Design by: S.Aryaiykia

EPCF - Oil & Gas Re-Refinery

NIROONAMAD

Modern, Advanced, And
innovative Technologies in Engineering

We,achieved the impossible.

Now,we are spreading our wings.

What makes us unique from others?

- High production capacity & application of advanced technologies
- Over twenty years of experience in engineering and construction
- Hiring specialized engineers & professional technicians
- Analysis, fault finding, assessment, provide solution and guidance
- Warranty and after-sales services

The Niroonamad
Company History

Niroonamad as a knowledge based company was established since 1995 with the aim to achieve self-sufficiency in design and manufacturing of high quality components in various industries such as oil & gas, petrochemical, cement, etc.

Constantly updating the knowledge, recruiting talented & specialized people are just some of benefits that made our business more efficient.

Nowadays our company is one of the world leaders in oil re-refining, oil regeneration & oil purification technologies and our machineries are sold to over 20 different countries.

Some of our products are as follows:

- Used Oil Re-refining Plant
- Mini Refinery
- Polishing System
- Blending Plant
- Wiped Film Evaporator (Agitated Thin Film Evaporator)
- Mineral Adsorbents & Catalysts
- Oil Regeneration Machines
- Transformer Oil Purification Machine
- Industrial Oil Purification Machine

Mini refinery

A hydrocarbon that forms the basis of crude oil, coal, and other important energy sources is an organic compound composed of only the elements of carbon & hydrogen. Hydrocarbons are utilized to produce fuels, plastics, detergents, solvents, paints, rubbers, etc.

We are able to design and manufacture hydrocarbon processing plants for the production of a wide spectrum of products such as gasoline, diesel, kerosene, etc. The presence of sulfur in hydrocarbon feedstock leads to a serious concern as it is associated with various problems and adverse impacts on the environment. Thus, the mini refineries that are produced by Niroonamad, have desulfurization units in order to remove sulfur-containing compounds continuously and efficiently through hydrodesulfurization (HDS) and adsorptive desulfurization (ADS).

Gas condensate (sometimes referred to as condensate) that is a mixture of low-boiling hydrocarbon liquids is utilized as one of the main feedstocks for our mini refineries.

The core benefits of our mini refineries are:

- Lower capital cost compared to crude oil refinery
- Removal of sulfur containing compounds via HDS & ADS
- Adsorbent is Multiple regenerable, can be reactivated several times
- Production of high quality products
- High performance & low energy consumption
- Reduction of greenhouse gases
- Short construction period

Used Oil Re-refining Plant

Used oil is exactly what its name says: any petroleum-based or synthetic oil that has been used. During normal use, impurities such as dirt, metal scrapings, water, or chemicals, can get mixed in with the oil, so that with increased time of usage, the oil no longer performs well. Eventually, this used oil must be replaced with virgin oil or re-refined to do the job correctly. Re-refining is a process used to refurbish used oil and return it to a high quality base oil.

From an energy point of view re-refining of waste oil to manufacture a base oil conserves more energy than reprocessing the waste oil for use as a fuel. The energy required to manufacture re-refined oil from used oil is only one-third of the energy required to refine crude oil to produce virgin base oil. Therefore, re-refining is considered by many as a preferred option in terms of conserving resources, as well as minimizing waste and reducing damage to the environment.

Some advantages of used oil re-refining include:

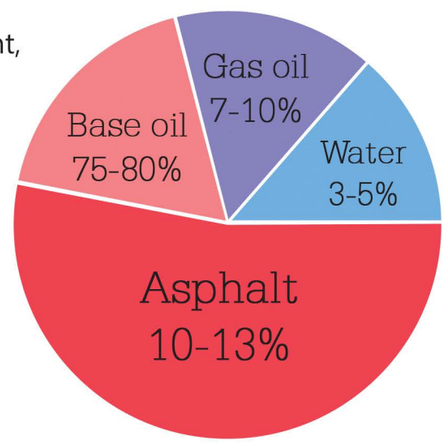
- Environment protection
- High quality products
- Low energy consumption in comparison to virgin base oil production
- Crude oil resources conservation (one gallon of used oil provides the same 2.5 quarts of lubricating oil as 42 gallons of crude oil)
- Process of hazardous materials in a safe and effective way
- Reducing greenhouse gases & heavy metal emissions

The used oil re-refining process designed by Niroonamad, is an economically attractive recycling method that recovers base lubricants from used oil by Thin Film Evaporation technology.

Process description:

The whole process consists of pre-treatment (removal of carbon sludge), dehydration, gas oil removal, vacuum distillation by thin film evaporator and polishing.
Thin film evaporation technology is a highly efficient, economical & green mechanism that produces high quality base oils in accordance with API & ACEA standards.

Used oil constituents:



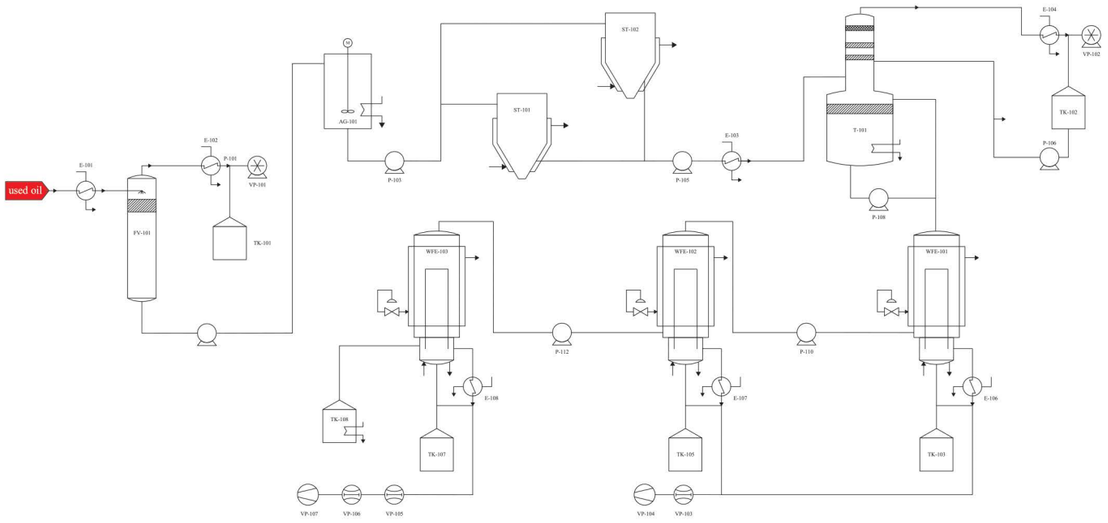
Used Oil Re-refining Plant

Firstly, a special kind of solvent is added to used oil feed for the precipitation of polymer, waxes & insoluble particles. Then the feed is partly vaporized under vacuum to remove water & light ends. For the separation of water & light ends, flotation is used. Gas bubbles attach to oil droplets in the water to increase their rise rate. Once on the surface of the water, the oil can be skimmed off, removing a large portion of the free oil in the water. It must be mentioned that separated water is applied in Liquid Ring Vacuum Pumps. Dehydrated oil is sent to a vacuum distillation column for gas oil removal. Oil from vacuum distillation is sent to agitated thin film evaporator (wiped film evaporator) for the separation of base oils. ATFE is an equipment for the continuous evaporation process of high boiling point, heat sensitive, viscous, and fouling products.

The ATFE system operates under vacuum conditions to reduce the boiling point. The liquid material to be distilled is distributed on the inner surface of evaporator by the rotating wipers. It must be mentioned separation & purification process is carried out under high Vacuum conditions. Thin film evaporator achieves high selectivity & oil purification from metals, heavy polymers, carbon, dust, etc. vacuum distilled lube oil is further processed to improve product quality as well as color. This process is done by polishing system.

Some special characteristics of our process are:

- High yield of the process
- Possibly to achieve API & ACEA requirements
- The technology does not use acid/clay
- Operates without extensive heat or pressure
- Possibly to produce several base oils with various characteristics



Used oil re-refining plant process flow diagram

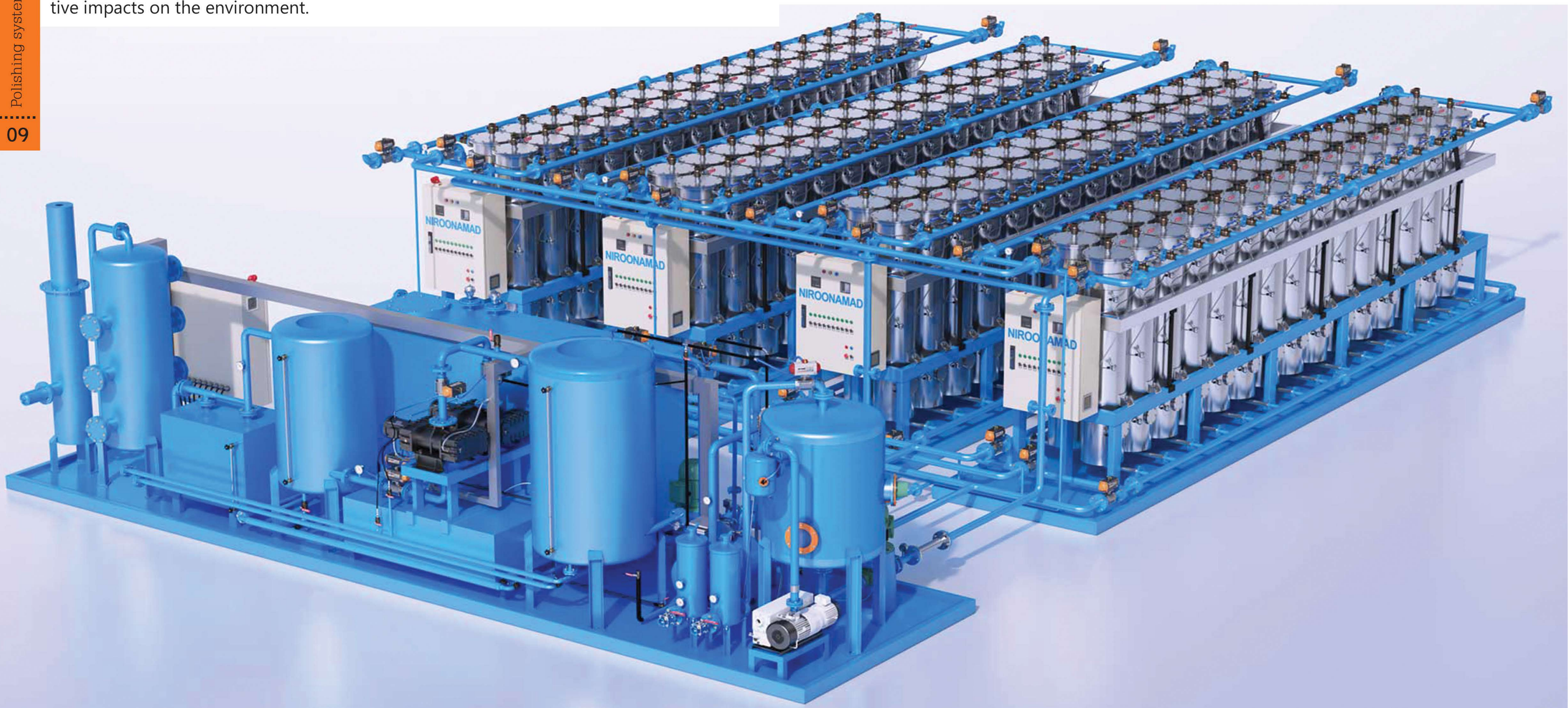
Polishing system

Polishing process is ideal for oils that have been pre-treated by vacuum distillation or wiped-film evaporation. This process consists of columns loaded with special adsorbents that its main application is in the removal of acidity, sludge, other soluble oil decay products and discoloration.

The unique features, which distinguishes the Niroonamad polishing system from other methods, are the ability to reactivate adsorbents and processing the feed without using any chemicals such as solvents. It is not necessary to remove adsorbents from Niroonamad polishing system for a long period of time, because they can be used over a range of 100-500. When finally saturated, they can be disposed of without any negative impacts on the environment.

Advantages:

- Low operating costs & initial capital investments compared to other finishing treatments
- High quality marketable base oil
- Reduce oil acidity
- Color & odor removal from distilled lube oil
- Technology overcoming all the limitation of Existing conventional methodology
- Adsorbent is Multiple regenerable, can be reactivated several times
- Less manpower is required to handle the process
- Environmentally safe to dispose once exhausted.
- Fully automated reactivation process

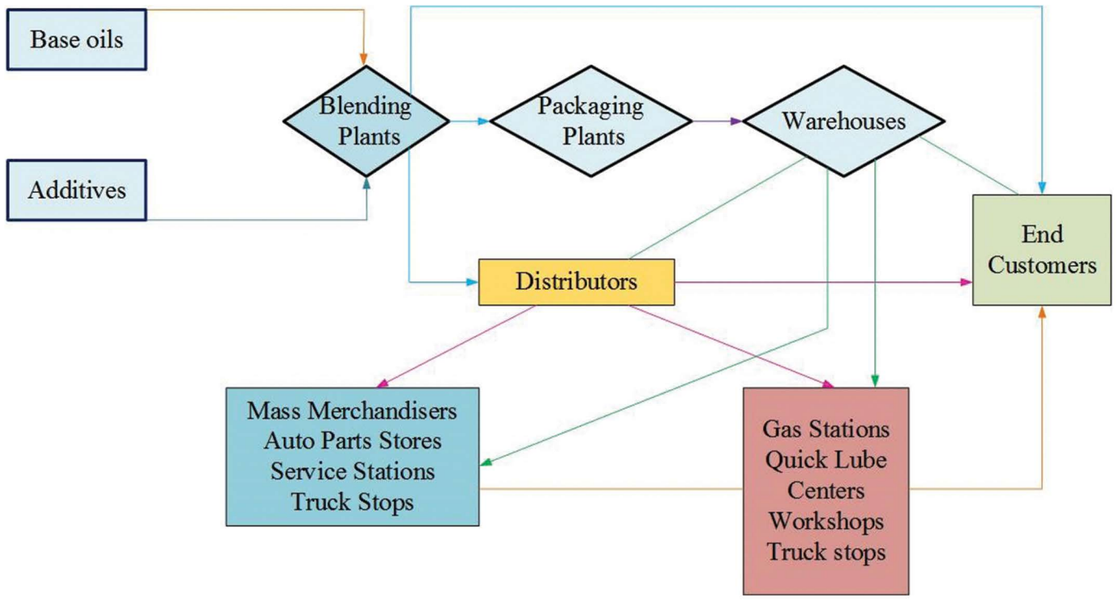


Blending Plant

The feed which is entered to the blending process is base oil that does not have the proper characteristics for use in industrial applications.

Lubricant additives are chemical mixtures which are combined with base oils to enhance the performance of lubricants and functional fluids. At lubricant blending and packaging process lubricants/mineral base oils are processed with required quantity of additives and chemicals to get the final product.

Niroonamad lube oil blending plant is a fully or semi-automated batch process and is performed within multiple parallel lines. Each line consists of one additive weighing, mixing vessel, and blender. Furthermore, PLC and SCADA batch control is possible from remote operating station. It must be noted the finished product is in accordance with international standards (API & ASTM).



Wiped Film Evaporator (WFE)

Wiped Film Evaporators (WFE) are used to separate & purify difficult-to-handle products. Thin film evaporation is a very energy intensive technology which separates mixtures based on differences in volatility.

The main component of the thin film evaporator consists of an internal rotor/wiper enclosed in a cylindrical shell. By using the rotor, a thin layer of oil is distributed on the heated wall surface. By this action the more volatile substance is evaporated. Then condensed and collected at a separate location. It must be taken into account high turbulence which occurs in the thin layer of oil, avoids the product degradation at high temperatures.

Niroonamad Company is able to design and manufacture thin film evaporators which are made of high quality materials with the highest performance. These evaporators allow even to separate sensitive products in small quantities.

Several advantages of thin film evaporators over other types of conventional evaporators are as follows:

- Short residence time
- High heat transfer rate through the film
- Ability to process high-viscosity materials
- Ability to process material which are sensitive to thermal degradation
- Efficient & regenerative cleaning of the contact surface
- Reduced pressure drop

Adsorbents & Catalysts

Niroonamad Company, that relies heavily on experienced research & development, develops & manufactures a variety of catalysts & adsorbents used in industries such as refining, petrochemical, chemical, and gas processing. It must be mentioned the prepared adsorbents also used for the removal of water pollutants.

These products are capable of reducing the level of impurities such as moisture, colloid particles, sulfur and acidic compounds which are available in industrial oil, edible oil, different fractions of crude oil and hydrocarbon feedstock.

We have developed crystalline & highly porous materials providing mechanical stability, selective adsorption, high adsorption capacity as well as durability to ensure efficient and reliable regeneration.

Some advantages of our adsorbents include:

- High sorption capacity
- High specific surface area, selectivity & high mechanical strength
- Adsorbents can be regenerated more than 100 times.
- Production process is more economic than other conventional methods
- After saturation, they can be dispose of without any negative impact on the environment
- They can be used for the removal of chlorine and fluorine from wastewater

Transformer and turbine oils regeneration machines

Reclamation or regeneration is defined as a process in which undesirable contaminants (mostly in the form of oxidation byproducts) are eliminated or reduced significantly, mainly through physical or chemical adsorption process.

Our regeneration machines not only removes water, gases, and particulate contamination, but also removes chemical byproducts including acids, aldehydes, ketones, and sludge and restore aged oil into like new condition fulfilling the requirement of IEC 60296 and ASTM D4378 standards.

These mobile machines which are designed fully-automated or semi-automated also can be utilized for the removal of corrosive sulfur. Generally the oil processing by our machines consists of two phases:

1) Regeneration: First of all, the physical parameters of oil are restored by passing through the filters. Then used oil passes through a degasification vacuum tank which not only is used for the removal of water and gases, but also elevates the regeneration effect by heating. Finally oil is stripped of impurities and aging byproducts by a bank of columns which are filled with an adsorbent media.

2) Reactivation: After fully saturation attained by sorbents due to the occupation of active sites, the sorbents need to be reactivated. One advantage of our system is that reactivation is performed within the columns and there is no need the sorbents to be drained. During the reactivation process, the impurities are removed from the sorbent and restore it to its initial state. When the sorbent media is exhausted can be disposed of as a dry waste in landfill.

It must be mentioned regeneration and reactivation phases are performed simultaneously and during the reactivation a bank of column, the other one is used for regeneration.

General specifications before and after transformer oil regeneration

Property	Test Method	Unit	Before regeneration	After regeneration
Acidity	IEC 62021	mg KOH/g	0.25	< 0.01
Color & Appearance	ISO 2049	...	Brown / Cloudy	< 0.5
Breakdown Voltage	IEC 60156	kV	< 30	> 70
Water Content	IEC 60814	ppm	< 2000	5
Tan δ at 90 °C	IEC 60247	...	< 0.01	< 0.001
Interfacial Tension	ASTM D971	mN/m	< 15	> 40

Benefits of our regeneration machines:

- Cost effective and environmentally acceptable method
- Treatment without removing the oil
- Processing equipment that is energized or off-load
- Performing reactivation & regeneration simultaneously
- Restoring the sorbent to its original state (no need the sorbents to be drained)
- Restores oil parameters including moisture and acidity similar to those of new oils according to IEC 60296 and ASTM D4378 standards
- Ability to design the regeneration machines fully-automated or semi-automated

General specifications before and after turbine oil regeneration

Property	Test Method	Unit	Before regeneration	After regeneration
Viscosity at 40 °C	ASTM D445	cSt	45	≤ 43.5
Viscosity at 100 °C	ASTM D445	cSt	6.5	6.6
Acidity	ASTM D974	mg KOH/g	0.31	< 0.13
Oxidation stability	ASTM D2272	...	203	> 1659
Level of cleanliness	NAS 1638	particles/ml	Out of range	7
Water separability	ASTM D971	...	...	0/40/40
Varnish potential test	ASTM D 7843	...	28.4	< 15
Foaming test	ASTM D 892	ml/ml	...	0.2
Water content	ASTM D 6304	ppm	> 200	20

Transformer oil purification machine

Transformer oil purification machine is a unit designed to eliminate or reduce physical contamination (moisture, gases, particulate matter) from electrical insulating liquids in order to restore its original properties to be used equally with fresh oils.

Nowadays we are producing transformer oil purification machines with a wide range of capacities. Our oil purification machine is very compact, portable and has high efficiency. Furthermore, due to the combination of vacuum chamber and heaters, there is no heat loss during the transferring of oil to vacuum chamber.

The importance of oil purification:

Petroleum-based mineral insulating oil which is mostly used in power transformers carries diagnostic information about the state of the transformer. Meanwhile, the proper maintenance of insulating oil ensures the reliable performance of the transformer.

The presence of solid contaminants such as dust and metal particles in oil may cause

Transformer oil purification machine

the formation of sediment and sludge. Some of these impurities can lead to a reduction in water separability. Furthermore, during the service, mineral insulating oil is subjected to an oxidative degradation process in the presence of oxygen and high temperatures. It must be noted metal particles such as iron and copper act as catalyst and accelerate the oxidation reaction of mineral insulating oil. Moisture is another factor that increases the speed of reaction. Consequently, chemical byproducts including acids, aldehydes, ketones, and sludge are produced which will further deteriorate the transformer insulation oil as well as the electrical grade paper insulation. In extreme cases, the damage to the paper insulation and other parts of the transformer may be irreversible which significantly increases the service costs of the transformers. Hence, for improving the lifetime of transformers, aged oil must be quickly replaced with either a new, fresh one or it can be purified. Both environmental and economic concerns make the latter a much more desired choice.

System advantages:

- High efficiency of purificatin and low energy consumption
- Oil processing on site and on a live transformer
- Reduction of particulate contamination based on NAS and ISO standards
- Improvement the insulation properties of the oil

General specifications after purification

After one pass	Water content	< 5	ppm
	Gas content	< 0/1	Vol%
	Breakdown voltage	> 63	Kv/2.5 mm
After three passes	Water content	< 3	ppm
	Gas content	< 0/05	Vol%
	Breakdown voltage	> 75	Kv/2.5 mm

Industrial oil purification machine

Lubricants play a major role in bearing and machinery function and increase the life-expectancy of equipment by:

- Reducing wear of moving parts
- Reducing friction between rotating parts and stationery ones

As a matter of fact, the potential consequence of equipment failure is attributed mainly to the lubricating oil used in equipment, which is about 75%. Hence, for improving the lifetime of equipment, aged oil must be quickly replaced with either a new, fresh one or it can be purified. Both environmental and economic concerns make the latter a much more desired choice.

Niroonamad manufactures fully or semi-automated industrial oil purification machine that removes water contamination under vacuum as well as other types of contamination, i.e. particulates and gases.

Benefits of the system:

- Reduction of particulate contamination based on NAS and ISO standards
- High efficiency of purification and low energy consumption
- Utilization of dry air for the improvement of water removal efficiency
- Oil processing on site and on a live transformer
- Indirect heating system (prevent oil degradation, additive loss, and ionization)
- Fully automated or semi-automated design
- Increasing heat transfer rate

Services

- Holding Oil Condition Monitoring (OCM) & Condition Monitoring (CM) training courses
- Holding oil workshop & training courses
- Professional consulting services
- Transformer oil regeneration based on IEC 60296 & IEC 60422 standards (this process is done onsite & can be performed on a live transformer)
- Turbine oil regeneration based on ASTM D4378 standard
- Industrial oil purification (this process is done onsite)
- Cleaning & flushing of hydraulic systems, pipes and tanks

Custom build:

We produce a different kind of machinery; for different kind of markets from the oil & gas industry to food & pharmaceutical industries after receiving customer order. Furthermore, our specialized consultants can offer solutions and practical guidance especially in the fields of separation, purification and re-refining of different types of oils.

Other products:

- Chemical reactors (continuous, batch & catalytic)
- Atmospheric & vacuum distillation columns
- Flushing system
- Electrostatic filter
- Oil skimmer
- Industrial oil filtration
- SF6 gas injection
- Desander & desilter

Environment (tomorrow?)

Apocalypse Now, a film by Francis Ford Copula. If you seen it, then you know what I am talking about. Well, That's what I remember, when anyone utters the word "Environment".

For anyone, who is slightly interested as to what is happening around us, then you would know that the clock is ticking down and if we don't do anything about our Environment, everything we built or did would be for nothing. Just look around you, Plastic waste everywhere, Forest disappearing at a rate that is unbelievable, Artic nearly gone, Oceans polluted to the extent that the news says, swim in the sea at your own risk. Drinking Water,,, well, we all know about that and as for weather ... Oh, I think I could for days just talking about this.

We all know, individually we can do nothing, but together we might be able to do something about it and hopefully save the world so that our children can live in it too .

To this end, we decided to do our bit by working in an industry that has been seriously effecting our planet, oil & gas. Oil is used to make petrol, plastic, tar, lube oil, and so many other products that is just mind boggling. As for us, we went into recycling lube oil, one of the most widely used crude oil derivatives .

Think about it, just about any engine we use, be it for automobiles, transformers, turbines, hydraulic gears, ,,,, uses lube oil. But, as useful as lube oil is, it is also extremely harmful to our environment and specially when the waste oil gets into the underground water system .

We are the manufacturers of systems that just about recycle any kind of waste oil and make it even refined better than its original form. The same oil can then be used over and over again without any waste .

At Niroonamad, we want to leave our children a better tomorrow, not an Apocalyptic one .

Note :

Note :

Address:

Sadra Street ,12th Km of Mashhad , Sento Road
Razavi Khorasan Province, Mashhad, Iran

Tel : +98 513 1511000
+98 935 805 0244
+98 935 222 9749

www.niroonamad.com

Info@niroonamad.com

NIROONAMAD General Catalogue
2023