

[®]**IONITECH**
ion nitriding technology

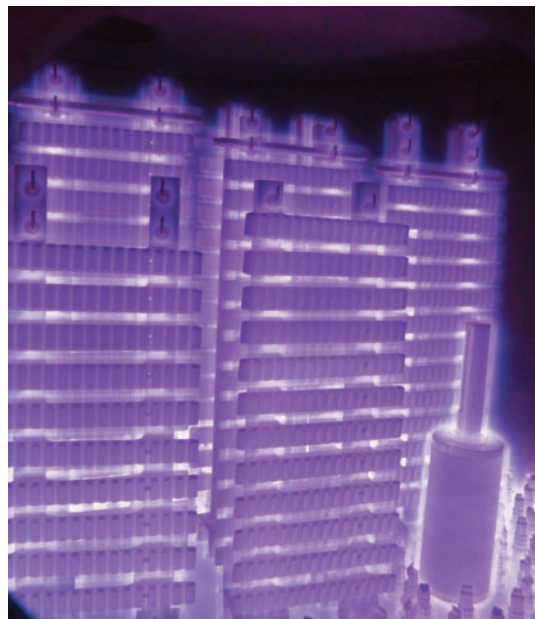
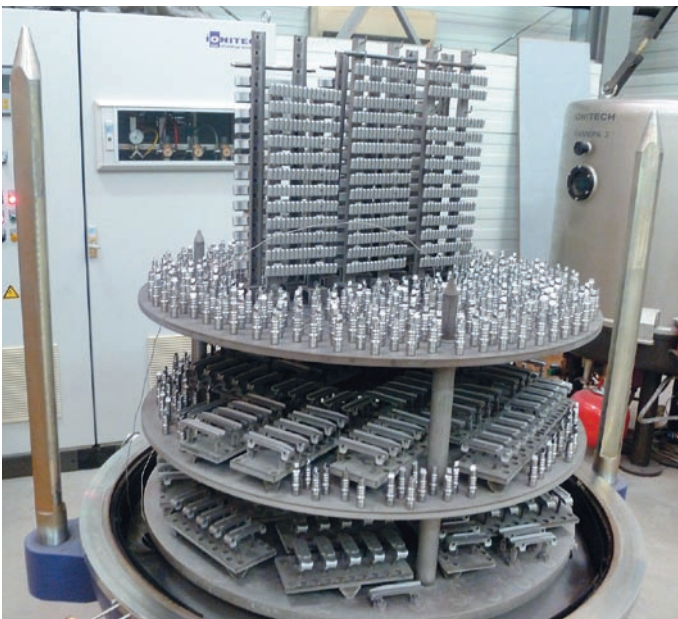
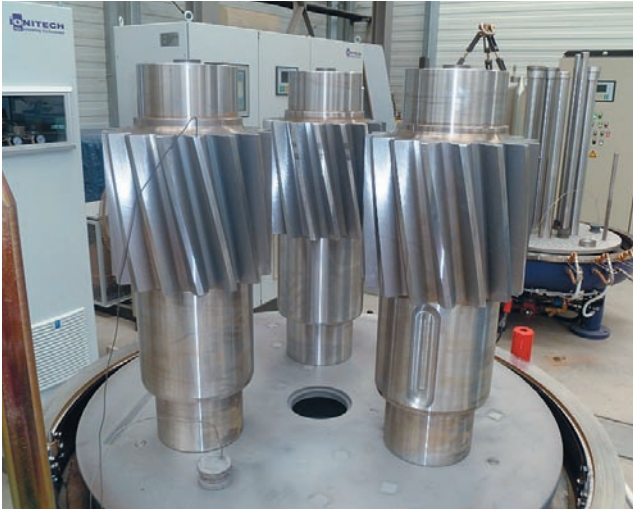
The best and affordable way towards improvement

Ionitech Ltd. is a private family company founded in 2003. The company is specialized in the manufacturing of Hot-Wall and Cold-Wall furnaces for Plasma Nitriding and Nitrocarburising as well as providing services.

Main role in the founding of the company play the long years of scientific research and development in the field of material science and engineering, carried out by Ph. D. Alexander Varhoshkov in the beginning of the 1970's. The solid foundation of his researches in Plasma Nitriding in addition to the engineering knowledge and entrepreneurship of Edward Varhoshkov and the expertise of Yovcho Stoyanov in the field of electronics and control systems, quickly transformed the company in a trustworthy and competent partner, devoted to the success of it's clients.



Currently, high qualified specialists, working at Ionitech in close collaboration with our partners from Vacuumterm 2000 Ltd. and Digicon, have dedicated to constant development and improvement of their results and Know-How, in order to provide the best possible equipment and knowledge to our partners and clients.



Plasma Nitriding brings solutions for your needs

Plasma nitriding, also called Ion Nitriding, is a thermochemical treatment, which is carried out in a glow discharge, excited in a gas mixture of nitrogen and hydrogen. Nitrogen ions, accelerated by an electric field, bombard engineered parts, heat them and create conditions for the diffusion of nitrogen atoms into the lattice of the metal. The result is the formation of a high hardness surface layer. When the gas mixture contains carbon, the process is called low temperature Plasma Nitrocarburising.

Plasma/Ion Nitriding is used to improve the surface hardness, wear resistance, fatigue life, corrosion resistance of parts made of steel, cast iron, titanium and aluminum alloys, sintered materials etc.

Applications

- Automobile/Aircraft Industry - crankshafts, camshafts, gears, pistons, cylinders, valves, valve springs, synchromesh rings;
- Metal Casting and Moulding Industries - moulds for non-ferrous metals and alloys;
- Aluminium Industry - dies for casting and extruding;
- Forging Industry - all kinds of dies for hammering and pressing (cold forging, impression forging, open die forging);
- Plastics Industry - extruder screws, cylinders, moulds for injection moulding;
- Machine Building - shafts, spindles, slide-rails, instruments for cold and hot rolling, dies and punches for deep drawing, pump cylinders, milling and drilling tools (milling cutters, rams, drills, taps, broaches, etc.);
- Powder Metallurgy - gears, bushes, synchromesh rings;
- Power Engineering - turbines, shafts, spindles, gears.

Advantages of Plasma Nitriding

Typical feature of plasma nitriding is the active participation of the treated parts in the glow discharge - the parts act as a cathode, while the chamber acts as an anode.

There are many advantages of this method over conventional gas nitriding:

- Cost effectiveness:
 - 3 to 10 times reduced duration of treatment;
 - 50% - 100 % less energy consumption;
 - 50 to 100 times less working gas consumption;
- Distortion - none or negligible distortions, because ion nitriding is performed at lower temperature and under vacuum;
- Higher surface, case and kept core hardness;
- Excellent wear resistance - the ion nitriding process produces a compound zone which is dense, nonporous, very hard, not brittle, and has a low coefficient of friction;
- Reproducible results and better control - the technological process of ion nitriding is fully automated and computer controlled. The parts are heated by the ion bombardment on their surface and therefore the parts are heated uniformly;
- Surface finish - due to minimum deformations no additional mechanical treatments are necessary;
- Necessity of prepassivation of stainless steel is eliminated;
- Masking - surfaces which require masking are easily masked with reusable mechanical masking devices or special paint for masking - 100 % effective;
- Excellent hygiene and working conditions - the process is not toxic and corresponds to all modern requirements for environmental control.



Hot-Wall equipment

Ionitech's Hot-Wall plasma nitriding and low temperature nitrocarburising equipment - aerospace solutions for your needs. In the Hot-Wall type plasma nitriding installations, the heating of the parts in the vacuum chamber is done by both heaters and pulsed plasma. This type of installations are especially suitable for nitriding different shaped and sized parts in one batch.

The main advantages of this type of equipment are:

- The installations fully comply with the AEROSPACE MATERIAL SPECIFICATION - AMS 2759/8A
- Full temperature uniformity, inspected with 9 thermocouples
- Can plasma nitride parts for the air and space industries
- Absolute temperature uniformity in all parts
- The chambers could be equipped with their own lifting mechanism
- No water cooling of the vacuum chamber

The vacuum chambers are manufactured from stainless steel. Depending on their size they have 2 or 3 separate zones of heating and cooling. The parts are loaded on metal plates. These plates lie on support insulators, and are connected to the cathode of the plasma generator. The process of plasma nitriding could be viewed through a sight glass. The temperature during the process is measured directly in the parts using one or two thermocouples K-type.

Installation model	Working volume, mm, Ø x h	Heating and cooling zones	Max. weight of loaded parts, kg
ION-25HWI	500 x 600	2	200
ION-50CWI	750 x 800	2	800
ION-75HWI	750 x 1200	3	1500
ION-100HWI	1000 x 1200	3	2500
ION-150HWI	1300 x 1300	3	3250
ION-200HWI	1300 x 1800	3	4000
ION-250HWI	1500 x 2000	3	5000

Hot-wall plasma nitriding models:

- Input voltage: 3/400V (480V) +10%/-15%, 50Hz (60 Hz)
- All installation models could be equipped with two chambers working separately - learn more about Ionitech's Double-Chamber System for no loss in technological time
- Working gases: ammonia, nitrogen, hydrogen, propane, methane
- Cooling gases: nitrogen, argon
- Working pressure: 1-8 mbar
- Time for manufacturing 4 – 6 months (depending on the model).



Cold-Wall equipment

Ionitech's Cold-Wall plasma nitriding and low temperature nitrocarburising equipment is a perfect addition to your manufacturing process for repeatable results.

The heating of the parts, in a Cold-Wall plasma nitriding installation, is carried out only by pulsed plasma created in the vacuum chamber. This type of plasma nitriding equipment is especially suitable for nitriding similar in shape and size batches of parts.

The main advantages of this type of equipment are:

- Lower cost of the equipment
- Easy maintenance
- Lower consumption of electrical energy

The Cold-Wall vacuum chambers' type could be:

- Door-type chambers
- Bell-type chambers
- Pit-type chambers'
- Combined chambers loaded from the bottom and from the top

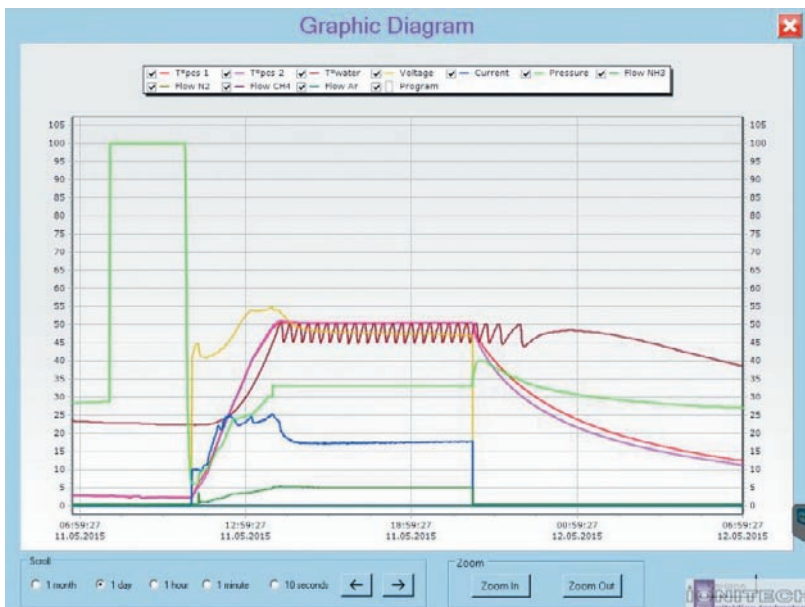
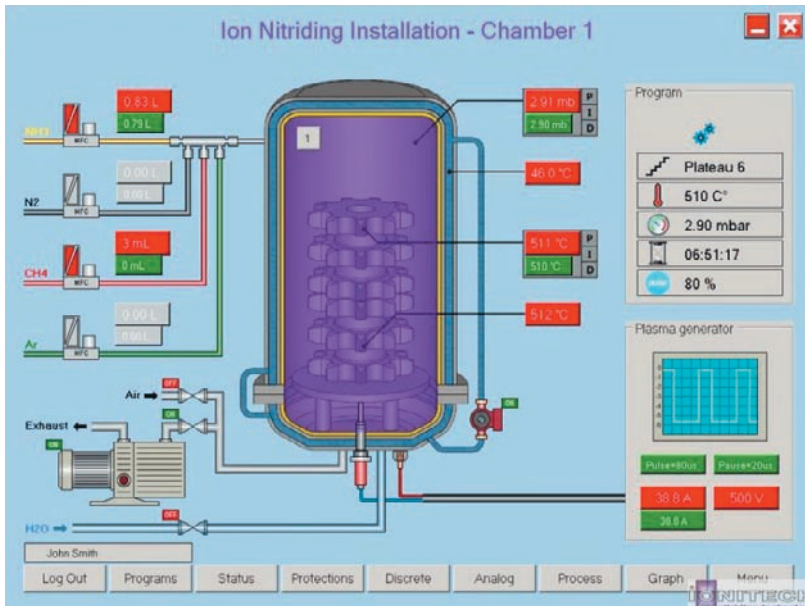
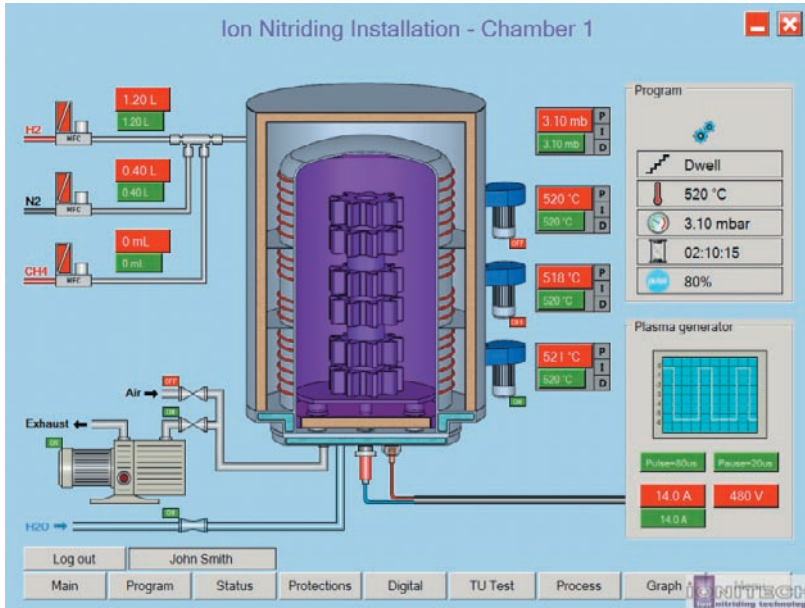
Installation model	Working volume, mm, Ø x h	Vacuum chamber type	Max. weight of loaded parts, kg
ION-20CWI	500 x 600	Door-type	200
ION-25CWI	500 x 600	Door-type	300
ION-40CWI	750 x 750	Bell-type	600
ION-50CWI	750 x 900	Bell-type	1000
	750 x 1200	Bell-type	1000
ION-75CWI	750 x 1800	Pit-type/Combined	1500
	1000 x 1000	Bell-type	1500
ION-100CWI	750 x 3000	Pit - type	2000
	1000 x 1500	Bell-type	2500
	1000 x 2000	Bell-type	2500
	1300 x 1300	Bell-type	2500
ION-150CWI	750 x 5000	Pit - type	2500
	1300 x 1800	Bell-type	3000
	1600 x 1600	Bell-type	3000
ION-200CWI	1000 x 5000	Pit - type	3500
	2000 x 1000	Bell-type	4000
ION-300CWI	2500 x 1500	Bell-type	5000

- Input voltage: 3/400V (480V) +10%/-15%, 50Hz (60 Hz)
- All installation models could be equipped with two chambers working separately - learn more about Ionitech's Double-Chamber System for no loss in technological time
- Working gases: ammonia, nitrogen, hydrogen, propane, methane
- Cooling gases: nitrogen, argon
- Working pressure: 1-8 mbar
- Time for manufacturing 4 - 6 months (depending on the model)

Steel		
Steel grade, EU (AISI)	Carbon Content, %	Alloying Elements
11MnPb3	0.05 - 0.3	Low-Alloy
16MnCr5		
20MnCr5		
17CrNiMo6		
20NiCrMo 2-2		
21CrMoV 5-7		
31CrMoV8		
S355J2		
S235JR		
C22 (AISI 1020)		
34CrNiMo6 (AISI 4340)	0.3 - 0.6	Low-Alloy
41CrAlMo7		
40Cr4		
42CrMo4		
S45C (AISI 1045)		
C35 (AISI 1035)		
100Cr6		
GG25	Cast Iron (> 2 %)	
GGG60	Cast Iron (> 2 %)	
35NiCrMoV 12-5	0.3 - 0.6	Medium-Alloy
56NiCrMoV7		
FDAC (JIS standart)		
X37CrMoV 5-1 (H11)		
X40CrMoV 5-1 (H13)		
X155CrVMo 12-1	Cast Iron (> 1 %)	High-Alloy
X165CrVMo 12-1	Cast Iron (> 1 %)	
X220CrVMo 12-2	Cast Iron (> 2 %)	
S-6-5-2	0.6 - 1	High-Alloy
S-10-4-3-10		
Sintered Steel		
D 30	< 0.3 %	Low-Alloy
D 39	0.3 - 0.6	
Stainless Steel		
200 Series	0.05 - 0.3	High-Alloy
300 Series		
400 Series		

Results after Plasma Nitriding for some Steel Grades

Process Temperature, °C	Results		Type of Parts or Tools
	Surface Hardness, HV1	Case Depth, μm	
540 - 570	450 - 600	300 - 500	Gears, crank shafts, camshafts, bushes, cylinders, extruder screws, couplings, admission cams screws, guide manrels, synchromesh rings, etc.
480 - 540	600 - 750	150 - 400	
480 - 540	600 - 750	150 - 400	
480 - 540	600 - 750	150 - 350	
480 - 540	600 - 750	150 - 350	
480 - 540	600 - 750	150 - 350	
480 - 540	600 - 750	150 - 350	
540 - 570	450 - 600	300 - 500	
540 - 570	450 - 600	300 - 500	
540 - 570	450 - 600	300 - 500	
480 - 540	650 - 800	150 - 400	Pressforms for plastics and casting of non-ferrous metals and alloys, stamps, gears, crank shafts, camshafts, cylinders, etc.
480 - 540	900 - 1100	150 - 400	
480 - 540	600 - 750	150 - 400	
480 - 540	600 - 750	150 - 400	
540 - 570	450 - 600	300 - 500	
540 - 570	450 - 600	300 - 500	
	550 - 650	300 - 500	
540 - 570	450 - 600	300 - 500	
540 - 570	450 - 600	300 - 500	
500 - 530	600 - 700	50 - 300	Tools for extrusion, plastic molding, punch, shear, cutter, etc.
500 - 530	600 - 700	50 - 300	
500 - 530	900 - 1200	40 - 200	
500 - 530	900 - 1200	40 - 200	
500 - 530	900 - 1200	40 - 200	
480 - 500	900 - 1200	60 - 150	Stamps, punches, deep drawing, etc.
480 - 500	900 - 1200	60 - 150	
480 - 500	900 - 1200	60 - 150	
500 - 540	900 - 1300	10 - 50	Gear cutting tools, milling tools, punch, cutter, etc.
500 - 540	900 - 1300	10 - 50	
540 - 570	450 - 600	300 - 500	Gears, shafts, synchronizer rings, etc.
540 - 570	450 - 600	300 - 500	
400 - 540	550 - 1300	20 - 130	Food industry, automotive industry, corrosive enviroment, etc.
400 - 540	550 - 1300	20 - 130	
400 - 540	550 - 1300	20 - 130	



Plasma nitriding at your control

Take full control with our user-friendly PC Control Panel.

The control system consists of a PC controller, main system controller and subsystems (transmitters and drivers) that are connected in a communication network.

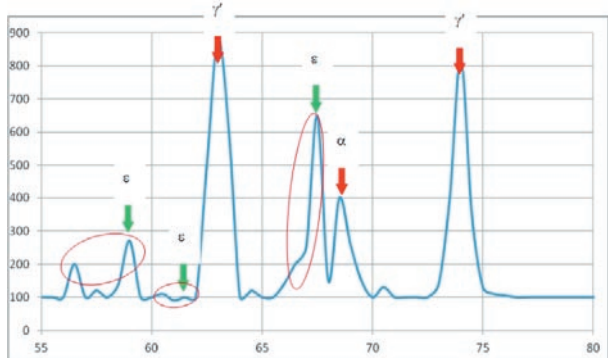
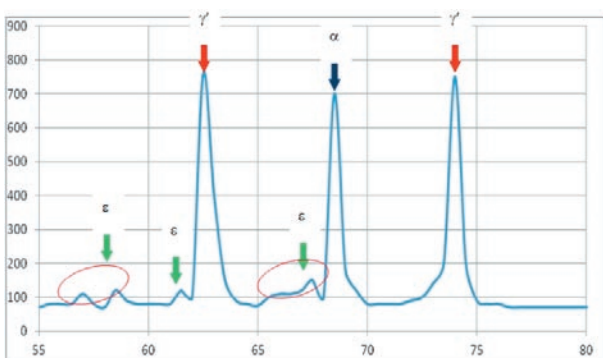
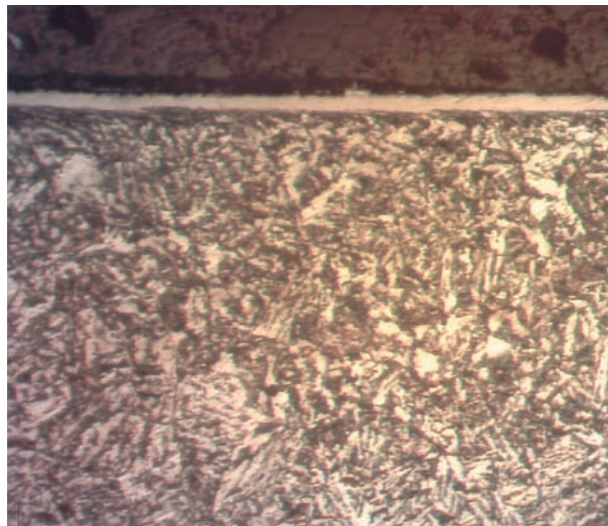
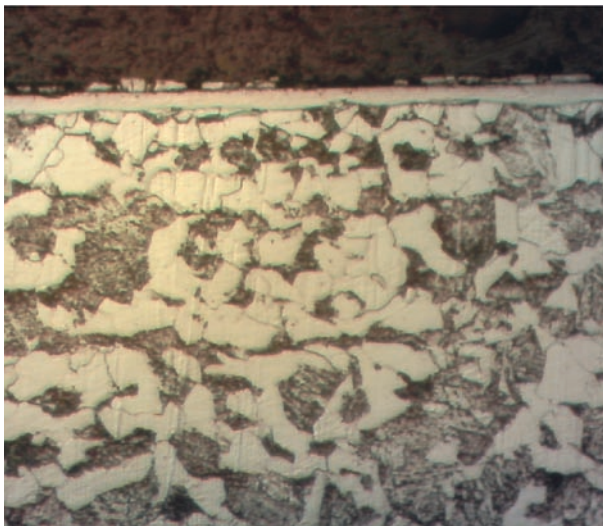
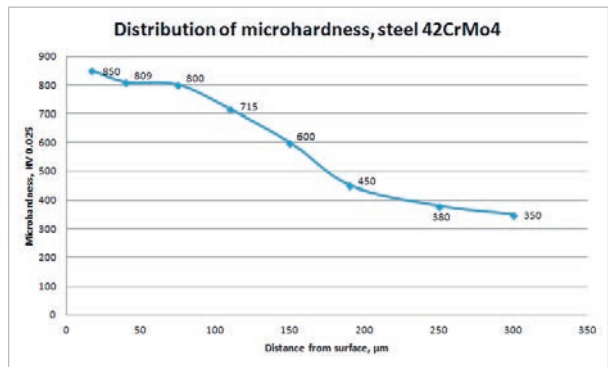
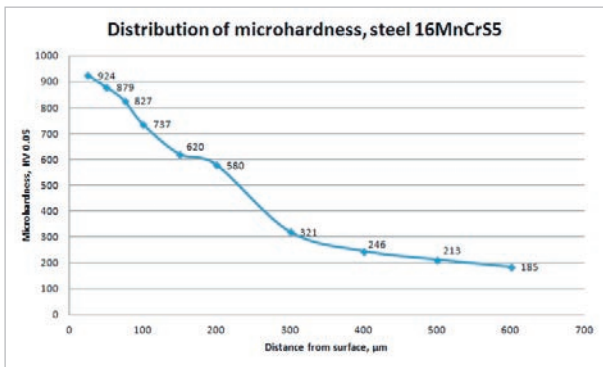
The Panel PC is equipped with a 15" touchscreen display and uses Windows Embedded Standard 7 operating system.

The technological process is completely automatic. All of the main parameters are controlled by the system controller:

- Pressure in the working chamber
- Temperature of the processed parts
- Heat rate
- Ratio and consumption of working gases
- Process time length
- Pulsed Plasma Current
- Frequency of pulses
- Duty-cycle of pulses
- Temperature of cooling water

Specifically designed application, called IonView, implements the operator interface of the ion nitriding installation. It has the following capabilities:

- Visualization of the technological process parameters
- Review and editing of technological programs, even while the installation is working
- Archive of the technological processes
- Remote access to the archive
- Visualization of the installation alarms
- Alarm notification through e-mail and sms
- Possibility to send process data to Ionitech as attached zip-file through email.



Ionitech Ltd. offers Solutions

Ionitech Ltd. has its own plasma nitriding units and provides services of plasma nitriding, plasma nitrocarburising and post-oxidation using our more than 40 years of experience to achieve the best results. Upon client's desire we make metallographic test reports containing information about the process, the surface hardness of the steel, microhardness in depth (diffusion depth) and metallographic studies of the nitrided layer.

Ion nitriding and nitrocarburising are used to improve the surface hardness, wear resistance, fatigue life, corrosion resistance of parts made of steel, cast iron, titanium and aluminum alloys, sintered materials, etc.

Plasma nitriding is a method with vast technological possibilities, suitable for treating parts with very complex shapes and geometries.

Diffusion layers of desired structure can be obtained, i.e. the diffusion saturation process is controllable and can be optimized to comply with the particular requirements for the layer qualities.

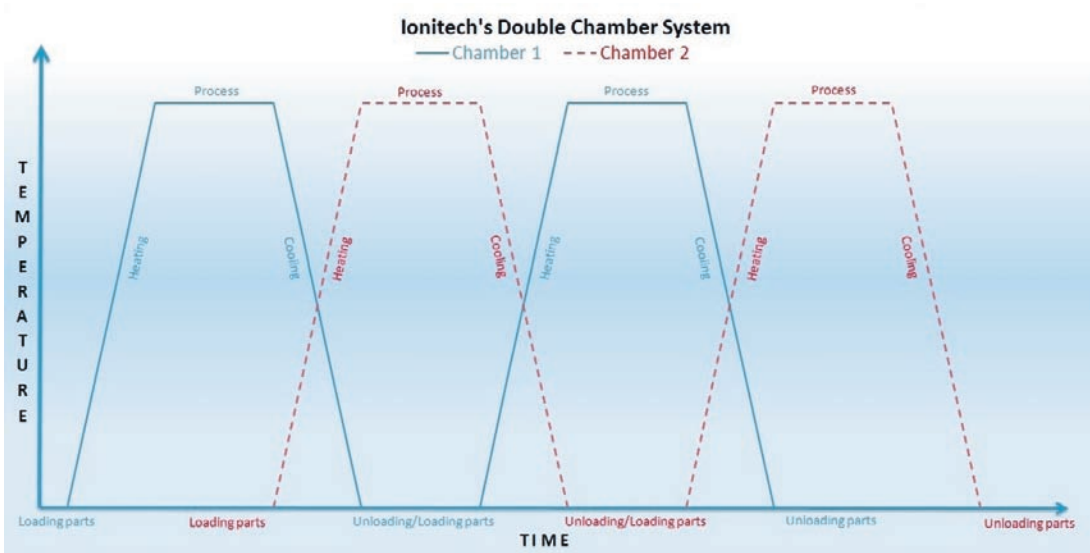
The achieved nitride zones are dense and solidly connected with the base metal.

Plasma Nitriding is also capable of treating parts of Stainless Steel without the necessity of a prepassivation process. The treatment could also be carried out so that it could preserve the corrosion resistance of the steel.

Post-Oxidation is done if there is a requirement to increase even further the corrosion resistance of the parts or tools.

Research and development for best results

Ionitech is dedicated to constant expanding their know-how and improving results. Every day research activity is carried out in-house, providing thorough information on surface hardness, microhardness, nitrided layer microstructure and corrosion protection for all types of steel. Contact us to find out how we could help you to achieve your requirements.



Ionitech's Double-Chamber System for no loss in technological time

The advantage of Ionitech's Double-Chamber Plasma Nitriding system is that there is no loss in technological time - waiting for the plasma nitrided parts to cool down to a suitable temperature before opening the chamber and loading the new batch.

While the parts in chamber 1 are being treated, new batch of parts could be prepared and loaded in chamber 2. When the process in chamber 1 is finished, chamber 2 could start its heating steps. This way several hours are saved when nitiding many batches of parts.

- The two chambers are controlled by one electrical cabinet.
- The two chambers could be with different working dimensions.

Ionitech's Double-Chamber System could be constructed for both Hot-Wall and Cold-Wall type furnaces.

Full-time support

We at Ionitech Ltd. value our clients and respect their time and energy and we know that any loss in technological time could be costly, so we offer full-time support for our equipment online and we respond as fast as we can. The support covers the following:

- Any difficulty or problem in working with our equipment, maintenance or any other arisen issue with it;
- We also share our know-how of more than 40 years of experience in Plasma Nitriding to help our clients achieve the best possible results, concerning parts', arrangement, process parameters and desired results.



ISO 9001:2015 Certificate for quality

Seal of Excellence by the European Commission



Our Partners around the World:

- IBC Coatings Technologies - USA
- PROCION LLC - RUSSIA, BELARUS
- HTS Vacuum Furnaces - Italy
- Representaciones Térmicas@Industriales - México
- TAE Korea Co.
- Monometer Manufacturing - UK
- Tandarra Engineering Ltd - NEW ZEALAND & AUSTRALIA
- SAHASYA METALLURGICAL SERVICES - ASIA
- Plasma DOO - MACEDONIA
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