

OCTOBER 2017

SOCAR Polymer Newsletter / Issue 10 / 2017

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10 mln LTI-free man-hours achieved

p.2



HDPE Loop Reactors installed



Argus Azerbaijan - International Petroleum
Summit

p.22



10,495,533

Man-hours LTI Free

399

Employees

94.8%

PP Total progress in
October

81.4%

HDPE Total progress in
October

SOCAR
POLYMER

10.000.000

Man-hours LTI Free

OCTOBER, 2017

Dear colleagues,

As the countdown to the launch of the PP plant continues, I am proud to share with you the news of the record-breaking 10,000,000 hours free of Lost Time Incidents or industrial injuries.

Building a chemical plant is an exceptionally complex process that requires elaboration, close attention to detail and continuous diligence of all the branches of our multifaceted team whose health and safety lie in their own hands but under the vigilant eye and scrupulous attention of our HSE colleagues keeping up an unabating state of alert. It takes strenuous risk calculation, ability to think ahead, predetermine possible negative consequences and ways to mitigate them to ensure that thousands return to their families safe and sound on an array of some thousands of days. It takes knowledge, experience and professionalism to keep a constantly populated site and office preventively aware of and abiding by the HSE rules. The sheer lack of

any crisis situations and the continuous state of business running as usual, however routine and boring it may sound, are in fact the best proof of the preventive activities being well performed.

Thus, I would also like to take this opportunity to thank the HSE team for taking such good care of our staff, and for everyone following suit to keep the HSE standards up. The accomplishment we are celebrating these days would not have been possible without you. Let's keep on together on the same track.

Farid Jafarov





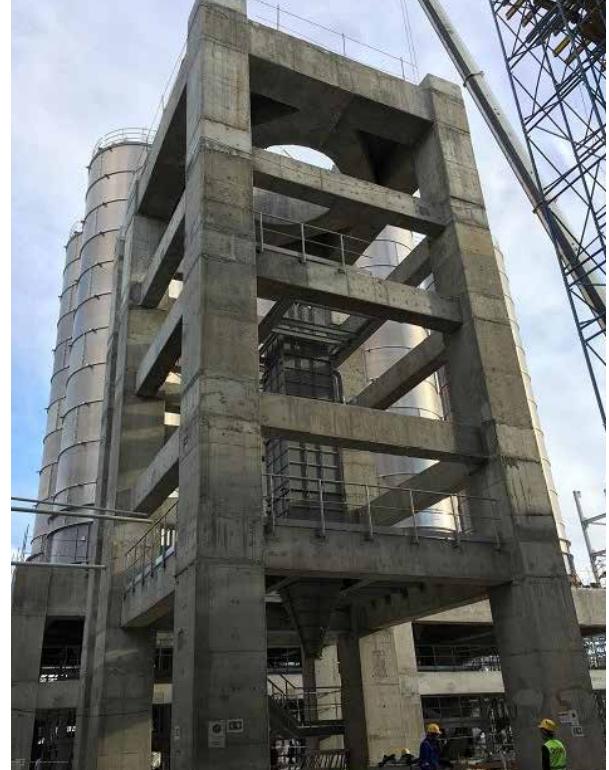
October 2017

Site Photos



PROGRESS ON SITE DURING OCTOBER

HDPE plant

September	Progress over October	October
	<p>HDPE: Blending Silos. Handrails and pathway installation completed on the top of the silos</p> 	
	<p>HDPE: Organoleptic Structure and Effluent Treatment. Cooler installation completed. SS erection ongoing</p> 	

September

Progress over
October

October



HDPE: Extrusion Structure.
RCC and SS works in progress.
Equipment installation ongoing



HDPE: Polymerization.
SS installation ongoing. Loop Reactor and
Degasser installed. Piping, cable tray, other
works ongoing



HDPE: Electrical Substation.
Internal finishing and HVAC works ongoing.
Electrical panel installation ongoing.
Electrical and instrumentation works ongoing.
Façade painting works started



HDPE: Polymerization Pipe Rack.
Pipe support installation ongoing. Cable tray installation ongoing. Cable pulling in progress



September

Progress over
October

October



HDPE: Pellet
blower package
space for logistic
conveying.
Pipe erection in
progress



HDPE: Reactors
Dump tank.
Electrical and
instrumentation
works in
progress



PP plant and U&O area

September

Progress over
October

October



PP/U&O:
Electrical
substation.
Complete
energization
activity in
progress. Most
system installation
works completed



PP/U&O:
Common Control
Room.
Most of the
instrument cable
pulling works
completed.
Telecom towers
erection in
progress



September

Progress over
October

October



PP/U&O:
Chemical
& Additives
Storage
Building.
Roof sheeting
works
completed.
Façade
sheeting works
in progress



PP/U&O:
Laboratory.
Finishing and
HVAC works
ongoing.
Installation of
outside doors
and windows
completed



PP/U&O:
Administration
building.
Finishing
works ongoing.
Installation
outside doors
and windows
completed



PP/U&O:
Workshop.
Finishing
works ongoing.
Roof sheeting
works almost
completed



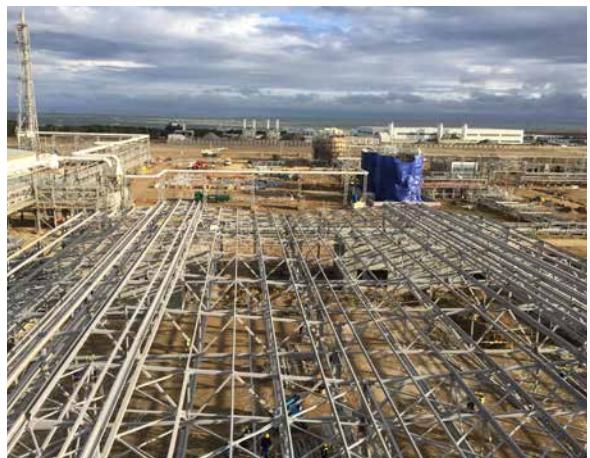
September

Progress over
October

October



PP/U&O:
Bagging &
Packing Building.
SS installation
ongoing



PP/U&O: Fire
water Retention
Basins and
Pump House.
Pre-
commissioning
and repair works
in progress



PP/U&O: Air/
HP Nitrogen
Condensate
Compressor
Station Storage
& Pumping.
Equipment and
pump alignment
ongoing.
Installation
of electrical
instrumentation
ongoing



PP/U&O:
Cooling Tower.
Pre-
commissioning
activities in
progress.
Façade painting
completed



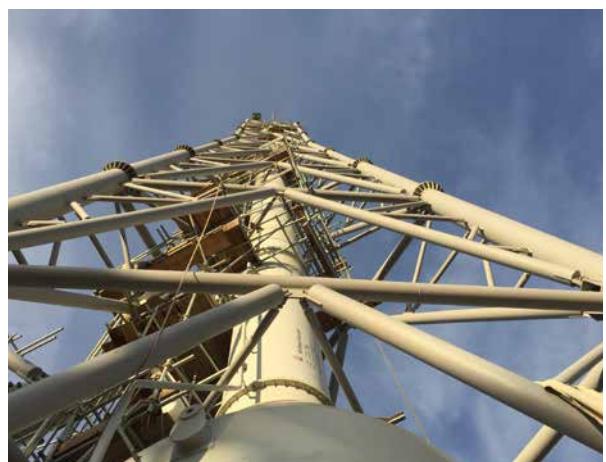
September

Progress over
October

October



PP/U&O: Flare
Stack.
Commissioning
completed



PP/U&O: Flare
Knock Out Drum.
Pipe testing,
electrical and
instrumentation
works in
progress



PP/U&O: Valve
house.
Valve and pipe
installation
ongoing.
Finishing
works mostly
completed



September

Progress over
October

October



PP/U&O: Side
Stream Filter
Package.
Testing in
progress



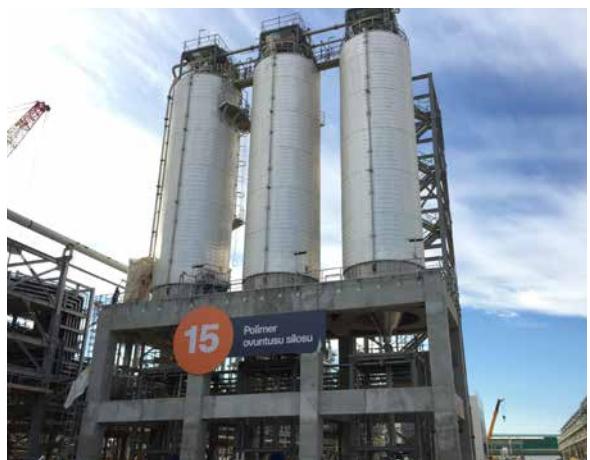
PP/U&O: PP-
Wet section /
Polymerization.
Equipment
installation
and alignment
ongoing.
Installation
of electrical
instrumentation
ongoing



PP/U&O: PP
Dry Section /
Extrusion
building.
Equipment
installation
and alignment
ongoing.
Electrical and
instrumentation
works ongoing.
Façade sheeting
installation in
progress



PP/U&O: PP Dry
section / Powder
Silos.
Equipment and
Pump alignment
ongoing.
Electrical and
instrumentation
works ongoing.
Lighting
installation in
progress



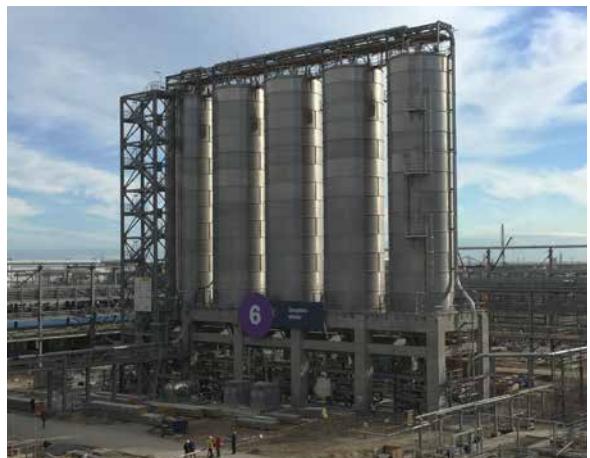
September

Progress over
October

October



PP/U&O:
Homogenization / Blender Silos.
Pump/Pipe and equipment alignment ongoing.
Electrical and instrumentation works ongoing.
Lighting installation in progress



PP/U&O: Raw Water Storage Tank.
Electrical and instrumentation works started. Pre-commissioning in progress



PP/U&O: DM Water Storage Tank.
Pre-commissioning in progress



PP/U&O:
Isobutane Sphere.
Dike wall welding ongoing. Pipe installation ongoing. Dike wall exterior painting in progress



September

Progress over
October

October



PP/U&O: Hexene Storage Tank.
Tank erection ongoing. Piping works ongoing



PP/U&O:
Impounding
Basin for
Isobutane.
Piping works
ongoing.
Electrical and
instrumentation
works started



PP/U&O:
Interconnecting
Pipe Racks.
Pipe erection
ongoing. Cable
pulling ongoing



September

Progress over
October

October



PP/U&O: Pipe Sleepers.

Pipe erection and cable tray installation ongoing. Cable pulling ongoing



Nitrogen package.

Equipment, pipe and steel structure installation works ongoing. Electrical and instrumentation works ongoing



Warehouse.

Ventilation Deflectors installation ongoing. Electrical instrumentation and Fire system works in progress. Roof cladding completed



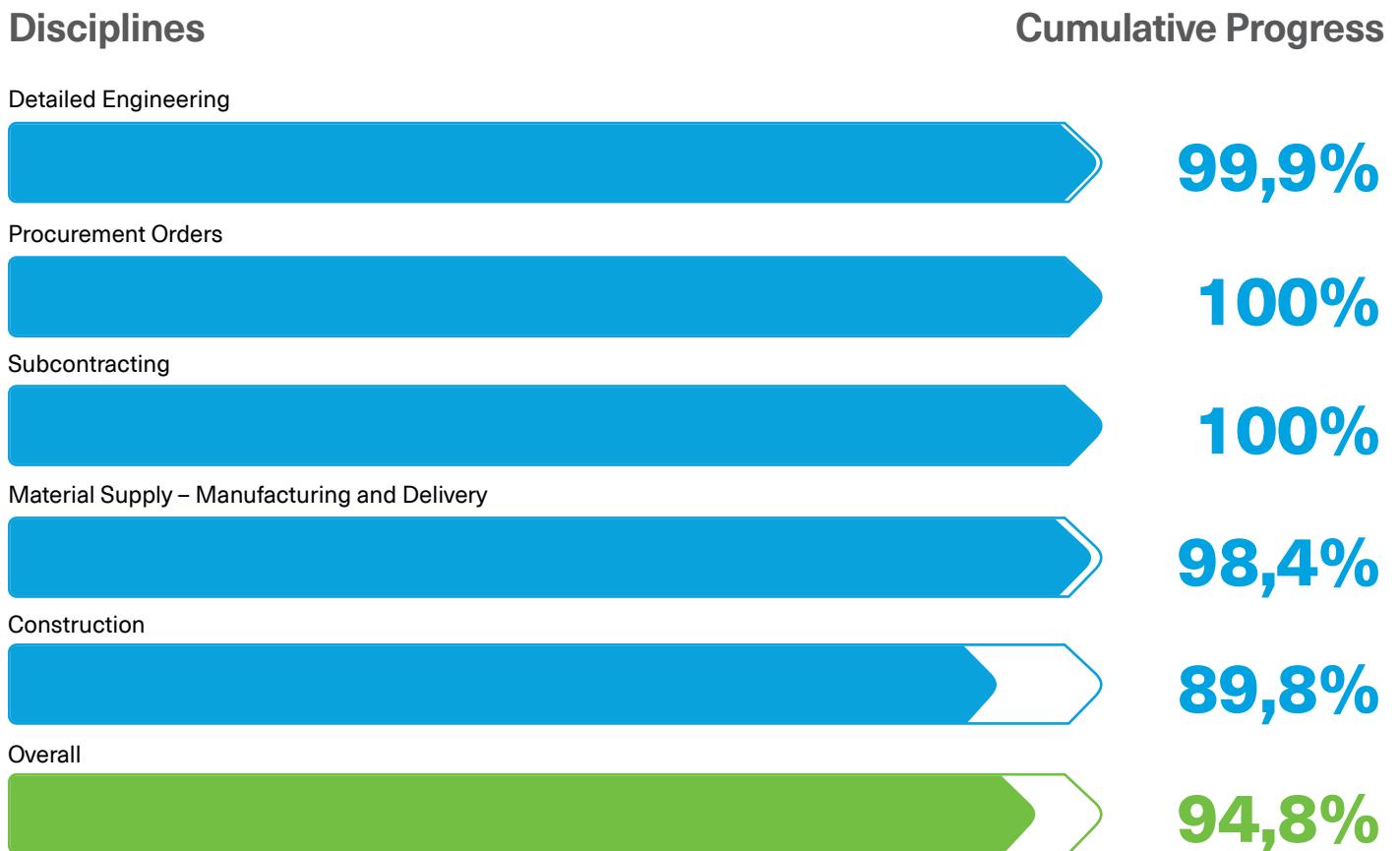
Roads.

Internal roads' construction ongoing. Laying of the first asphalt layer ongoing. Area lighting works in progress

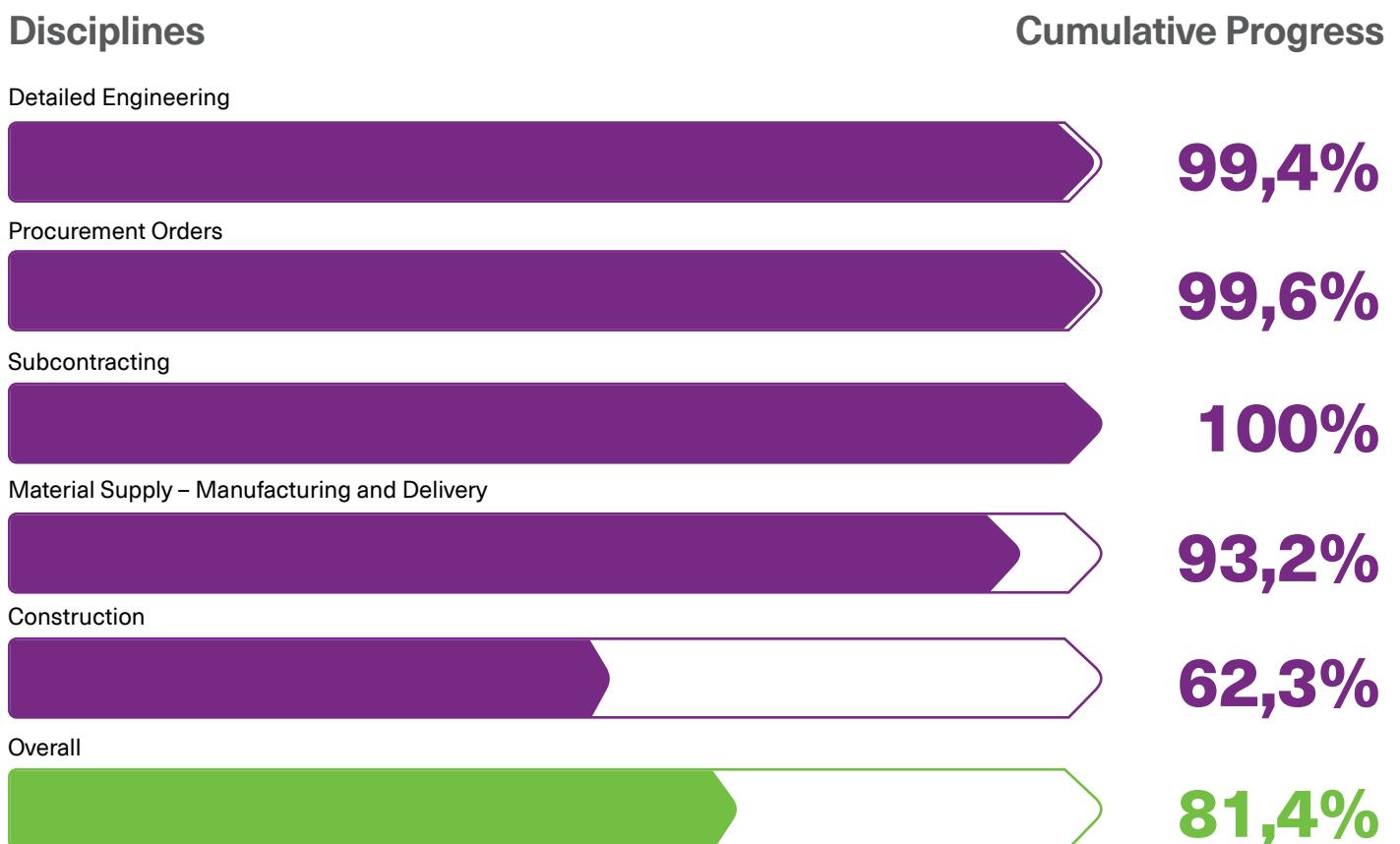


Project progress status

PP Plant Progress



HDPE Plant Progress





HDPE plant: Loop Reactor installed

Home to the polymerization process, the Loop Reactors are, perhaps, one of the most important units within the HDPE plant. They consist of continuous tubes/pipelines arranged to a "rectangular" shape. Running through those tubes or pipelines will be slurry which is a mixture of the monomer, the catalyst, the generated polymer, and optionally a co-monomer, a co-catalyst, a diluent and polymer modifier. Slurries behave in some ways like thick fluids which can be pumped if not too thick. The chemical polymerization reaction takes place in the reactor as the slurry travels along its walls, so, to increase the contact area and residence time, the reactor is looped. Therefore, one of the main advantages of Loop Reactors compared to conventional reactors, is that at a given fixed volume they have a greater inner surface area.

Circulation pumps are used to re-circulate the slurry through the loop to increase the rate of conversion, while cooling jackets are responsible of removing the heat generated in the course of polymerisation reactions. Loop Reactors that are used in the HDPE plant are twice as tall as the Maiden's Tower - around 56 m.

With an inner diameter of about 630 mm, the Loop Reactors are capable of handling 15,000 kg/hr throughput. Made of

carbon steel, they are operating under 40 bar pressure and at 80-100°C. The reactor circulation pumps have capacity of around 10,000m³/hr recirculation rate. Cooling jackets operate under nearly 1.5 bar pressure and have cooling water available at around 25°C.





SOCAR Polymer Plant receives guests



Meeting with the Ukrainian delegation

On 20 October 2017, the AR Deputy Minister of Economy, Niyazi Safarov and Deputy Director of the Sumgayit Chemical Industrial Park (SCIP) Zaur Mammadov hosting a Ukrainian delegation of 9 people headed by Ukraine's Deputy Prime Minister and Minister of Economy and Trade Stepan Kubiva visited the SOCAR Polymer Plant. The Ukrainian delegation members A.Mishenko, A.Perevezentsev, Y.Brovchenko, I.Jovkva, A.Rojkov, V.Sidachenko, E.Afanasyeva, V.Gurin and A.Simonenko represented companies operating in the fields of energy, metallurgy, chemical industry, pharmacology, printing, etc. In the VIP center of the Plant, the guests were welcomed by the Financial Director of SOCAR Polymer Fuad Ahmedov, his deputy Rauf Guliyev and the Public Relations Specialist Ilaha Hajiyeva. With a detailed electronic presentation, Mr. Ahmedov informed the guests about the historical background of the SOCAR Polymer Plant, their innovative advantages, and potential benefits for our country. The presentation was regarded with interest,

and expectations of a high demand for the plants' future products were expressed in the discussions. Pleased with the meeting the guests wished our company further success and expressed their gratitude for the reception.



Meeting the delegation of the Scientific and Research Institute of Economic Reforms



On 27 October 2017, a delegation of 5 people headed by the Director of the Scientific Research Institute of Economic Reforms Vilayat Veliyev, accompanied by the Director of the Sumgait Chemical Industrial Park Nazim Talibov, his deputy Zaur Mammadov, the head of the Investor Relations and Business Support Department of SCIP Elshan Shirihev and the chief specialist of the Investor Relations and Business Support Department Ayaz Allahverdiyev visited the SOCAR Polymer Plant. The Financial Director of our Company Fuad Ahmedov, his deputy Rauf Guliyev, a Senior Financial Analyst Babek Beydullayev and the Public Relations Specialist Ilaha Hajiyeva welcomed the guests and invited them to the VIP center. Presented with detailed information on the SOCAR Polymer plants at the beginning of the meeting, the guests initiated extensive discussions and an exchange of opinions on matters concerning feedstock supply to the plants, the demand for polypropylene and HDPE, the expansion of the polymers market, formation of industrial clusters and the like.

In the end, the guests expressed their gratitude for the meeting, emphasizing its fruitfulness.



On-the-job training sessions at the SOCAR Polymer plant site

The EPC contract with the Tecnimont company includes trainings which the Kinetics Technology (KT) company has provided on daily basis since 28 August. The extensive Training Program scheduled for the period from August 2017 till mid-February 2018 covers all aspects of plant operations and envisages Classroom training (480 hours total) by various specialists and vendors, as well as On-job training (1050 hours total) to be led by experienced technicians until the end of the project to ensure complete grooming of SOCAR Polymer operators to efficiently handle the Plant. The trainings are listed under four major disciplines/categories: electrical, instrumentation, mechanical and operation. Thus, the SOCAR Polymer plant personnel gets a better understanding of the principles of equipment operation, and grows better informed of the basic maintenance and troubleshooting processes.

More detailed information on some of the training sessions conducted on site in October is provided below:

Training title	Duration	Dates	Participants' positions
Fuel Gas and Flare	1 day	5 Oct	9 operators and 2 mechanical technicians
CSE	1 day	6 Oct	2 HSE team members
AGT	2 days	10-11 Oct	8 operators and mechanical technicians
DC/AC UPS	1 day	6-12 Oct	10 electricians 8 operators, 2 mechanical technicians, 1 mechanical supervisor, 3 shift supervisors, 2 electricians, 2 instrument technicians
Cooling Water Pumps	1 day	6 Oct	8 operators, 2 mechanical technicians, 1 mechanical supervisor, 3 shift supervisors, 2 electricians, 2 instrument technicians
Instrument Air/Plant Air System	1 day	10 Oct	3 mechanical technicians, 1 instrument technician, and 7 operators
Steam and Condensate System	1 day	13 Oct	3 mechanical technicians, 8 operators and 1 instrument technician
Utility & Offsite Training	3 days	12-14 Oct	10 operators and 2 shift supervisors
Training for Waste Water System	1 day	17 Oct	12 operators, 3 HSE, 2 mechanical technicians, 2 instrument technicians



Niccolo Heilpern
Head of Branch Office in Azerbaijan
Kinetics Technology company

- After a brief introduction, classroom activity is developed with proactive methodologies as KT trainers fully involve plant operators by two-way interaction. The main advantage of field training is exposing the trainees to the working environment of an operating plant to have them apply in practice the theories acquired during classroom workshops. In addition, to achieve maximum efficiency during all field sessions trainees cooperate with "integrated teams" of KT's experienced pre-commissioning and commissioning technicians, with full safety ensured. Thus, operators nurture the spirit to do almost any job, develop leadership abilities and

responsibility in performing given tasks, get more disciplined in following safety rules and regulations as demonstrated by the KT personnel, gain experience and accumulate confidence in their respective fields in a real work environment. Real job situations foster responsibility in operators who take this as a challenge and test their perseverance and reasoning abilities when facing a decision-making situation. This approach to training is unique and crucial for the operators to gain knowledge, confidence and operational experience to operate the Plant independently with full efficiency.

OPS Trainings



OPS (operations) trainings are offshore/onshore trainings conducted for SOCAR Polymer's operation/maintenance/laboratory staff to expand their theoretical knowledge and practical skills regarding the technical aspects of operating/maintaining various types of equipment/facilities installed at the PP plant. Trainings are arranged by Tecnimont, SOCAR Polymer or Fluor, and are delivered at vendors' facilities abroad or at appropriate institutions in Azerbaijan.

During the month of October, SOCAR Polymer employees attended the following trainings:

Left to right: Mahmud Huseynov; Ramil Hajiyev; Fazil Kazimov; trainer Abhijeet Patil; Elgun Aslanli; Mushfig Baghirov

OFFSHORE TRAININGS	
Training theme	Cooling Tower Pumps
Company/Location	Kirloskar Group Pune, India
Duration	5 days
Dates	02-06 Oct
Participants' positions	5 mechanical technicians
Participants' names	Ramil Hajiyev Elgun Aslanli Fazil Kazimov Mahmud Huseynov Mushfig Baghirov

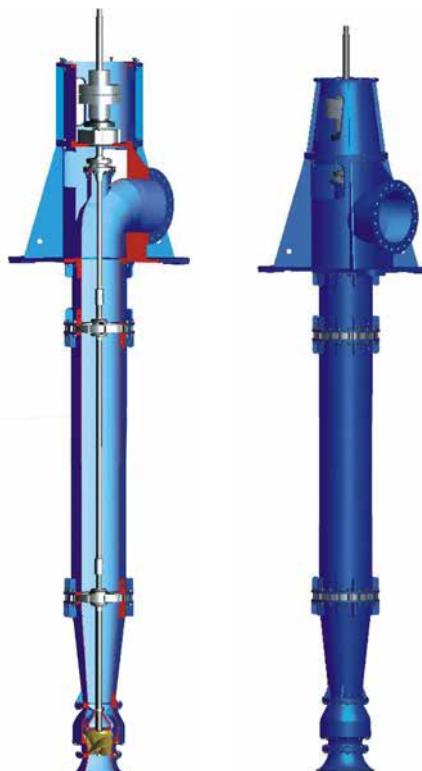
Ramil Hajiyev

Mechanical technician

The training on Cooling Tower Pumps was administered by the Kirloskar Brothers Ltd. company in India. The company engineers and manufactures industrial & petrochemical, agriculture & domestic pumps, valves and hydro turbines. The KBL company has supplied our plant with more than 16 pumps for various applications.

Our plant shall use 4 BHR type vertical turbine pumps designed by Kirloskar for the Cooling Tower system to secure cooling water circulation. The training covered a range of topics regarding BHR pumps, such as their general arrangement and assembly drawings, as well as mechanical parts including radial impellers, thordon and thrust bearings, bearing houses, bowl, pump lubrication systems, bearing lubricate cooling, ratchet system to restrict reverse rotation of shaft to serve the pumps. We also became familiar with 12 BHQ and KPDS type pumps designed for transferring waste water and road water to

the system. We visited a shop at the manufacturing facility, and the trainer explained in practice and demonstrated how the pumps were manufactured and assembled, and how initial and final inspections were performed before delivery to the customer. He also informed us of possible malfunctions and troubleshooting procedures regarding the pumps, as well as of maintenance procedures and sequence of maintenance actions based on the approved schedule for lubrication and other daily/monthly checking activities involving bearings and cooling systems. Upon completion of the course we got certificates.



Argus Azerbaijan

International Petroleum Summit



Argus Azerbaijan International Petroleum Summit 2017

12–13 October 2017 · Baku, Azerbaijan



The first Azerbaijan International Petroleum Summit of the Caspian Region, co-organized by the State Oil Company of the Azerbaijan Republic and global energy and commodity price reporting agency Argus, took place in Baku on October 12 – 13, 2017.

Targeting specifically the Caspian Region industry community, the two-day event covered a broad range of topics, such as current and projected regional refining and processing capabilities; region-specific crude swap deliveries; multi-national transit, logistics and infrastructure projects; tariff policies, environmental consciousness, et al. Over 400 corporate representatives from 28 countries conferred in a multitude of sessions and panel discussions on the margins of the forum. They concurredly agreed on a practical value of an open exchange of views the forum offered, particularly at a time when changes in the industry are roller-coaster swift. A guarded wish to make such meetings a regular occurrence was expressed by many participants.

Azerbaijan's Pitch

Azerbaijan used the opportunity to pitch its high-power energy and infrastructure projects for the international

stakeholders and potential investors. As for instance, recently launched Baku-Tbilisi-Kars railroad, whose 504-km leg runs across Azerbaijan, would benefit China, Kazakhstan, Central Asia, Georgia, Turkey and Southern European countries, as the shortest, safe route hurling Asia and Europe together.

In his welcome address, Mr. Rovnag Abdullayev, President of SOCAR, underscored the importance of the prolongation until year 2050 of the Contract of the Century, on conditions remarkably more lucrative for Azerbaijan than those stipulated in the original version 23 years earlier. Mr. Abdullayev noted that revamp and upgrade of the refineries and petrochemical plants already in operation, as well as building up of new gas processing and petrochemical capacities remain a priority for Azerbaijan's oil and gas sector. A carbamide plant in Sumgait is due to enter into operation in 2018. According to the SOCAR President, the Southern Gas Corridor project will be consolidated by 2020, when TAP (Trans-Adriatic Pipeline) will begin streaming the Shah-Deniz natural gas to Northern Greece, Albania and across the Adriatic Sea to Southern Italy; the TANAP (Trans-Anatolian Pipeline) will start streaming to Turkey via Georgia by late 2018.



Mr. Vyacheslav Mischenko, Head of Argus in Russia, CIS and the Baltic Region, highlighted the meaningful role of Azerbaijan as a new energy security factor for Europe. Mr. Gary Jones, BP Regional President for Azerbaijan, Georgia and Turkey (AGT), reiterated a combination of three distinctive features - bounteous resource base, sophisticated infrastructure and nexus geographical location - make Azerbaijan a naturally unique regional leader.

Unlocking Azerbaijan's Downstream Potential

A panel discussion on oil refining and chemical industry in the Caspian Region took place on the first day of the Summit and featured presentations by top ranking SOCAR managers. Mr. Tofiq Gahramanov, Vice-President for Strategic Development, provided an update on Azerbaijan refining capacity development; Mr. Mukhtar Babayev, Chairman of the Steering Committee of SOCAR's Azerikimya Production Unit, elaborated on retrofits the Azerikimya plants are undergoing. Mr. Farid Jafarov, General Manager of SOCAR Polymer, delivered a slide presentation, *Unlocking Azerbaijan's Downstream Potential*.

In the introduction to the main theme of his presentation, Mr. Jafarov noted, that irrespective of the current economic downturn, the production of plastics is growing steadily above GDP, at CAGR 4.1% compared to CAGR 2.5% GDP. Population growth calls for polymers to make up for the shrinking natural environment. The demand for common thermoplastics such as ABS, EPS, PE, PC, PET, PMMA, PP, PS, PVC and SAN is estimated to exceed 400 000 mln. metric tons by year 2025.

Azerbaijan is determined to make an input into satisfying the global demand. Presently, the national downstream

sector includes four major elements in varying stages of performance productivity. The BHAR Refinery, the primary flight of the production chain, is undergoing a major revamp to increase output to 7.5 mta upgraded to stricter Euro 5 emissions standard. It will also produce 110K tons of ethylene and 150K tons of propylene per annum, specifically to satisfy the feedstock needs of the SOCAR Polymer plants. Second on the list of downstream projects undergoing modernization is the Azerikimya Steam Cracker being switched to gas feedstock to increase scale and efficiency. Third is the SOCAR Polymer project, which is nearing completion, with the PP plant ready at 93.3%, and the HDPE plant at 76.9%. Fourth and most ambitious to date is the SOCAR GPC project, a jumbo complex that will integrate a 10 bcma gas processing plant in Garadag 45 km south-west of Baku, with a 610 kta Steam Cracker, 600 kta LLDPE/HDPE, 130 kta Propylene, 21 kta Hexene-1 and 32 kta Butene-1. Speaking of the national economy benefits the ongoing downstream projects would bring about, Mr. Jafarov underscored the employment ratio, which is 11 times higher in processing industries compared to the oil production sector. SOCAR Polymer and GPC plants will provide up to 2000 permanent jobs (16,200 jobs in a construction phase), and contribute a swelling tax flow to the national budget. Combined estimated revenue per year is expected to exceed \$1.4 bln.

Both projects, Polymer and GPC, will significantly expand Azerbaijan's industrial capabilities and trigger a multiplicative effect on the national economy. They will also create diverse investment opportunities: MTO/MTP, Formaldehyde, Methylamine, DME, MMA, BOPP, to name a few.

Recent quotes about SOCAR Polymer

“The SOCAR Polymer Project with construction works performed in the territory of the Sumgayit Chemical Industrial Park has entered its completion stage. The construction of the Polypropylene Plant with 180K t of production capacity will be completed this year, with the HDPE Plant of 120K t of capacity following close behind and to be completed in 2018. In parallel, necessary steps are being undertaken to supply the plants with required feedstock. Some new production units are established in Azerikimya PU, with reconstruction and upgrading of the existing equipment and units”.

Rovnag Abdullayev
SOCAR President
Argus Azerbaijan International Oil Summit
Baku, 12 October 2017



The pioneering industrial clusters in Azerbaijan will be established around the SOCAR Polymer Petrochemical Complex in the Sumgayit Chemical Industrial Park, as well as at the solid waste decontamination site in Balakhani. The establishment of these clusters will enable small and medium businesses to unite around SOCAR Polymer and the Balakhani solid waste decontamination site to create a production line based on the feedstock produced at these enterprises.

Vilayat Veliyev
Director
Scientific Research Institute
of Economic Reforms
October 2017



Industrial clusters in Azerbaijan

"The full cycle of production should be concentrated in one place, and through the implementation of this project towards the development of the steel industry, metallurgical complex and aluminium industry we must ensure the development of a complete production chain – from production and processing to promotion of small and medium entrepreneurship – so that Azerbaijan produces end products."



Ilham Aliyev
President of the Azerbaijan Republic

Successful implementation of the industrialization policy in Azerbaijan is kept in the focus of attention. Industrialization is a rapid socio-economic transition to a new stage by increasing the industrial sector's share in the national economy. By promoting investment and economic development, the process of industrialization modifies the society's world outlook. This fact is obvious upon the example of England where the world's first industrial revolution took place.

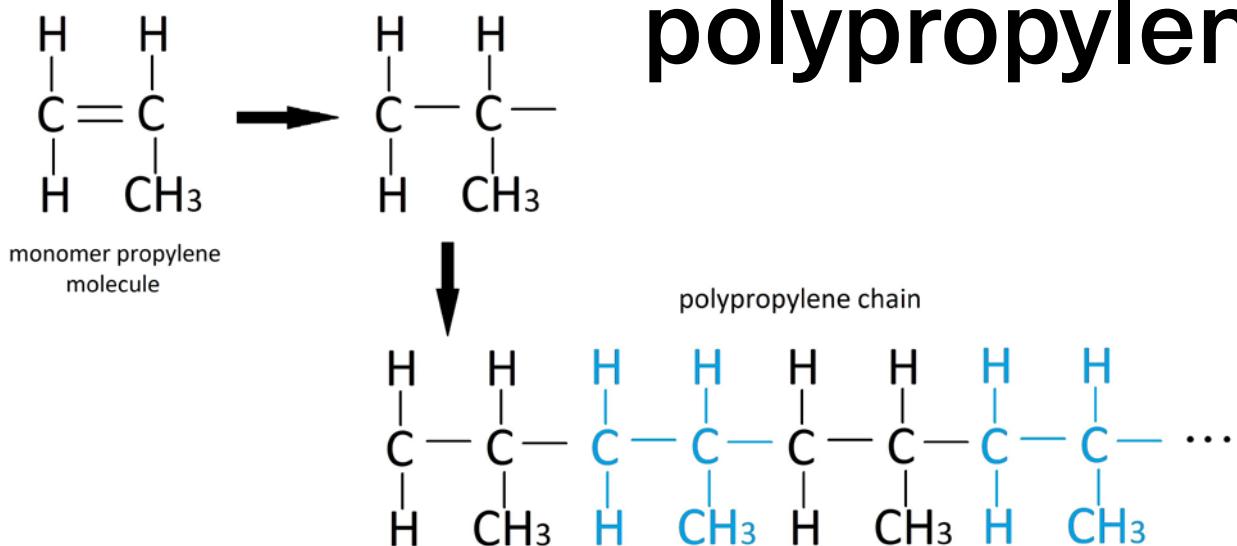
A cluster is one of the various economic mechanisms that are widely applied to ensure sustainable and comprehensive development of industrial sectors. A cluster is an effective system comprising entrepreneurship units operating within the same or similar industrial fields and based on interrelated performance principles within a complex system. Normally, a cluster is formed where interrelated or complementary

processes are defined as parts of a single cycle: with an infrastructure network established; with cross-use of technological resources, common marketing principles, labour power and labor reserves enabled; and with trade relations tailored to meet the interests of all parties involved.

An industry cluster represents the entire value chain of a broadly defined industry from suppliers to end products, including supporting services and specialized infrastructure. Cluster industries are geographically concentrated and inter-connected by the flow of goods and services. By clustering together, firms are able to benefit from such things as the neighbourhood's pool of expertise and skilled workers; its easy access to suppliers; and its information channels (both formal like magazines and informal like rumours).



From propylene to polypropylene



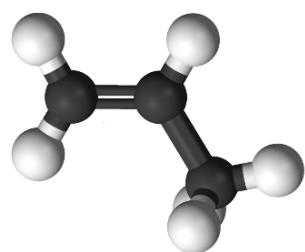
Liquid propylene as the main reactant will be supplied from the Azerikimya Steam cracker plant to our PP plant via a pipeline over a distance of roughly 3 kilometers at the rate of 18.75 t/h, while our plant is designed to produce at the maximum feedstock supply rate of 23 t/h. In addition to propylene, Azerikimya will also supply our plants with ethylene (used for co-polymer production and production of HDPE), hydrogen (used for molecular weight control) and steam (used as utility).

The plant utilizes a slurry phase polymerization process (with subsequent gas phase polymerization for Heterophasic co-

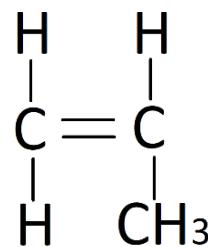
polymer grades only) that runs at relatively low temperature and pressure, with the production capacity of 184,000 tons/year; based on 8000 hours of production per annum.

Feedstock to be supplied by Azerikimya:

- Propylene (liquid) – 18.75 t/h (as per contract; plant designed for 23 t/h)
- Ethylene (gaseous) – 13.75 t/h (as per contract; plant designed for 15 t/h)
- Hydrogen (gaseous) – 64 kg/h
- Steam – 15 t/h



a monomer propylene molecule



When the monomer propylene molecules of liquid propylene enter the plant, they are first treated in the Propylene Purification area to remove some components (CO , H_2O , COS) that are contaminants to the polymerization reaction. After purification, propylene flows to the Polymerization area.

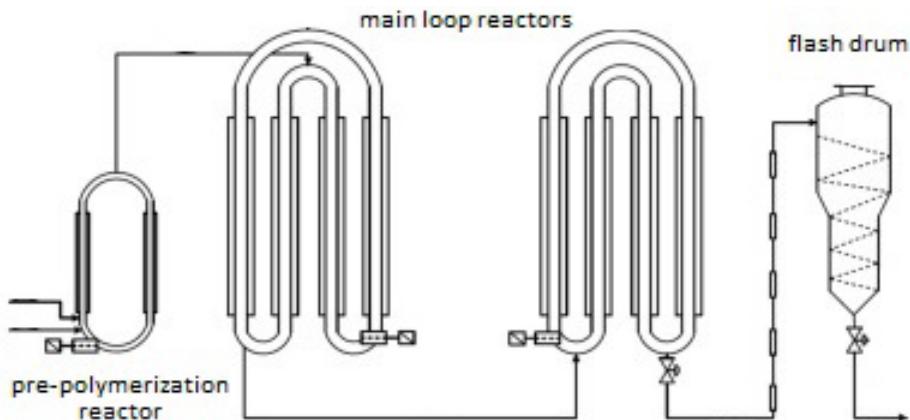
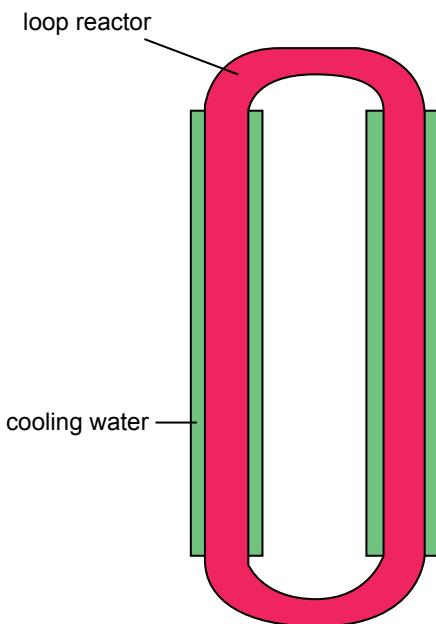
Polymerization is firstly initiated in the Pre-Polymerization Reactor (much smaller in size than the main loop reactors) where the catalyst particles are encapsulated with a thin polypropylene layer, in order to protect their spherical shape. Here, the reaction medium is less harsh on the catalyst particles, as the reaction rate is slow (operating conditions – pressure: 34-38 bar(g), temperature: 20°C).

The pre-polymerized product is sent to the reaction train consisting of two Loop Reactors operating in series, based on the slurry loop principle, i.e. continuous circulation by the action of reactor circulation pumps. Both reactors are constantly fed with propylene to maintain a constant solid concentration.

The heat produced by the reaction is removed by water that circulates in the reactor's water jackets. Loop reactors are operating at the temperature of about 70-75°C and at the pressure of about 34-38 bar(g).

At the outlet of the Loop Reactors, the slurry contains PP powder (53%) floating in liquid propylene (47%).

This slurry is then passed through the Flash-line, which is a 100-meter-long double-pipe heat exchanger where liquid propylene starts to evaporate into gaseous form. Pressure is lowered to 35-30.

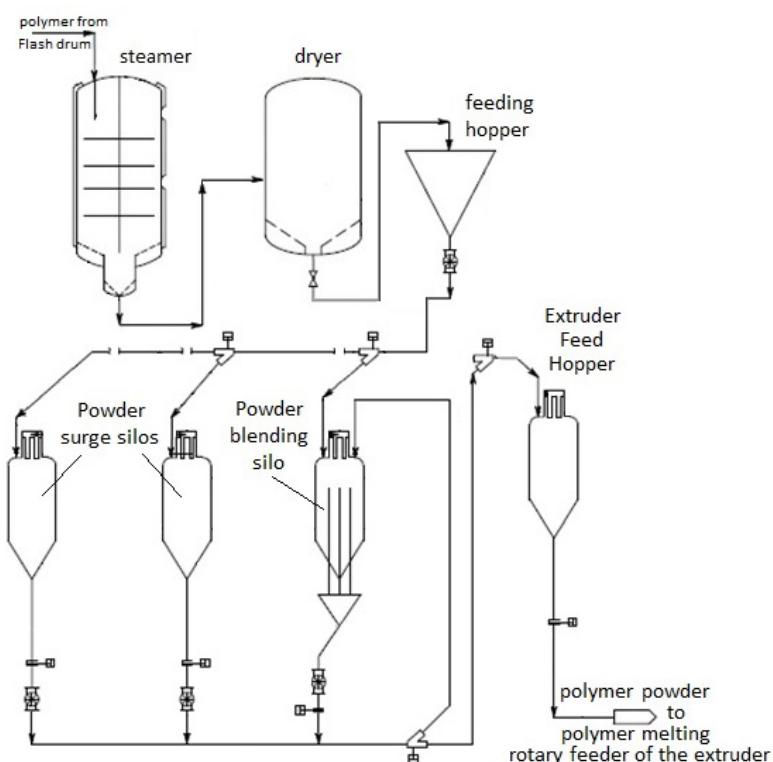


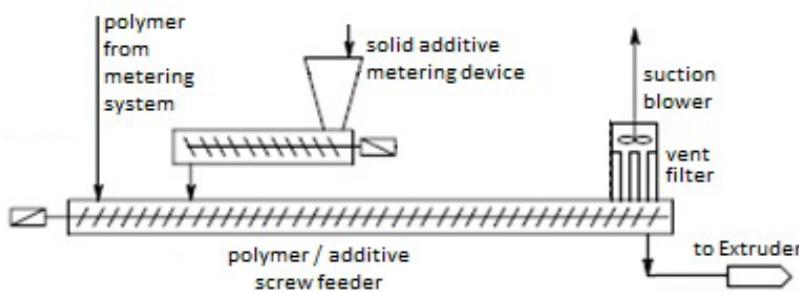
In the Steamer equipped with agitators (stirring mechanism), the fed-in PP powder is treated with steam to achieve full separation of PP powder from any remaining propylene. At the outlet, wet PP powder is obtained.

In the Dryer, which is a large vessel, hot Nitrogen is used to vaporize the water out to dry the PP powder. At the end of this stage, dry PP powder leaves the Wet Section for the Dry/Finishing Section.

From the Dryer the polymer powder is transferred via a Feeding Hopper to 3 Powder Silos (of which one is a blending silo) which normally just act as a transit point, but in case there is a jam in the next (Extruder) section they act as temporary storage facilities and the blending silo keeps the powder in motion to prevent it from agglutination.

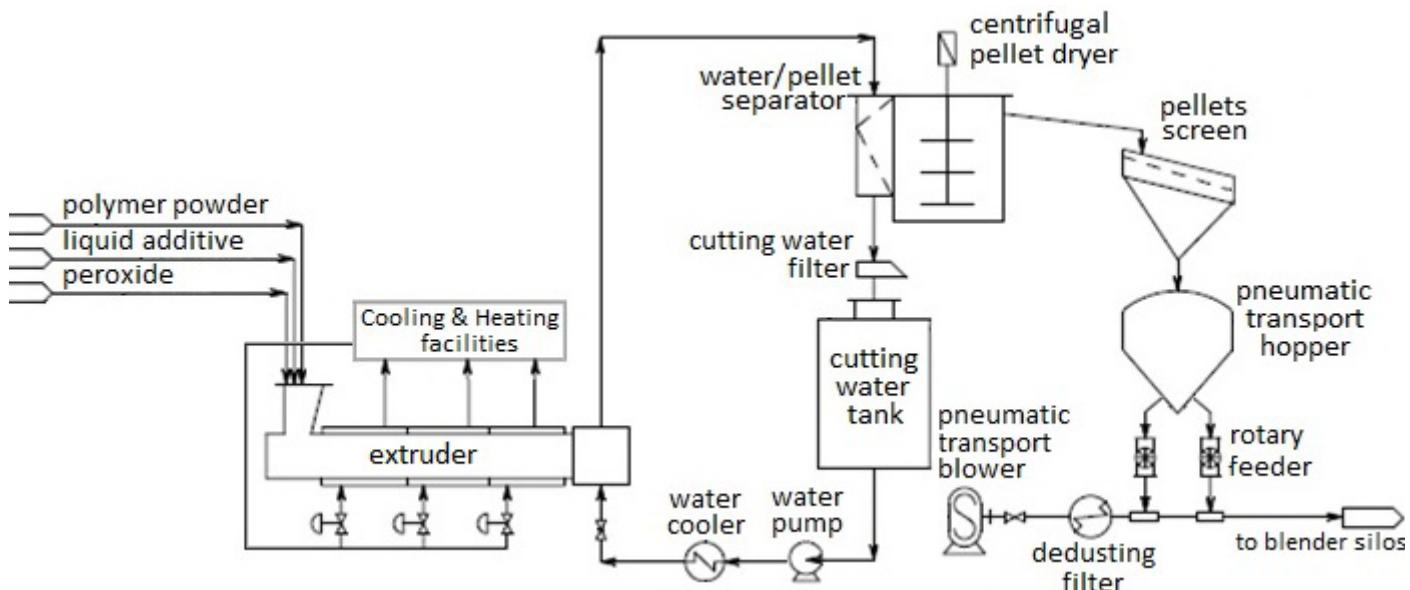
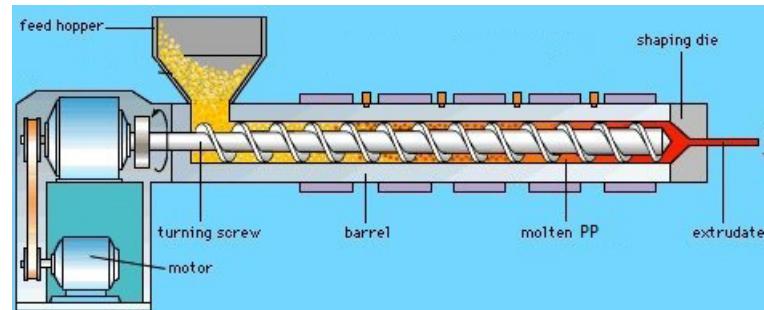
Via the Flash-line, the mixture flows to the Flash drum, where the pressure is further lowered down to 16 bars to continue promoting evaporation and separation of propylene gas from the PP powder. The unreacted propylene is separated from polymers and sent to the propylene recovery area where propylene is recycled back to the Reactors.

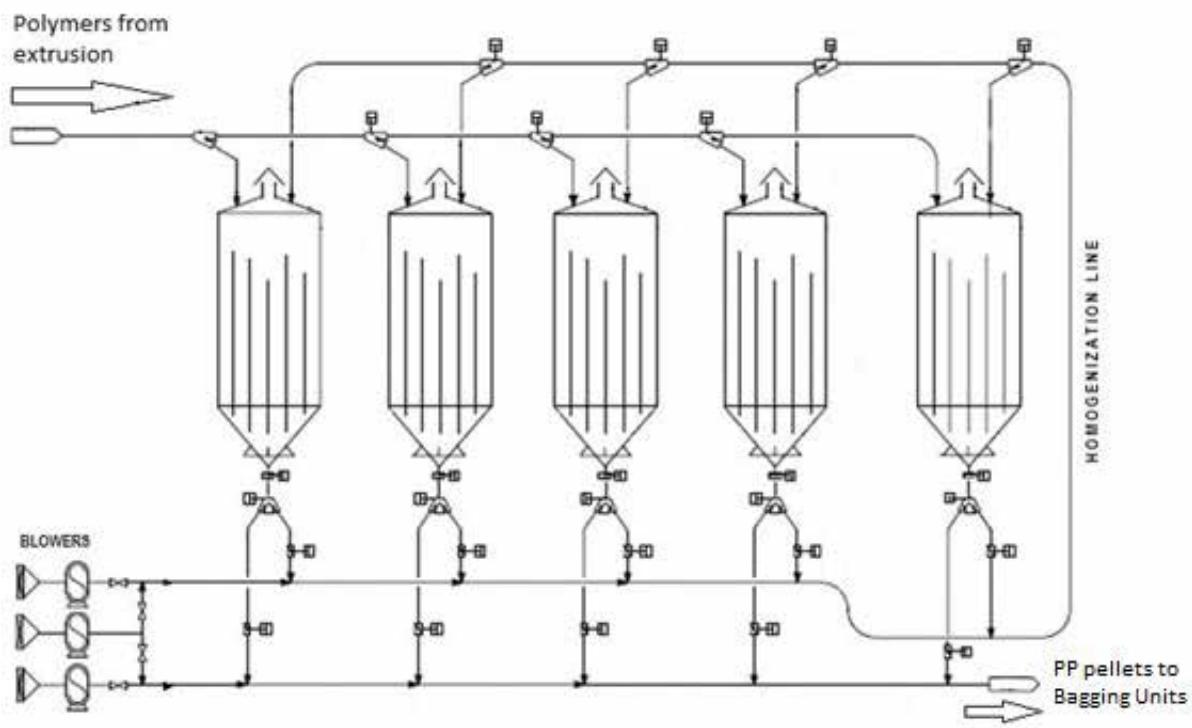




Passing through the Screw Feeder, the PP powder gets mixed with fed-in additives, as required by the licensor's recipe for a given grade of polymer pellet product.

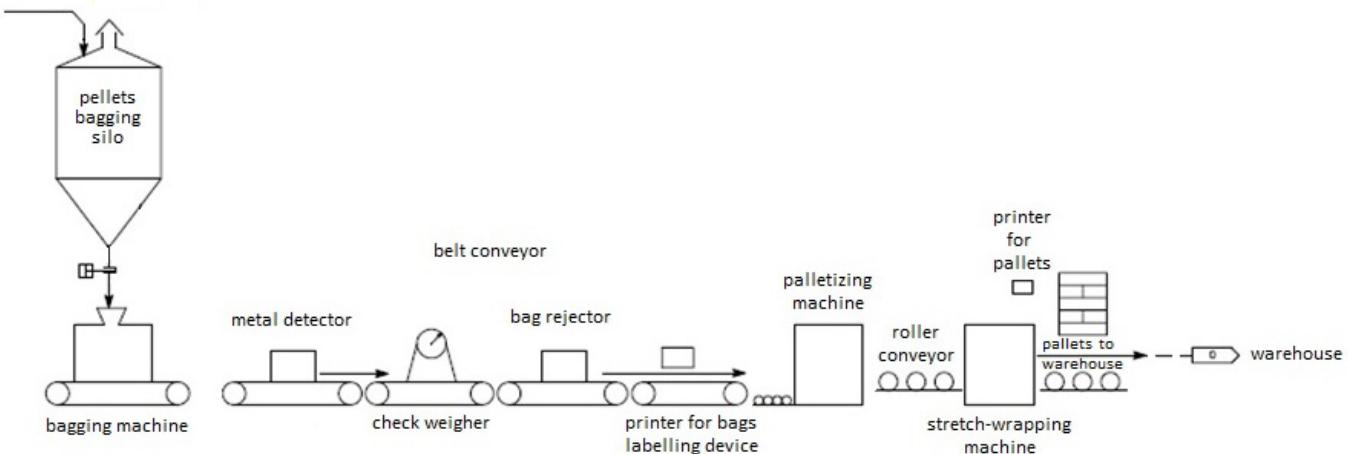
The **Extruder** also has a large rotating screw where at 240 degrees Celsius the PP powder melts up with the additives and is then directed towards the Die Plate where the protruding PP mass is simultaneously cut (granulated) and cooled with demineralized (DM) water. The Water & Pellet **Separator** sieves out the water and the dry PP pellets are then pneumatically (by air blowers) transported to the 5 **Blender Silos**, which are used for homogenization.





In addition to their homogenization function, the Blender silos can also ensure some necessary hold-up time to allow for performance of maintenance work (when necessary) at

the downstream PP Pellets Bagging and Packaging lines without shutting down the whole PP plant.



Homogenized PP pellets are pneumatically conveyed to the PP Pellets **Bagging and Packaging Area** where they are packed into 25 kg bags or into 1 ton big bags. The 25 kg bags are put on flat wooden pallet with net weight of 15000 kg (12 layers). The pallets are then covered by shrink film to stabilize the packaging on pallets during shipping.

Polymers in augmented reality



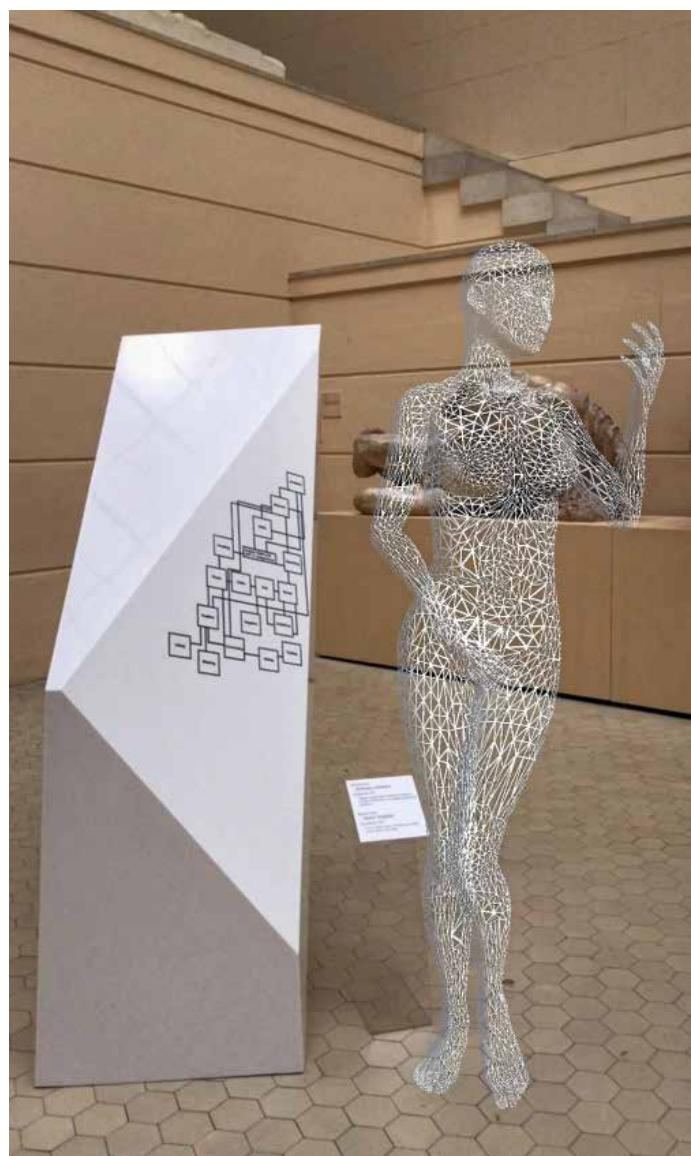
The polymers we are familiar with through daily chores are known as plastics. The plastics, or thermoplastics, are polymers that soften when heated and are molded into different forms - smart buildings, biometric clothes, bright new teeth prostheses, biosafe long live food packaging, and a sweeping range of other applications. Thermoplastics are used to make everything nowadays, from water bottles to pieces of conceptional art swiftly endorsed by the world's leading cultural authorities, such as the International Venice Biennale, an institution designated to identify trends and distribute cutting-edge ideas since 1895.

This year the 57th Biennale featured an installation by two Krasnodar residents, Andrey Blokhin and Georgy Kuznetsov, a.k.a. Recycle Group. Andrey and Georgy have recently made it to the list of contemporary artists with the highest investment potential, according to the Russian Art Investment Rating agency, 49ART.

Several weeks following the opening in Venice, Recycle Group turned up at the Pushkin State Museum of Fine Arts in Moscow.

Once known as the stronghold of conservatism and prudence, it is now setting forth a new concept – Pushkin XXI





Museum – entangling classical art with contemporaneity. Homo Virtualis, the exhibition in Moscow, reflects on the evolution of humans in a brave new world of web and gadgets, where data-saving in a cloud or a server could assure individual digital immortality, and ponders the emergence of new biological species, Facebooker and Twitterian, mono-functional and transfixed in self-admiration. 16 sculptures in molded polyethylene and post-industrial junk connect times by blending so perfectly with permanent museum faux marble artifact of Roman Renaissance, that they are impossible to tell from the ancient objects without the exogenous aide of Augmented Reality: visitors are advised to download RECYCLE APP on their mobile devices before entering the halls. The message could only be fully decoded when the exhibits are viewed through the mobile device lens: a see-through effect of the real-world environment is there, while the perception is enhanced by computer-generated input of graphics and GPS data. A sort of locative technology, that Will Gibson, the pioneer into the science fiction cyberpunk, described in his 2007 novel, "The Spook Country".



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