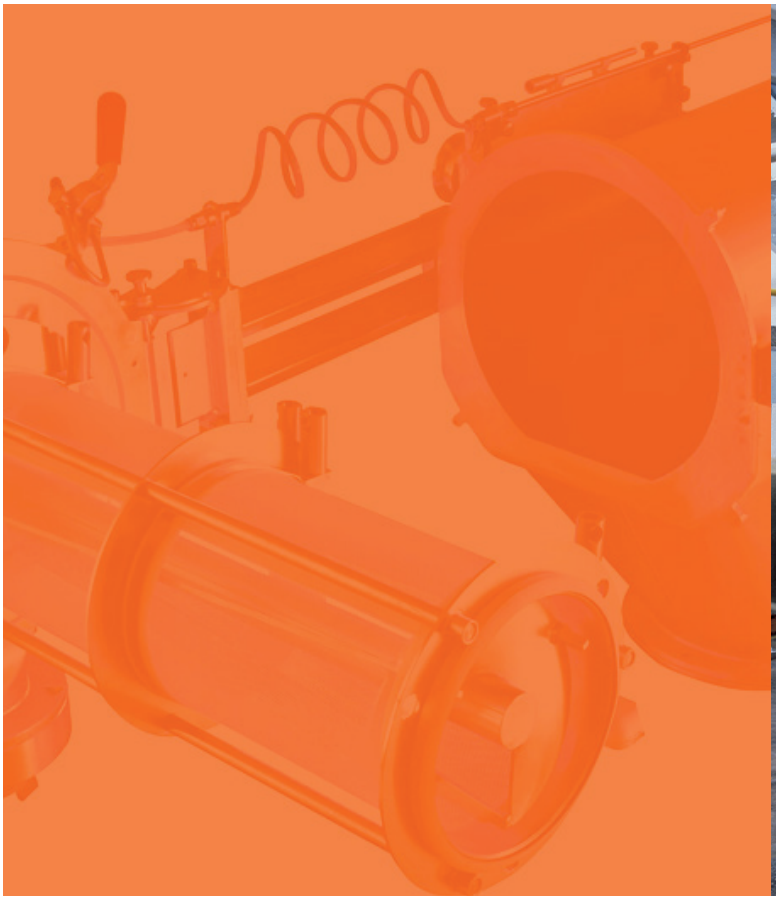
Selecting The Right Screener for Your Business

An engineers' and executives' guide to specifying, justifying and maintaining screening equipment for your operations



AZO®

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The history and evolution of screeners

Separating the wheat from the chaff — it's what ancient cultures accomplished by threshing and wind-assisted winnowing. Eventually there needed to be a reliable, scalable and mechanical solution to accomplishing this task. The introduction of the combine in 1935 consolidated mechanical processes, but the remaining hulls, contaminants and infestations left millers, bakers and later processors of other grains exposed. No one could assure consumers of the safety and purity of their products.

This was the challenge facing a young flour miller in 1949. Adolf Zimmerman from Osterburken, Germany, built the first wooden prototype of the cyclone screener that engineers and executives know today. It officially launched on the market under the name "Triumph" in 1952. Since then, centrifugal force has been the key ingredient to screening materials effectively.

Mr. Zimmermann took his initials in conjunction with the city of Osterburken, and founded AZO Inc. thereafter. Today, the AZO™ Cyclone screener is a trademarked term, and many in the industry simply refer to screeners as "AZOs" – so synonymous are the two.

Screener technology development

- **1949 Screening machine made of wood**
  This was the first cyclone screening machine in the world. It was developed and built by Adolf Zimmermann and later marketed under the name "Triumph" in 1952.

- **The 1960s E-series screeners and Liquid FLF Screener**
  Throughout the 1960s the E240, E360, E650 and E800 screener models were released by AZO. The FL-360 Screener, which was built to separate solids and liquids, was also released during this time. Each E model screener increases screening capacity with model number. The greater the screen size, the greater throughput is achieved in application. These screener models were developed with an aluminum-cast/steel housing. They were universally compatible in many industries, thanks to advanced materials and technology. The FL Screener exposed AZO to new potentials in the liquid market. Examples of applications the FL is utilized for include the production of whey, quark, latex and gold extraction.

- **1978 Double screener**
  This advancement increased performance through the use of a double screener insert (also compatible in many industries).

- **The Early 2000s Cyclone Screener DA650**
  Food hygiene was a top priority in the development of the DA650. This model is easy to clean, thanks to its extraction devices. It includes a dosing device, which saves space within a system.

- **2016 Screener DA240 MC Containment**
  This screener was created for operation and maintenance under conditions where contact with materials becomes dangerous. Through special foil bags, operators are protected against hazardous substances, even as the machine is open during screen inspection or cleaning. Potential dust contact is prevented by the use of inliners.

Applications of Screening Equipment

Screeners become essential when preventing foreign material in bulk solids and liquids from entering the production process. A screener can safely check the individual ingredients before, during or after processing high-quality raw materials, keeping your plant accountable and your consumers safe.

Screeners serve production functions as well as safety functions. They can condition material and help it become free-flowing for the rest of the conveying system. At times, clumps of sugar can prove difficult to convey and screeners can condition “out of spec” or agglomerated material such as this. Screeners also can make cuts in the material in regards to specific particle sizes.

Ultimately, your screener use will depend on the application and what you’re trying to accomplish. There are two points in conveying processes where screeners are typically used. Screeners are generally placed either directly after the raw material entry point or before a packaging line. In applications where the final product is still a powder, screeners are often incorporated before a product goes to packaging for a final quality safety screen. In applications where the final product is not a powder, it is more common to incorporate screening equipment earlier in the process (directly after the introduction of raw materials). Wherever a screener is placed, ingredients are conditioned to a uniform or homogenous state and oversized material, as well as foreign material (nuts, bolts, pieces of bag or pieces of rubber gloves), are removed from the process.

In some cases, a vibratory screener can remove impurities and eliminate contaminants for materials that are not a good fit for centrifugal screeners. Rice, orzo and particularly delicate products like dried beans are some examples of material better suited for a vibratory screener. Other materials like pellets do not require conditioning. Non-consumable materials typically have less standards in regards to safety. Particularly fluid materials like flour or starch do not require screening for conditioning purposes.

Still, companies that invest in and utilize screeners for necessary processes will maintain compliance with their quality assurance departments. Ease of consistent processing, material safety and material integrity are all greatly sustained by screening equipment.

Types of AZO Screeners for Solid Powders

There are three types of screeners specifically designed for screening solid powders available through AZO. These include the Type E, Type DA, and Type TW screeners. There are benefits and advantages to each screener, which can be viewed on the next page.

Type E

(sizes: 240, 360, 650, 800)

This screener is equipped with a single rotor and can be configured as a direct drive unit (with motor directly connected to a coupling from the shaft) or belt drive unit (with motor stored below the inlet). The E model does require a feeding device.

Type DA

(sizes: 360, 650, 800)

The DA Screener is equipped with a single rotor for the screening chamber and a separate drive for its integrated dosing screw.

Type TW

(size: 650)

The TW650 is made for truck unloading. It captures oversized particles when trucks are unloading into a silo with a pressure blower. Screen sizes are limited for this model. The TW screener is isolated from the stand because it has an attached vibrator motor that shakes the screening unit to help aid product flow through the screen.

Different Advantages of the AZO Solid Powder Screeners

Screener	Specific advantages	Where it is used in the process
Type E	• Easy inspection door (makes for quick, simple inspection) • Least expensive screener	When conditioning your product: can be used after the introduction of raw materials to the system (after a silo, a bag dump station, a super sack station etc.) When safety screening: at the end of a process, before packaging.
Type DA	• Contains its own integrated feeding device • "Low-profile" screener (good for buildings with height restrictions) • Extractable rotors and screws • Rails require little effort to inspect the screw and rotor • Extractable and easy to take apart, clean and change screens	When conditioning your product: can be used after the introduction of raw materials to the system (after a silo, a bag dump station, a super sack station etc.) When safety screening: at the end of a process, before packaging.
Type TW	• No tools required for inspection (due to its 16 clamps) • Rollers allow easy positioning • Can be quickly integrated into systems and removed (due to quick-lock couplings and clamping devices)	(For safety screening only) Between truck/railcar unloading and a silo.

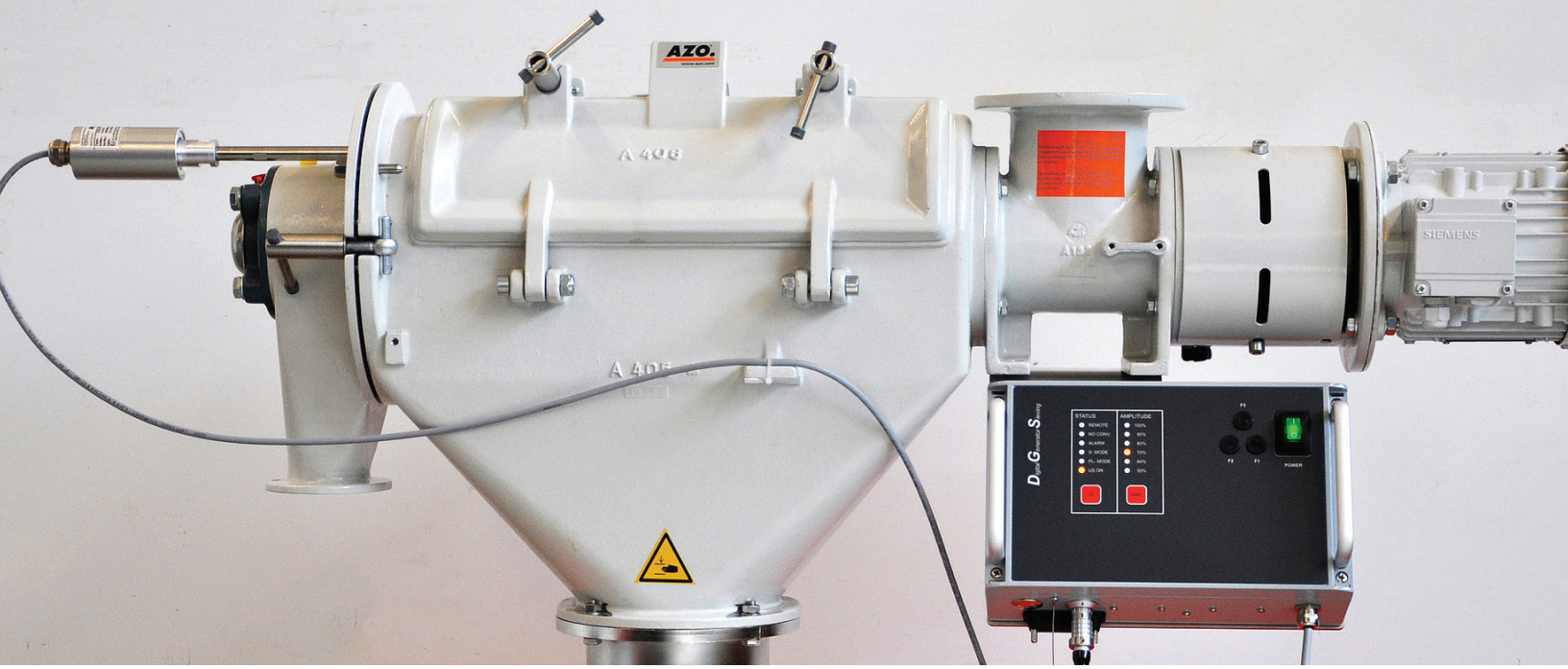
The FLF screener - Used for Separating Solids from Liquids

While the E, DA and TW AZO Screeners are all meant for solid powders, the Type FLF is used for an entirely different process: the continuous separation of solids from liquids.

Some examples of materials that would need to be separated by the FLF screener include screening cheese fines from whey and fruit remains in fruit juice. The FLF can also safely screen the production of latex and varnish, as well as wherever agglomerates may develop when stirring powder into liquids.

Advantages of the FLF:

- All product contacting parts are made of stainless steel
- Little maintenance is required
- Easy-to-clean design; simple dismantling
- Favorable price
- High throughput capacities, even with fine mesh sizes



Principles of Function for Cyclone Screeners

Self-cleaning screens and centrifugal force

Mr. Zimmerman started something revolutionary in 1949 with the first screener for the baking industry, but the key to his success was centrifugal force. So how exactly did he harness that power? Take a look inside an AZO cyclone screener today, and you'll see the answer.

Material to be screened enters the screener from an upstream feeding device. The feeding screw transfers the product into the screening chamber where centrifugal force is used to pass the product through the screen fabric. The screen-sized particles drop through while oversized particles such as contaminants and agglomerates are discharged continuously into an oversized product container. The baffle at the end of the screening chamber prevents in-spec material from entering the oversized product container. The screen material, which is mounted on rings, vibrates and therefore cleans itself automatically.

In short, the screens are self-cleaning, thanks to the help the "beater bars" attached to the auger and Mr. Zimmerman's old friend centrifugal force. When the screen vibrates, the open area is kept clean. Anything that is smaller than the mesh size will filter through the screen, leaving the oversized product to convey into the container.

For single-cut processes, you can't go wrong with a cyclone screener. They are compact, use less space, are easy to maintain and require less maintenance than other forms of screening equipment.

Applications for Screening Feeding

There are more than a few scenarios on how to convey the product to your screener.

Gravity

Gravity is the preferred method for feeding your screener.

Product is fed into your screener by a separate feed device. This may include a rotary valve, screw feeder or a vibratory feeder. The product can be fed into the screener from a surge bin above the screener.

From the screener, the product can be fed into a surge bin, packaging line, pneumatic conveying system or various other scenarios.

Vacuum Conveying Inline Screening

There are a couple of reasons you might want to screen inline. Maybe you have limited overall height in your facility and it will not allow for a separate screening stack up. You might also have existing equipment that will not allow for a screener to be installed in a gravity application. For vacuum conveying inline screening, the AZO screener is installed in the vacuum conveying line and product is conveyed through the screener by the vacuum conveying system.

For more information on this screening method, please contact your AZO Sales Manager.

Pressure Conveying System after the Screener

The AZO screener can be installed before the product is introduced into a pressure conveying system after the screener. In this scenario, a vent hopper, filter and vent fan will need to be installed on the thrus hopper to overcome the leakage through the rotary valve that is needed to meter the product into the pressure conveying system.

If you have other applications that don’t apply to this buying guide, call your AZO sales manager.

Material Design and Surface Finish

AZO specifically offers different combinations of our high-quality welds, coatings, surface finishes (the preparation of the surface) and materials (the type of steel used) for our screening equipment. These options are based on the needs of our customers. There is a suitable AZO screener model and design/surface finish combination for various types of materials and amounts clients are looking to handle.

An Overs container is a container on the discharge of the screener that is checked regularly. How regularly will depend on the quality of the product being screened or how fine a plant is trying to screen their product. This can range from once an hour to once a day.

There are six main metal finishes to choose from, and AZO sales associates are ready to work with you to decide what specifically your plant and processes require. The first step in customizing equipment to fit your needs is choosing between two distinctive materials of construction — carbon steel and stainless steel. The versions of AZO stainless steel available include 304, 304L, 316 and 316L.

All of our stainless equipment is “passivated,” a process that removes unwanted oil and debris. Passivation washes a metal to its original corrosion specifications and removes contaminants that may be previously embedded during the fabrication process. It is required in passivation to remove these contaminants down to the structure of the stainless steel’s surface.

While food and pharmaceutical companies generally choose higher grade finishes to minimize cross-contamination and to expedite cleaning, we offer different material/finish combinations that can be used in any system depending on your plant’s requirements and processes.

Here is a look at the different surface finish/material options AZO offers from our highly automated factories that can be custom-designed to fit your needs:

AZO has a distinct labeling system in place for the combinations of our finishes and material constructions. Each character in these titles represents different information. For example, with the A22 combination, the "A" and the first "2" represent whether the material offered is carbon or stainless steel (with other options, these first two characters can also represent the grade of stainless steel). The second "2" in "A22" specifies the surface finish grade. As this number increases, so does the quality of the surface finish.

A21: A21 is considered to contain the basic surface finish. The outside of the A21 component is welded, and both the inside and outside surfaces are brush cleaned. Spot welds (where brackets are not fully welded continuously) are present on the outside of the tank in the A21 option. This is the biggest difference between A21 and A22. Still, on the inside of the A21 option there are no spot welds.

A22: Like A21, both the inside and outside of the A22 vessel are brush cleaned. Everything on the inside of A22 is welded continuously.

A22R: A22R features an easy-to-clean design that meets higher requirements with regard to sanitation. The outside of A22R is brush cleaned. The inside welds are continuously welded and ground flush. The inside surface roughness has a micron rating of Rz < 20 microns, and the outside has a micron rating of Rz < 35 microns.

A23: The interior welds of A23 are polished and they are easier to clean than A22R. The welds are brushed smooth. A23 is optimal for certain plant requirements and the design meets higher sanitation requirements. The inside surface roughness has a micron rating of Rz < 8 microns, and the outside has a micron rating of Rz < 20 microns.

A23R: A23R features a design that meets higher sanitation requirements. However, it is more suited for some specific plant requirements than A23 because of the quality of both its inside and outside polish. The inside of A23 and A23R have seams that are continuously welded and ground smooth, but the outside polish of A23R distinguishes the two finishes. Both the inside and outside surface roughness of A23R has a micron rating of Rz < 8 microns.

Mechanical polishing and arithmetic formulas

When a surface is made smoother using abrasives and mechanical tools, it is referred to as mechanical polishing. Increasingly finer abrasives are used to polish the material until it reaches the specified level of smoothness.

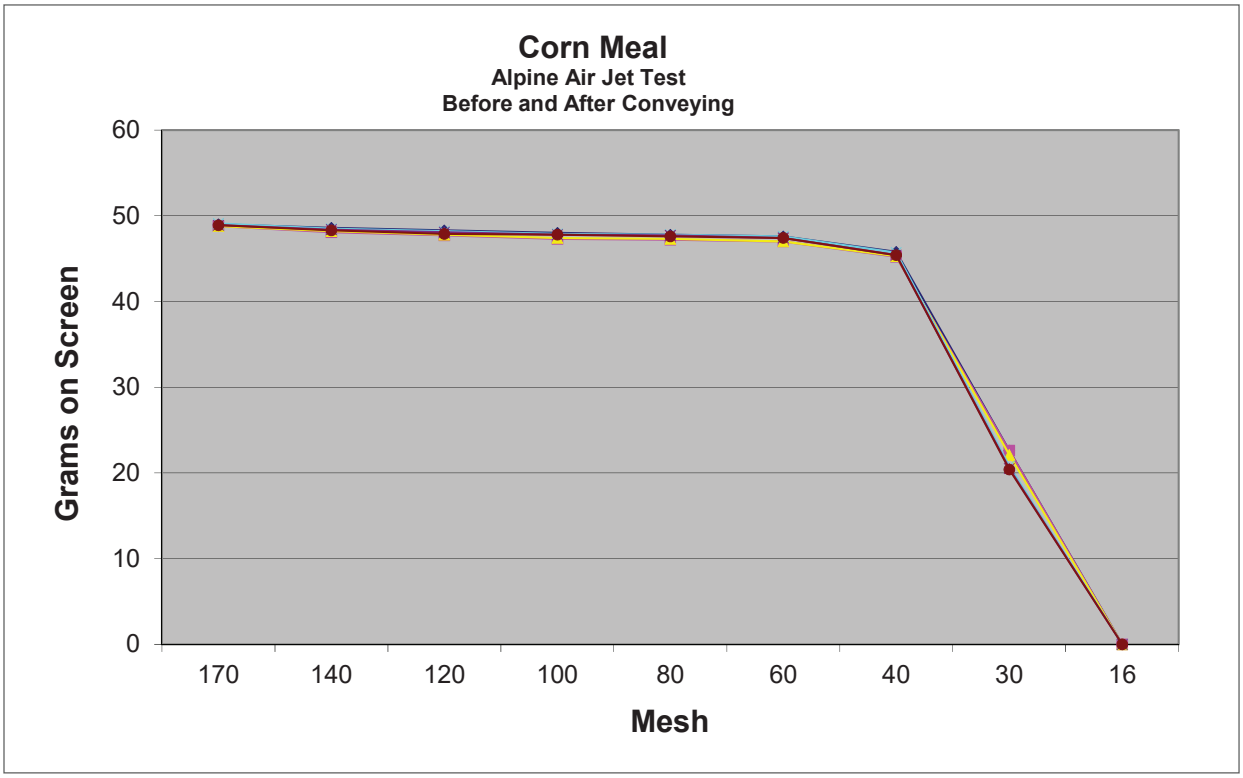
So how do we take a glance at the completed conditions of our metals? The answer is Ra and Rz — arithmetic formulas that are used to measure the final result of the polishing.

While Ra specifically measures roughness, Rz measures the maximum height of the metal microscopically as it is polished. Both formulas are used together so that measurements are accurate.

Options for your application

Sieve analysis

A sieve analysis is done with an alpine air jet machine. AZO engineers start with about 25 grams of a client's product using a very fine mesh and will gradually go down in mesh size recording how much of the product goes through each screen. This is so we can give you a graph on what your particle size is and help you pick the correct screen for your use.



Sizing

Once we've completed a sieve analysis and the AZO engineers know your rate, we can properly size a screener for your application. AZO engineers are happy to size screeners for you and your specific needs using volume and screen size.

Screener capacity depends on mesh size. Capacity can reach up to 50,000 pounds an hour.

Operating and Maintenance Considerations

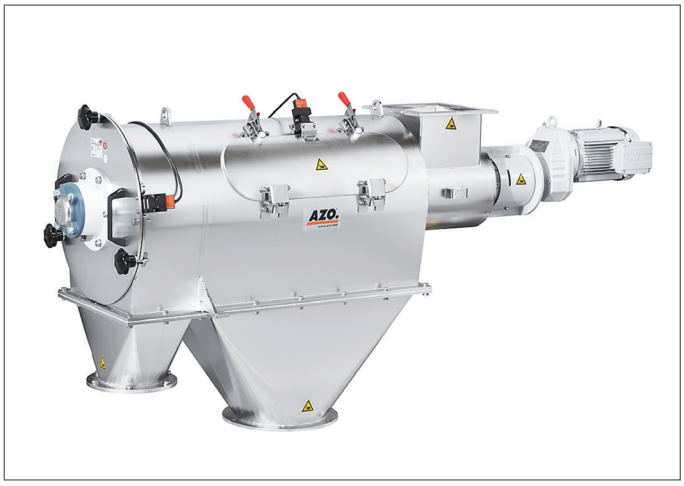
Screen inspection and replacement

Preventive maintenance is important on all AZO equipment. For AZO screeners, it is highly recommended that screens are inspected at least once per shift, every shift. Required maintenance depends on usage, your process and the material being screened. For example, if you are screening flour, the screens will last longer than if you're screening an abrasive product such as sugar.

Not only is maintenance primarily dependent on the type of product you are running through the screening equipment, but recognizing when to replace a screen is also product-dependent. Screens should be replaced at least once a quarter, but also when (during a routine inspection) an operator notices that screen material is torn or significantly worn. Fraying of the nylon screen fabric or stretching the nylon or polyester material are clear indicators that a screen should be changed.

As stated on Page 4 of this guide, there are different advantages to the AZO screener models and how simple it is to check screens varies between these models. The standard E model Screener is easier to inspect than the DA. The E has an inspection door, which can be opened with two handles. You can then spin the screen around to observe it. This process approximately takes 10 minutes.

Cleaning screens also varies between the E and DA models. As stated, the DA's rails require little effort to inspect the screen. They are extractable and easy to take apart. Though the E is easier to inspect than the DA, the DA is easier to clean than the E model because of the DA's ability to remove the screw and beater bars with quick-clamps.



Inspection and cleaning for a TW screener

With inspection and cleaning, the TW screener is a different animal than the E or DA screeners. Inspection should occur after every unloading event, which is typically every one or two hours depending on the plant. Screens utilized for a TW screener are stainless steel laser cut sheet metal and therefore are long-lasting items. These screens last much longer than screens used in the E or DA Screeners. Still, if you notice a screen is cracked or damaged upon inspection, a new screen can and should be ordered.

Inspection on the TW is critical because the screens are not self-cleaning. If material is caught by the screen, there is no way for a TW screener to reject that material. An operator must remove the material manually. If there is an abundance of material caught in the screen of a TW screener, it is recommended that your plant follow up with the material supplier to locate and identify specific issues.

Cleaning the Screener Unit

Cleaning of your screener is process/product-specific. Typically, this process is set up by a plant's production schedule. Still, for most processes, AZO recommends the screening equipment itself be completely cleaned annually. If a product change occurs before a screener is annually cleaned, the screener should be completely cleaned before this product change instead of a scheduled annual cleaning. This is recommended because many parts of the screener (groundings, gaskets, the rear screen-frame seal, the drive coupling clutches and the bearings) are much more accessible during a product change than during routine inspections. Items that can be worn down should be inspected, based on the preventative maintenance schedule. AZO recommends dry cleaning for all screening equipment, including the TW screener after every unloading event.

Warranty

All AZO equipment is under warranty for 12 months.

Budgeting and planning for screener purchase and installation

The price range for a screener depends on what a customer needs, the material construction of the screener and the surface finish. The materials of construction AZO offers includes our carbon steel, powder-coated and stainless steel (304, 316 or 316L).

The E240 model is the smallest screening machine that AZO manufactures. It is a half-horsepower machine, and the rest of the screeners range all the way up to a 5 horsepower machine.

Questions, comments, concerns?
We have the answer!

Contact us today!