommodation of workers, machinery and necessary materials until completion of the works on the said pipeline.

Delta Inženjering was entrusted design of the construction site at the location Šajkaš. The construction camp is made up of three sections: for the accommodation and nutrition of workers; residential-business section and plateau for pipe disposal.

The buildings in the workers' accommodation area are of container type. They include accommodation units for three or two workers with sanitary blocks and restrooms, offices, archives and meeting rooms, laundry facilities, porters and ambulances. Within the residential-business part there is an outdoor sports ground. The gas pipe disposal plateau is used to house gas pipes laid on a pebbly ground.

The facade of the buildings is thermal insulation, self-supporting panels filled with stone wool, 13.0 cm thick, plasticized in RAL, according to the requirements of the Investor. Each mounting unit is 606x244cm in size, and dilatation separated from the adjacent one.

The modules consist of prefabricated elements to simplify on-site installation

procedures and use of unskilled workers. Each unit contains detailed instructions for assembly, disassembly and packaging.

Units can be joined together on either side (long and short) or both sides, and the middle panels removed. The coupler is performed using a dedicated connection kit, with panels installed or removed, fully weatherproof. The type of foundation depends on the bearing capacity of the soil. The foundations may be a concrete floor slab for the building, reinforced by continuous edge beams below the pillars axis or insulated plinth.

The main internal road inside the camp site is six meters wide and designed as a ring around the residential and business part of the camp. Second-order internal traffic is also designed according to the purpose and type of traffic that goes on them. All roads within the construction camp are intended for the movement of fire trucks. Internal roads in the part of the camp intended for the storage of pipes (outdoors, substrate arranged with a final layer of gravel) are designed for the movement of heavy machinery (pipelines), which serves loading and unloading pipes.

Within the residential-business part of the construction camp, parking is planned for passenger vehicles, vans and buses which transport workers to the gas pipeline construction route. Pedestrian access to the buildings is provided with trails.



Postrojenje za tretman procednih voda deponije Vinča

Delta Inženjering je sa firmom SUEZ iz Francuske ugovorio izradu projektne dokumentacije i izvođenje mašinskih i elektroradova na izgradnji postrojenja za tretman otpadnih procednih voda koje se formiraju na deponiji gradskog komunalnog otpada Vinča.

Deponija Vinča je formirana 1978. godine. Sredinom devedestih godina odlučeno je da se zatvore lokacije svih gradskih deponija izuzev deponije Vinča, koja je, počev od 1998. godine, jedina deponija na području grada Beograda. U ovom trenutku ona može da primi oko 2.000 tona otpada dnevno, što je čini najvećom deponijom u Srbiji.

Deponija Vinča se nalazi neposredno izvan granica grada Beograda, na oko 11 km istočno od centra Beograda i oko 1,5 km zapadno od reke Dunav. Deponija Vinča danas sadrži oko 11 miliona kubnih metara otpada i prostire se na površini od 40 ha. Masa deponovanog otpada ne sadrži aktivni pokrivač i obrušava se u pravcu Dunava (koji se nalazi na 1,5 km istočno) i predstavlja pretnju po životnu sredinu.

Cilj izrade tehničke dokumentacije i izvođenja radova je izgradnja postrojenja za prečišćavanje procedne vode iz tela deponije Vinča, kako bi se sprečilo oticanje zagađene vode u Dunav.

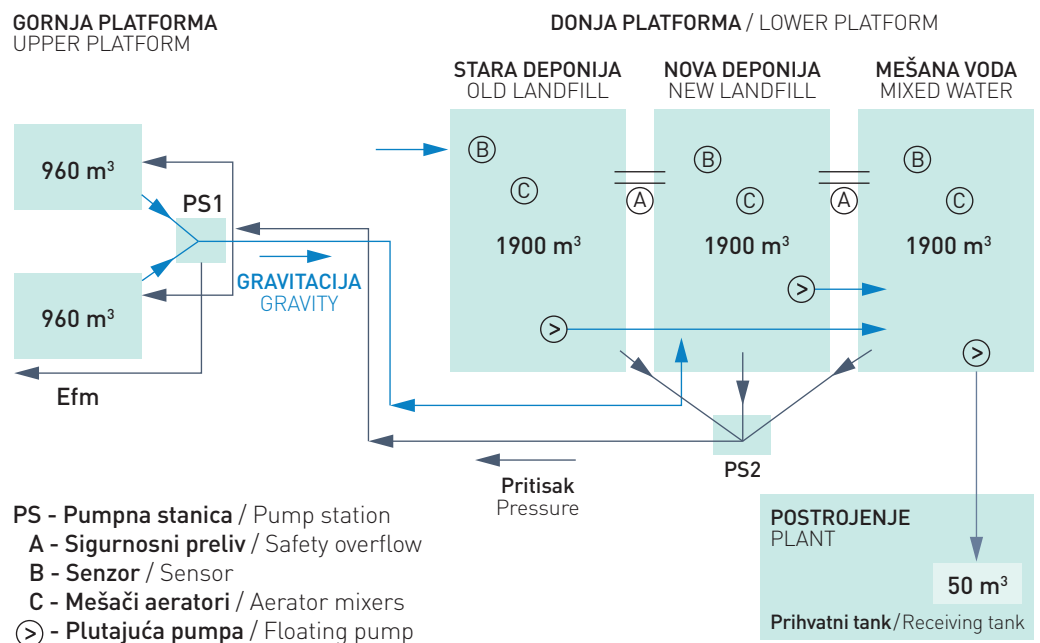
Postrojenje za prečišćavanje procednih voda sa deponije Vinča sastoji se od sledećih delova:

- ▲ Predtretman;
- ▲ Acidifikacija,
- ▲ Reverzna osmoza (RO);
- ▲ Evaporacija;
- ▲ Završna reverzna osmoza;
- ▲ Predtretman biogasa;

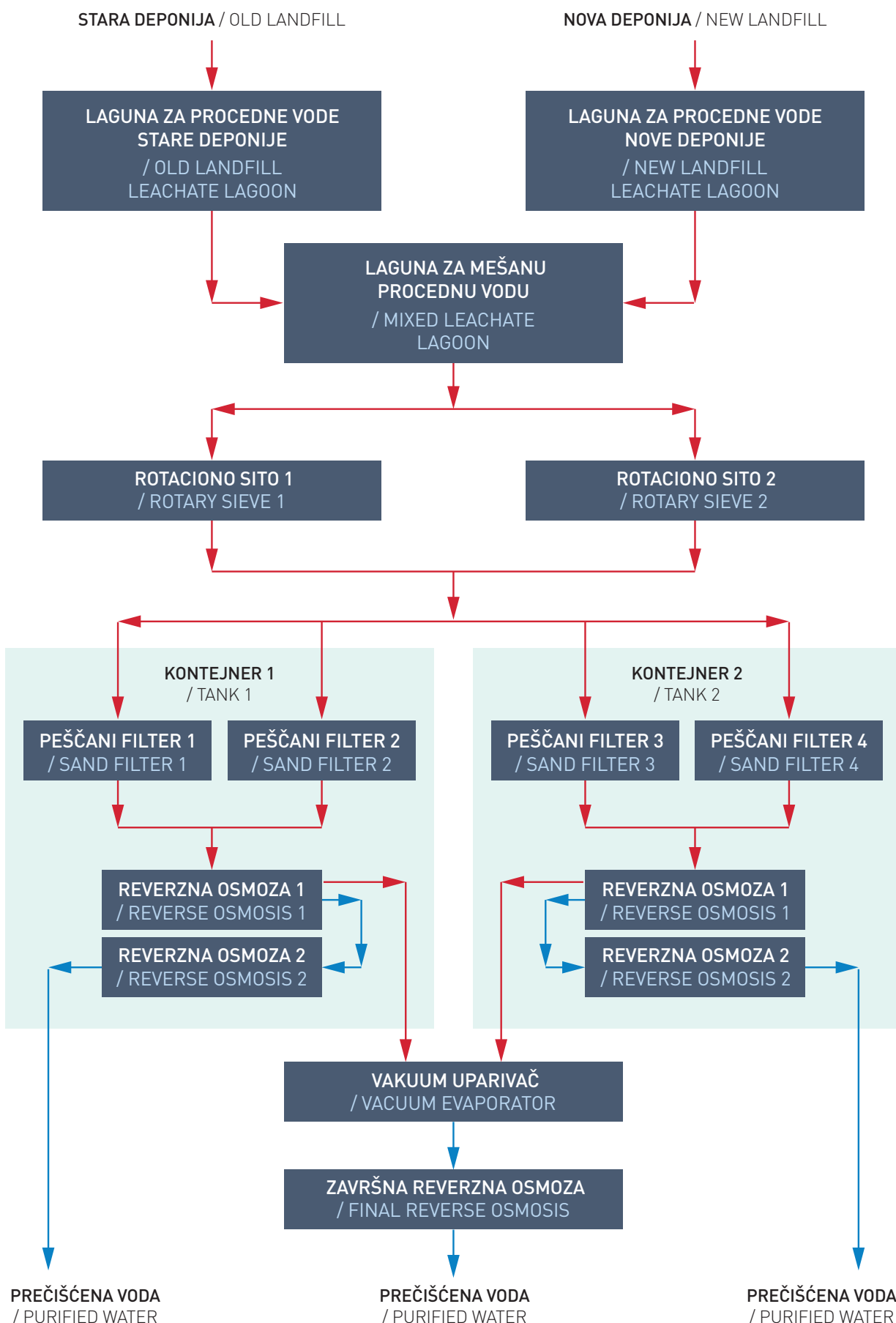
Za potrebe evakuacije voda iz tela deponije, predviđen je drenažni sistem koji sve zagađene vode odvodi do laguna koje transportuju vodu dalje na postrojenje za prečišćavanje. Nakon tretmana ove vode se mogu upustiti u Ošljansku baru i dalje u Dunav.

Šema prikupljanja procednih voda je prikazana na slici:

The scheme of collection of process waters is shown in the figure:



Blok šema procesa prečišćavanja / Block Diagram of the Purification Process





Drenažni kanali po obodu deponije prikupljaju procednu vodu i odvode je u lagune. Postoje dve lagune na gornjoj platformi, koje će sakupljati procedne vode iz nove deponije, i tri lagune na donjoj platformi, koje sakupljaju procedne vode iz stare deponije, nove deponije i treća za mešanu vodu.

Iz gornjih laguna gravitacionim cevovodom će se sakupljena procedna voda sprovesti do donjih laguna. Iz donje lagune, posle mešanja procednih voda sa stare i nove deponije (u trećoj laguni), procedne vode se transportuju do postrojenja za prečišćavanje procednih voda. Pumpna stanica na donjoj platformi je predviđena da, po zatvaranju postrojenja za prečišćavanje procednih voda (PPPV), transportuje sakupljene procedne vode u lagune na gornjoj platformi, a odatle u spalionicu.

Postrojenje za prečišćavanje procednih voda (PPPV) je dimenzionisano tako da zadovoljava:

- ▲ Sistem prečišćavanja
- ▲ Garantovane performanse postrojenja
- ▲ Uslove za ispuštanje u recipijent

U zavisnosti od ulaznog kvaliteta vode i parametra vode, tehnološkim postupcima definisanih projektom garantuje se kvalitet vode na izlazu iz postrojenja za prečišćavanje procedne vode koja se ispušta u recipijent (reka Dunav) koji je u saglasnosti sa propisima Republike Srbije.

Da bi se proces mogao odvijati nesmetano, potrebna toplota se obezbeđuje sagorevanjem dela biogasa nastalog na deponiji u kotlu na biogas ili električnim grejačem.

Predtretman

Procedna voda se dovodi u PPPV ispuštanjem iz lagune koja se nalazi pored PPPV. Pumpanje procedne vode počinje kada voda u laguni dostigne određenu visinu, a PPPV može da je primi. Procedne vode se iz laguna za procedne vode dovode na postrojenje pomoću potopljenih bunarskih pumpi montiranih u cevima.

Predtretman na PPPV Vinča podrazumeva mehaničko prečišćavanje na roto sitima i peščanim filterima (iako su oni sastavni deo postrojenja za reverznu osmozu). U predtretmanu se iz vode uklanjaju pesak, mulj i druge inertne čestice iz procedne vode.

Zakišeljavanje

Iz procedne vode je neophodno ukloniti amonijak, prisutan u procednim vodama. Slobodni amonijak može da prođe kroz membranu sistema RO i naći će se u permeatu (prečišćena voda). Zato se u filtrirane procedne vode dodaje sumporna kiselina i amonijak se pretvara u amonijum sulfat, koji ostaje u koncentratu prilikom prečišćavanja na membrani.

Reverzna osmoza

Membrana je selektivno propusna prepreka koja dozvoljava prolaz određenih komponenti, pri čemu zadržava ostale komponente rastvora. Protok materija kroz membranu je kinetički definisan primenom pritiska, napona pare, hidrostatičkog pritiska, električnog potencijala ili temperature.

Koncentrovane nečistoće bivaju zadržane na strani membrane koja je pod pritiskom, a prečišćena voda se propušta na drugu stranu membrane. Da bi bila selektivna, membrana ne treba da dopušta prolazak krupnih molekula ili jona kroz pore (otvore), ali treba da dopušta slobodan prolazak sitnijih komponenti rastvora (kao što je voda).

Zavisno od kvaliteta procednih voda (uglavnom so i organske materije), procenat dobijenog permeata (prečišćena voda) će biti oko 50% do 70% u odnosu na količinu dolazne vode.

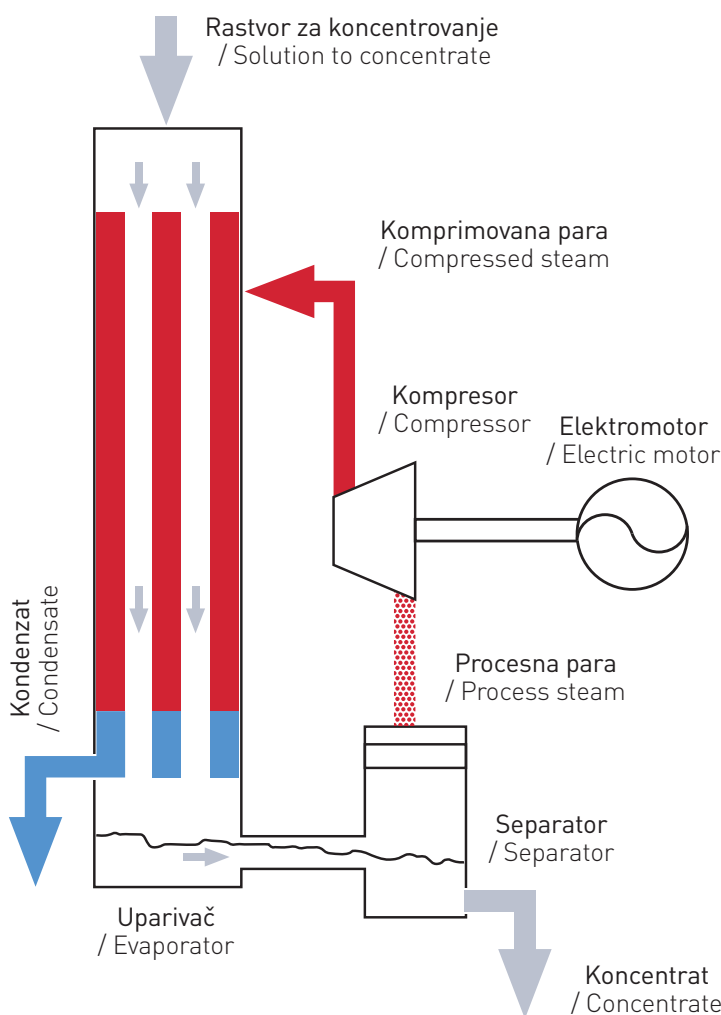
Permeat odlazi u bazen čiste vode, odakle se transportuje u recipijent, reku Dunav, uz prethodno merenje protoka, a koncentrat iz RO membrana se transportuje dalje na tretman na vakuum uparivaču.

Kod postupaka sa membranama, rastvor se priprema i upumpava pod pritiskom duž membrane i pri tome se deli u dva toka: u permeat, odnosno filtrat koji protiče kroz membranu i koncentrat, odnosno ostatak rastvora u kome su se koncentrisali sastojci vode koje je zadržala membrana.

Evaporacija – vakuum uparivač

Princip rada uparivača se odvija na takav način da vodenu paru niske temperature usisava kompresor (Mechanical vapor compressor) iz vakuum uparivača. Usisana vodena para se komprimuje i zbog kompresije zagreva. Zagrejana vodena para ulazi u izmenjivač toplote gde obezbeđuje energiju za isparavanje na zidovima izmenjivača toplote sa padajućim filmom. Sa druge strane cevnog zida, komprimovana vodena para se kondenzuje. Latentna toplota nastala kondenzacijom služi za isparavanje „rastvarača“, odnosno vode tako da se na kraju procesa sa jedne strane dobija zaprljani koncentrat a sa druge strane čista voda (kondenzat).

U uparivaču se koncentrat iz prvog stepena RO termički tretira. Zagrevanje se uglavnom postiže cirkulacijom toplote (iz kotla ili iz električnog grejača). Uparivač radi pod vakuumom, što omogućava snižavanje tačke ključanja vode i odvojanje pare od soli na nižoj temperaturi.



Završna reverzna osmoza

Sistem reverzne osmoze će se instalirati nakon vakuumskih isparivača radi tretmana kondenzata iz isparivača. RO sistem će ukloniti eventualno zaostali amonijak, soli i tragove teških metala i osigurati da vrednosti parametara budu u svakom trenutku ispod dozvoljenih granica. Procenat dobijenog permeata iz RO sistema za tretman kondenzata je 85-90%.

Koncentrat iz završne reverzne osmoze će se recirkulisati u rezervoar predtretiranih procednih voda (pre RO membrane na liniji vode), dok permeat iz drugog stepena reverzne osmoze odlazi u bazen čiste vode, a odatle se, zajedno sa permeatom iz RO sistema na liniji vode prvog stepena, gravitacionim putem odvodi do šahta i dalje transportuje u recipijen (reka Dunav) uz prethodno merenje protoka.

Potrebna toplota

Zagrevanje vakuum evaporatora/uparivača vrši se energijom koja se dobija spaljivanjem dela biogasa nastalog na telu deponije, u kotlu na biogas ili električnim grejačem. Da bi se biogas iskoristio kao gorivo, potrebno ga je prethodno prečistiti. Predtretman biogasa se sastoji u uklanjanju vode, H₂S i isparljivih organskih jedinjenja (VOC) iz biogasa. Tendencija je da se njegovim spaljivanjem dobije što manje štetnih produkata sagorevanja.

Kotao od 1 MW (1000 kW) i električni grejač od 800 kW su postavljeni redno jedan za drugim i obezbeđuju minimum od 800 kW čak i kada radi samo jedan. 800 kW je minimalna neophodna snaga. Primarno radi kotao, a grejač se uključuje samo za dopunu eventualno manje proizvodnje iz bojlera ili ako kotao iz nekog razloga ne radi.



Leachate Treatment Plant in the Landfill Vinča

Delta Inženjering has contracted with the company SUEZ from France to develop design documentation and to perform mechanical and electrical works on the construction of treatment plant for leachates from the municipal solid waste landfill Vinča.

The landfill Vinča was formed in 1978. In the mid-1990s, it was decided to close the locations of all city landfills except the landfill Vinča, which, since 1998, is the only landfill in the city of Belgrade. At the moment, it can receive about 2,000 tonnes of waste per day, making it the largest landfill in Serbia. The landfill Vinča is located just outside the city of Belgrade, about 11 km east of its downtown and about 1.5 km west of the Danube River.

The landfill Vinča today contains about 11 million cubic meters of waste and covers an area of 40 ha. The mass of deposited waste does not contain active cover and collapses in the direction of the Danube (located 1.5 km east) and represents an environmental threat.

The aim of technical documentation and execution of works is to build a treatment plant for leachates from the Vinča landfill body in order to prevent the flow of contaminated water into the Danube.

Treatment plant for leachates from the landfill Vinča consists of the following parts:

- ▲ Pre-treatment;
- ▲ Acidification,
- ▲ Reverse Osmosis (RO);
- ▲ Evaporation;
- ▲ Final reverse osmosis;
- ▲ Biogas pretreatment;

For the purpose of evacuating water from the landfill body, a drainage system is provided that takes all the contaminated water to the lagoons that transport the water further to the treatment plant. After treatment, these waters can be taken to Ošljanska bara and further to the Danube.

Drainage channels along the perimeter of the landfill collect leachate and drain it into lagoons. There are two lagoons on the upper platform, which will collect leachate from the new landfill, and three lagoons on the lower platform, which collect leachate from the old landfill, the new landfill and the third for mixed water.

From the upper lagoons gravity pipeline will conduct the collected water to the lower lagoons. From the lower lagoon, after the mixing of leachate from the old and the new landfill (in the third lagoon), leachate is transported to the leachate treatment plant.

The pumping station on the lower platform is intended to transport the collected process water to the lagoons on the upper platform, and from there to the incinerator, upon closure of the leachate treatment plant.

The leachate treatment plant (LTP) is sized to meet:

- ▲ Purification system,
- ▲ Guaranteed plant performance,
- ▲ Conditions for release to the recipient.

Depending on the inlet water quality and water parameters, the technological procedures defined in the project guarantee the quality of water at the outlet of the leachate treatment plant discharged into the recipient (the Danube River) in accordance with the regulations of the Republic of Serbia.

In order for the process to proceed smoothly, the required heat is provided by the combustion of part of biogas produced at the landfill in a biogas boiler or by an electric heater.





Pre-treatment

Leachate is fed into the LTP by pumping from a lagoon adjacent to the LTP. Leachate pumping begins when water in the lagoon reaches a certain height and the LTP can receive it. Leachate is supplied from the leachate lagoons to the plant by submerged well pumps mounted in pipes.

Pre-treatment at Vinča LTP involves mechanical purification on rotary sieves and sand filters (although they are an integral part of the reverse osmosis plant). During pretreatment, sand, sludge and other inert particles are removed from leachate.

Acidification

It is necessary to remove from leachate ammonia, present in leachate. Free ammonia can pass through the membrane of the RO system and will be found in permeate (purified water). Therefore, sulfuric acid is added to the filtered leachate and ammonia is converted to ammonium sulfate, which remains in the concentrate when purified on the membrane.

Reverse osmosis (RO)

The membrane is a selectively permeable barrier that allows the passage of certain components while retaining other components of the solution. The flow of matter through the membrane is kinetically defined by the application of pressure, vapor pressure, hydrostatic pressure, electrical potential or temperature.

The concentrated impurities are retained on the side of the membrane under pressure and purified water is leaked to the other side of the membrane. In order to be selective, the membrane does not need to allow large molecules or ions to pass through the pores (openings), but it should allow free passage of the finer components of the solution (such as water) to flow freely.

Depending on the quality of leachate (mainly salt and organic matter), the percentage of permeate (purified water) obtained will be about 50% to 70% with regard to the amount of incoming water.

The permeate goes to a clean water pool, from which it is transported to the recipient, the Danube River, with a preliminary flow measurement, and the concentrate from the RO membranes is transported further for treatment on the vacuum evaporator.

In membrane processes, the solution is prepared and pumped under pressure along the membrane and divided into two streams: permeate, or filtrate flowing through the membrane and concentrate, that is, the rest of the solution in which the constituents of water retained by the membrane were concentrated.

Evaporation - vacuum evaporator

The principle of operation of the evaporator is that the low-temperature steam from the vacuum evaporator is sucked in by a compressor (Mechanical vapor compressor). The suction water vapor is compressed and, due to compression, heats up. The heated water vapor enters the heat exchanger where it provides energy for evaporation on the walls of the heat exchanger with the falling film. On the other side of the pipe wall, the compressed water vapor condenses. The latent heat generated by condensation serves to evaporate the "solvent" or water so that at the end of the process a dirty concentrate is obtained on the one hand and pure water (condensate) on the other.

In the evaporator, the concentrate from the first stage RO is thermally treated. Heating is generally achieved by the circulation of heat (from a boiler or from an electric heater). The evaporator operates under vacuum, which allows the boiling point of the water to be lowered and steam removed from the salt at a lower temperature.



Final reverse osmosis

The reverse osmosis system will be installed after vacuum evaporators to treat condensate from the evaporators. The RO system will remove any residual ammonia, salts and traces of heavy metals and ensure that the parameter values are below the permitted limits at all times. The percentage of permeate obtained from the RO condensate treatment system is 85-90%.

The concentrate from the final reverse osmosis will be recirculated into the pre-treated process water reservoir (before the RO membrane on the water line), while the permeate from the second stage of the reverse osmosis goes to the clean water pool, and from there, together with the permeate from the RO system on the first stage water line, gravitationally drains to the shaft and continues to be transported to the recipient (the Danube River) with a preliminary flow measurement.

Required Heat

The vacuum evaporator/evaporator is heated by the energy obtained by burning part of the biogas produced on the landfill body, in a biogas boiler or with an electric heater. Biogas needs to be refined before it can be used as fuel. Biogas pretreatment consists of removing water, H₂S and volatile organic compounds (VOC) from biogas. The tendency is to burn as little harmful combustion products as possible by burning it.

The 1 MW (1000 kW) boiler and the 800 kW electric heater are installed one after the other and provide a minimum of 800 kW even when only one is running. 800 kW is the minimum power required. The boiler is primarily operated and the heater is only switched on to supplement possibly less production from the boiler or if the boiler does not work for some reason.

TE-TO Pančevo



Godine 2018. Delta Inženjering je u konzorcijumu sa kompanijama Delta preving, KFG i Montprojekt iz Beograda započeo vršenje tehničke kontrole „u hodu“ projekata za građevinsku dozvolu Termoelektrane – toplane Pančevo.

Projektну dokumentaciju radila je kineska kompanija SDEPCI, a nostrifikovao Energoprojekt – Entel. Nakon prihvatanja projekata i dobijanja građevinskih dozvola, Delta Inženjering je, u istom društvu, nastavio sa vršenjem stručne i tehničke kontrole „u hodu“ i projekata za izvođenje. Paralelno sa ovim angažovanjem, Delta Inženjering radi i planove preventivnih mera za svaku od faza, tj. funkcionalnih celina kompleksa.

Kontrola projekata „u hodu“, kao i stalna komunikacija između projekatana i vršioca tehničke kontrole, doprinosi izradi kvalitetnije dokumentacije, time i kvalitetnijoj i ekonomičnijoj izgradnji, te na kraju i kvalitetnijoj i sigurnijoj upotrebi objekta.

2019. godine ovaj proces razmene i sučeljavanja znanja, iskustava i ideja nad ovim velikim i važnim projektom se, uporedo sa završetkom izrade projekne dokumentacije, približava kraju. Započeta je i izgradnja objekata, čiji se završetak i puštanje u rad očekuje 2020. godine.

Delta Inženjering učestvuje i u vršenju stručnog nadzora na izvođenju radova.



Termoelektrana-toplana Pančevo biće prva parno-gasna elektrana u Srbiji, koja podrazumeva elektranu od 200MW za kogeneraciju na bazi tehnologije parno-gasnog ciklusa sa istovremenom proizvodnjom električne i toplotne energije u obliku tehnološke pare. Ova tehnologija predstavlja ekonomski najopravdanije tehničko rešenje korišćenja prirodnog gasa kao goriva, obezbeđuje visok nivo iskorišćenja energije goriva i ekološki je prihvatljiva. Cilj je da poveća pouzdanost snabdevanja RNP električnom i toplotnom energijom, kao i da usmeri do 65% proizvedene električne energije u energetski sistem Srbije.

CCPP (Combined Cycle Power Plant) Pančevo

In 2018 Delta Inženjering, in consortium with Delta preving, KFG and Montprojekt from Belgrade, started performing technical control “on-the-go” of projects for the construction permit CCPP Pančevo with the project documentation being worked out by the Chinese company SDEPCI and certified by Energoprojekt - Entel. After accepting the projects and obtaining building permits, Delta Inženjering, within the same company, continued to carry out professional and technical “on-the-go” controls and projects for execution. In parallel with this engagement, Delta Inženjering also develops preventive action plans for each phase, i.e. functional entities of the complex.

The control of “on-the-go” projects, as well as the constant communication between the designers and the technical controllers, contributes to the production of better quality documentation, thus to a better and more economical construction, and ultimately to a better and safer use of the facility.

In 2019 this process of sharing and confronting knowledge, experience and ideas over this major and important project is nearing completion, along with the completion of project documentation. Construction of the facilities has begun, with the completion and commissioning expected in 2020.

Delta Inženjering also participates in performing expert supervision on the execution of works.

CCPP Pančevo will be the first steam-gas power plant in Serbia, which includes a 200MW power plant for cogeneration based on the steam-gas cycle technology with simultaneous production of electricity and heat in the form of process steam. This technology is the most economically feasible technical solution for using natural gas as a fuel, provides a high level of fuel energy utilization and is environmentally friendly. The goal is to increase the reliability of the Oil Refinery Pančevo electricity and heat supply, as well as to direct up to 65% of the generated electricity to the energy system of Serbia.



Preuzeto sa geh-serbia.rs



Izvođenje radova na izgradnji, rekonstrukciji i adaptaciji Kliničkog centra Srbije u Beogradu

Klinički centar Srbije projektovan je kao složen arhitektonsko-građevinski kompleks koji se sastoji iz četrnaest celina (lamela): A, B, C+J, WEST, NORTH, K, D, CENTRAL, W, EAST, SOUTH, WEST ENTRANCE, NORTH ENTRANCE i EAST ENTRANCE.

Radovi su počeli 06.12. 2018. sa ugovornim rokom od 32 meseca. Posle završene konstrukcije objekta Nova kula, od ukupno 20.000 m², počelo se sa:

- ▲ izradom dvostruke modularne fasade sa strane GAK-a, klinike Laza Lazarević i ka Urgentnom centru;
- ▲ izvođenjem oko 10.000 m² pregradnih zidova;
- ▲ radovima na uglednoj bolničkoj sobi - ugradnja svih materijala koji će biti usvojeni kao konačni sa svim završnim arhitektonsko-zanatskim radovima i instalacijama;
- ▲ izradom instalacija medicinskih gasova od nivoa +4 do +12 na Novoj kuli;
- ▲ izradom instalacija ventilacije od nivoa +4 do +12 na Novoj kuli;
- ▲ izradom instalacija jake i slabe struje od nivoa +4 do +12 na Novoj kuli;
- ▲ izradom instalacija ViK od nivoa +4 do +12 na Novoj kuli i razvoda u toaletima bolničkih soba.

Trenutno se vrše radovi na rekonstrukciji i to:

- ▲ izrada dva liftovska okna za osam novih liftova na kuli D;
- ▲ ojačanje AB stubova čeličnim „polutkama“ na kuli D;
- ▲ postavljanje karbonskih traka i tkanina na svim lamelama;
- ▲ izrada slojeva za pad i svih slojeva budućih krovova sa ugradnjom sistema za odvodnju kišne kanalizacije (urađeni krovovi na objektima A - Nova kula i objektu B);
- ▲ zidanje zidova od Ytonga i gipsanih pregradnih zidova;
- ▲ demontaža stare fasade (demitirano oko 12.000 m²);
- ▲ izrada magistralnog cevovoda.

Radovi na izgradnji tehničkog bloka B - izrada konstrukcije AB zidova i AB ploča sa temeljima za buduću opremu. Za potrebe izrade konstrukcije izvršen je iskop stenske mase VII kategorije od 4.000 m³.

Deo lamele A je objekat postojećeg prostora Nacionalnog PET centra na koti +111.05 (nivo -2), koji je u funkciji i gde se zdravstvene delatnosti vrše bez prekida. Objekat je podeljen na hladan i topli deo i izvedeni su radovi na konstrukciji, enterijeru i instalacionim sistemima u prostoru u hladnom delu (grupe prostorija koje služe za prijem i prvi pregled pacijenata). Rok izvođenja radova

u toplom delu - GAMA je planiran za kraj aprila 2020.

Za izgradnju objekta koristimo najmodernije materijale i tehnologije koji trenutno postoje u okruženju, ako ne i u Evropi. Betonska konstrukcija se osim čelikom ojačava i karbonskim tkaninama i karbonskim lamelama. Takođe, cela zgrada imaće visoku energetske efikasnost.

Kada svi radovi budu završeni, Srbija će dobiti najmoderniju zdravstvenu ustanovu. U projekat će biti uloženo oko 110 miliona evra, a trenutno na gradilištu KCS-a radi oko 450 radnika, čiji se broj iz dana u dan povećava.





Works on Construction, Reconstruction and Adaptation of the Clinical Center of Serbia in Belgrade

The Clinical Center of Serbia is designed as an architectural and construction complex consisting of fourteen structural units: A, B, C+J, WEST, NORTH, K, D, CENTRAL, W, EAST, SOUTH, WEST ENTRANCE, NORTH ENTRANCE and EAST ENTRANCE.

Work started on 06.12.2018 with a contractual term of 32 months.

After the construction of the New Tower facility, totalling 20,000 m², it was started with:

- ▲ making of a double modular facade on the side of the Clinic for Gynecology and Obstetrics, Clinic for Mental Disorders Dr Laza Lazarevic and towards the Emergency Center;
- ▲ construction of about 10,000 m² of partition walls;
- ▲ works on the demonstration hospital room - installation of all materials that will be adopted as final with all final architectural and craft works and installations;
- ▲ making medical gas installations from level +4 to +12 level at the New Tower;
- ▲ making ventilation installations from level +4 to +12 at the New Tower;
- ▲ making high and low voltage installations from level +4 to +12 at the New Tower;
- ▲ making ventilation and air conditioning installations from levels +4 to +12 on the New Tower and distribution in the toilets of hospital rooms.

Reconstruction work is currently underway:

- ▲ construction of two elevator shafts for eight new elevators on tower D;
- ▲ reinforcement of reinforced concrete columns by steel bars on tower D;
- ▲ Placement of carbon strips and fabrics on all structural units;
- ▲ Design of fall layers and all layers of future roofs with the installation of rainwater drainage systems (roofs made on facilities A - New Tower and facility B);

- ▲ building walls of Ytong and gypsum partition walls;
- ▲ dismantling of the old facade (about 12,000 m² dismantled);
- ▲ development of the main pipeline.

Construction works on technical block B - construction of reinforced concrete walls and reinforced concrete plates with foundations for future equipment. For the purpose of construction of the structure, the excavation of a rock mass category VII of 4,000 m³ was carried out.

Part of the structure unit A is the facility of the existing space of the National PET Center at elevation +111.05 (level -2), which is operational and where health care activities are carried out without interruption. The building is divided into cold and warm part and works on construction, interior and installation systems in the cold part area (group of rooms used for admission and first examination of patients) were performed. Deadline for works execution in the warm part - GAMA is scheduled for late April 2020.

To build the facility we use the most up-to-date materials and technologies that currently exist in the neighbouring, if not in Europe. In addition to steel, the concrete structure is reinforced with carbon fabric and carbon plates. Also, the whole building will have high energy efficiency.

When all the work is completed, Serbia will receive the most modern medical institution. Around EUR 110 million will be invested in the project, and currently on the construction site of CCS are working about 450 workers, whose number is increasing day by day.



Projektovanje i izgradnja najmodernije laboratorije (BSL-2) za Covid-19 na Balkanu „Vatreno oko“

Projekat je počeo 25. marta, a rok je bio samo dve nedelje da se izvrši dizajn, isporuka i instalacija kompletne laboratorije tipa BSL-2 za testiranje korona virusa.

Laboratorija je puštena u rad po prispeću opreme iz Kine, a zvanično 21. 4. 2020.

U rekordnom roku, za manje od dve nedelje, Delta Inženjering je zajedno sa konzorcijskim partnerom GH Holding i partnerskim kompanijama završio projektovanje i izgradnju kompletne najmodernije laboratorije (BSL-2) za COVID-19 na Balkanu, u sklopu Kliničkog centra Srbije, koja nosi naziv „Vatreno oko“.

Vlada Republike Srbije, a konkretno Ministarstvo zdravlja i ministar Zlatibor Lončar, angažovala je Delta Inženjering kao generalnog projektanta i izvođača kompletne laboratorije, čime je naša kompanija bila uključena u projekat od velikog značaja za državu i stanovništvo u vreme pandemije kao vodeći motor svih aktivnosti od idejnog rešenja do puštanja u rad.

Kapacitet laboratorije je 2.000 uzoraka na dan, što je jednako kapacitetu svih ostalih laboratorija u Srbiji u kojima se trenutno vrši testiranje uzoraka na korona virus, čime će se značajno ubrzati dijagnostikovanje novog korona virusa. Ova laboratorija je identična laboratoriji u Vuhanu.

Ukupna površina laboratorije je preko 700m².

Projekat je završen u rekordnom roku, radno vreme je bilo 24/7 tokom dve nedelje, multidisciplinarnost inženjera i visokokvalifikovanih radnika Delta Inženjeringa na svim frontovima omogućila je da se ovakav objekat izvede u zadanom roku, a kuriozitet je da se u normalnim uslovima ovaj posao ugovara za period koji nije kraći od šest meseci.





Design and Construction of a Complete State-of-the-Art Laboratory (BSL-2) for Covid-19 in the Balkans “Fire Eye”

The project began on March 25, and the deadline was only two weeks for design, delivery and installation of a complete BSL-2 laboratory for coronavirus testing.

The laboratory was commissioned upon the arrival of equipment from China, and officially on April 21, 2020.

In record time, in less than two weeks, Delta Inženjering together with a consortium partner GH Holding and partner companies has completed the design and construction of a complete state-of-the-art laboratory (BSL-2) for COVID-19 in the Balkans as part of the Clinical Center of Serbia under the name “Fire Eye”.

Delta Inženjering has been engaged by the Government of the Republic of Serbia, specifically by the Ministry of Health and Minister Zlatibor Lončar, as general designer and contractor of the complete laboratory, which included our company in the project of great importance for the state and the population during the pandemic as the leading engine of all activities from conceptual design to commissioning.

The capacity of the laboratory is 2,000 samples per day, which is equal to the capacity of all other laboratories in Serbia in which samples are currently being tested for coronavirus, what will significantly speed up the diagnosis of the new coronavirus. This laboratory is identical to the Wuhan laboratory.

The total area of the laboratory is over 700m².

The project was completed in record time, working hours were 24/7 for two weeks, the multidisciplinary nature of engineers and high-skilled Delta Inženjering workers on all fronts enabled such facility to be completed within the given deadline, and the curiosity is that under normal conditions this work is contracted for a period of not less than six months.

Huo-yan nacionalna laboratorija za molekularnu detekciju infektivnih agenasa u Nišu

Delta Inženjering, kao generalni izvođač, započeo je 28.04.2020. sa projektovanjem i izvođenjem radova na izgradnji Huo-yan nacionalne laboratorije za molekularnu detekciju infektivnih agenasa u Nišu, na lokaciji Instituta za javno zdravlje Niš.

Laboratorija će biti izvedena u skladu sa normama i standardima projektovanja i izvođenja radova za ovakvu vrstu objekata - Biosigurnosni nivo 2. Dimenzionisanje prostora izvršeno je prema predviđenoj opremi za ispitivanje i ostaloj laboratorijskoj opremi, kao i opremi za potrebe serološke laboratorije koja je sastavni deo ove laboratorije.

Huo-yan National Laboratory for Molecular Detection of Infectious Agents in the City of Niš

On April 28, 2020 Delta Inženjering, as the general contractor, started the design and construction of Huo-yan national laboratory for molecular detection of infectious agents in the city of Niš, at the location of the Institute of Public Health Niš.

The laboratory will be constructed in accordance with norms and standards of design and execution of works for these types of facilities - Biosafety Level 2. The sizing of the space was performed according to the planned testing equipment and other laboratory equipment, in accordance with the needs of serological laboratories.



5 Proslava jubileja

Jubilee Celebration



Delta Inženjering je proslavio 30 godina postojanja i uspešnog poslovanja u društvu poslovnih partnera, saradnika i zaposlenih 24.12.2019. godine u Kristalnoj dvorani hotela Hyatt Regency u Beogradu.





Delta Inženjering celebrated 30 years of existence and successful business in company of business partners, associates and personnel at the Crystal Hall of the Hyatt Regency Hotel Belgrade on December 24, 2019.



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