Introduction

FEECO International was founded in 1951 as an engineering and equipment manufacturer. We quickly became known as the material experts, able to solve all sorts of material processing and handling problems, and now serve nearly every industry, from energy and agriculture, to mining and minerals.

As experts in the field of mineral processing, FEECO has been solving problems through feasibility testing and custom potash processing equipment since the 1950s. We’ve helped our customers process hundreds of materials into value-added products, eliminating handling and transportation problems, improving product characteristics, and creating marketable products.

Many of the world’s top companies have come to rely on FEECO for the best in custom process equipment and solutions, some of which include:

For further information on our potash processing capabilities, contact a FEECO expert today.

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Please note that some images may display equipment without the proper safety guards and precautions. This is for photographic purposes only and does not represent how equipment should be properly and safely installed or operated. FEECO shall not be held liable for personal injuries.
An Overview of POTASH

Potash granules created in the FEECO Innovation Center
The term potash generally refers to potassium chloride, although it is also loosely applied to a number of potassium compounds found in the agriculture industry, such as potassium sulfate, potassium nitrate, and the like.⁴

Utilized in a variety of products such as soaps, glass, and gunpowder, before it was mined for industrial use, early potash processing was a by-product of forest clearing, involving the burning of wood and leaching of the resultant ashes, garnering the name, potash. The discovery of deposits worldwide later opened the door for large-scale use of this versatile mineral.²

Today, the lion’s share of mined potash goes to the agriculture industry, where it has become a staple in modern fertilizer products.

Potash is a form of potassium, one of the key elements in plant growth and biological life. And as available farmland decreases while demand for food increases, never has it been more important to cultivate more productive plants with less space. Because of this, recent years have seen a focus on nutrient management and advanced fertilizer products.

This has pushed development of advanced processing techniques in the potash industry and has resulted in a wealth of options for processing this vital mineral.

Despite all of these advancements, there is still a lot of groundwork to be done when it comes to processing potash into a refined product; different deposits yield varying mineral combinations and present unique challenges. In addition, potash is a demanding material that requires an experienced hand to produce desired results.

The following takes a look at the various available potash processing techniques and equipment, the challenges presented by potash during processing, and how to combat these challenges.

Potash under a compression test in the FEECO Innovation Center
**PELLETIZING POTASH**

While compaction granulation is the primary method used to process potash, pelletizing, or pelletization, is gaining popularity among fertilizer manufacturers looking for a premium, refined product that can quickly deliver nutrients. The process of pelletizing offers many benefits to the end product.

**POTASH PELLETIZING PLANT OVERVIEW**

The following is an overview of a typical potash pelletizing process. See next page for diagram.

**PRECONDITIONING**

1. First, finely crushed potash enters the pelletizing process through a raw material feed bin.

2. Next, the potash travels to the pin mixer. The intense spinning action of the mixer and the addition of a liquid binder work to pre-condition the material. This process reduces the air and water volume between potash particles as it creates densification within the material.

**PELLETIZING VIA TUMBLE GROWTH AGGLOMERATION**

3. After preconditioning, the potash material is fed onto the disc pelletizer. Using tumble growth agglomeration, the potash material gradually rolls and builds against itself while rotating on the disc. Material is fed at a controlled rate and water is added to assist in binding the material. The result is a round, uniform pellet. Pellet size can be controlled using variables such as disc speed and angle. Once the potash pellets reach the desired size, they are discharged from the disc pelletizer.

**FEECO DISC PELLETIZERS AT A GLANCE**

<table>
<thead>
<tr>
<th>SIZE</th>
<th>24” - 25’ (0.6 - 7.5m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAPACITY</td>
<td>100 lb/hr - 100 TPH</td>
</tr>
<tr>
<td>CUSTOMIZABLE?</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**FEECO PIN MIXERS AT A GLANCE**

<table>
<thead>
<tr>
<th>SIZE</th>
<th>10” - 50” (254 - 1,270mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAPACITY</td>
<td>200 lb/hr - 70 TPH</td>
</tr>
<tr>
<td>CUSTOMIZABLE?</td>
<td>Yes</td>
</tr>
</tbody>
</table>
PRODUCT FINALIZATION

4. Because moisture is added during pelletization, a drying phase is necessary. This is commonly carried out using a rotary dryer or fluid bed dryer.

5. After drying, potash pellets are sometimes cooled. Cooling brings down the temperature of the material so it can move on to transport, packaging, or storage.

6. Finally, the potash material is screened to ensure only optimally sized pellets exit the process. Both the larger pellets (overs) and smaller pellets (unders) are recycled back into the pelletizing process, while
on-size potash pellets move on to bagging, storage, or transport.

**ADVANTAGES TO POTASH PELLETIZING**

Pelletized potash offers a host of advantages in terms of processing solutions and product benefits. Because the process is a non-pressure technique, a potash pellet is an ideal solution for fertilization. The round, uniform pellet shape is less dense than that of more traditional compacted potash granules, allowing the pellet to deliver nutrients faster. Fixed formulations especially benefit from this quick breakdown ability. Moreover, the rounded shape of pelletized potash reduces the occurrence of potash fines due to attrition and is also very easy to handle and apply.

In certain occurrences, pelleting is the only solution for processing specific potash derivatives.

**COMPACTION GRANULATION**

Compaction operates on the principle that when the fine particles of some materials are subjected to a high pressure, their surfaces get close enough to achieve cohesion. This principle holds true for potash and other salts, making these materials ideal candidates for use in compaction granulation circuits. Typically a liquid binder is not needed to achieve granule formation, but occasionally the addition of a minor amount of water can help the process.

A screen is often put in place prior to the compactor, in order to sieve out any tramp material. A magnet may also be used to remove any metal that could potentially damage the rolls. Potash is then fed via a force feeder assembly (usually a screw system) between two counter-rotating rolls, where it is put under extreme pressure. The material exits the rolls in the form of a compacted sheet, which is then fed into a flake breaker and granulator, where it is broken up into the desired granule size.

**FEEO COMPACTORS AT A GLANCE**

<table>
<thead>
<tr>
<th>CAPACITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 lb/hr - 50 TPH (.5 kg/hr - 45 MTPH)</td>
</tr>
</tbody>
</table>

CUSTOMIZABLE? Yes

**KEYS TO SUCCESS**

There are a few key components to successful compaction granulation. This is true not only for potash, but for other materials processed using the roll compaction method as well.

**FEEDING MECHANISMS**

The main purpose of the feeding mechanism is to eliminate entrained dust/air in order to maximize particle cohesion. An even, steady pressure across the entire face width is required to create a product of integrity. If only one large screw is used, the material may be of desired quality in the middle, but not at the edges. In order to resolve this, a double screw system can be employed.
PARTICLE SIZE DISTRIBUTION

Feedstock particle size distribution is also a key factor in the success of a compaction granulation circuit. A variance in particle size distribution is ideal for the compaction process, so that when pressed together, smaller particles will fill in the voids between larger ones.

Too coarse of a particle size distribution, and the particles will not move through the compactor well. A particle size distribution that is too fine will also cause deaeration problems.

After compaction, granules are sometimes tumbled in a polishing drum to break off edges and “polish” granules.

At this point, the resulting on-size granules can be considered a final product and move on to packaging or storage. However, some processes implement an additional stage, where granules are...
conditioned by adding a small amount of water and then feeding them to a dryer-cooler, a process called glazing.

**COMPACT VS. PELLETIZATION**

The choice between these two methods of processing is one that potash producers commonly face. Ultimately, cost is often the major factor in determining which potash process to use. While the initial capital cost of potash pelletizing equipment is less than compaction equipment, the additional processing cost required in the pelletizing method has historically outweighed this initial cost benefit. However, there are advantages and disadvantages to each method that could ultimately dictate the process to be used. Additionally, as mentioned, some potash derivatives may only be processed using the pelletizing method, due to material characteristics. The primary considerations for both processes have been summarized in the chart below.

<table>
<thead>
<tr>
<th>Pelletization</th>
<th>Compaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Produces round, smooth pellets (considered a premium product)</td>
<td>Produces coarse granules</td>
</tr>
<tr>
<td>Less attrition</td>
<td>Significant attrition likely</td>
</tr>
<tr>
<td>Binder usually required</td>
<td>Typically no binder needed</td>
</tr>
<tr>
<td>Drying required</td>
<td>Typically no drying needed</td>
</tr>
<tr>
<td>Faster product breakdown</td>
<td>Delayed product breakdown</td>
</tr>
<tr>
<td>Lower capital investment</td>
<td>Reduced processing costs</td>
</tr>
</tbody>
</table>

**DRYING**

Drying is a vital aspect of processing potash into a usable form and creating a better end product.

**BENEFITS OF DRYING POTASH**

In general, the drying process accomplishes many benefits for potash, including:

**REDUCED MOISTURE**

The drying process reduces moisture in potash, diminishing material handling issues such as caking.

**ROUND, POLISHED GRANULES**

Rough granule edges can wear down other granules and produce a large amount of fines—a process known as attrition. Drying in a rotary dryer rounds and polishes granules, reducing the opportunity for attrition.

**HARDENED GRANULE SURFACE**

Potash drying flashes residual moisture off quickly, leaving a hardened, more robust potash product with a re-crystallized surface.

**WHY DRY POTASH?**

After potash is mined, it undergoes processing to extract potassium from minerals and create a final potassium product in a readily available form. Agglomeration is part of the overall processing used to achieve an optimal potash product. Drying complements both the compaction granulation and pelletizing processes.

**COMPACTION GRANULATION AND DRYING**

As previously discussed, compaction granulation is the most frequently used solution to agglomerate mined potash into a usable product.

Compaction is a dry process that requires low moisture feedstock, and in the case of potash, somewhat hot material. Drying is also commonly used to improve resistance to attrition. This is done by wetting and then drying the granules in a dryer. The goal is to fill cracks inside the particles and eliminate sharp granule edges,
reducing dusting problems that would otherwise occur when the material is shipped and handled. Both rotary dryers and fluid bed dryers can be used to dry the potash granules after they are wetted.

PELLETIZATION AND DRYING
Pelletizing is considered a wet process, because it requires a liquid binder to adhere the potash to itself. Because the binder adds moisture, a drying phase is necessary. As with granulated potash, both rotary dryers and fluid bed dryers are excellent industrial dryer choices for pelletized potash. Due to the tumbling action that occurs in a rotary dryer, this dryer type offers the added advantage of further rounding and polishing the granules.

MATERIAL CONSIDERATIONS IN DRYING
As with any material, there are a variety of material-specific factors that must be considered during the drying process:

AIR FLOW
Rotary dryers utilize a co-current air flow when drying potash, meaning the potash and air stream flow in the same direction, which proficiently dries the material. This maintains the integrity of the product, because the hottest gases come in contact with the wettest material. If a counter current dryer were chosen, the hottest gases would come in contact with the driest material, which can discolor potash, cause attrition, and/or reduce the overall quality of the end product.

CORROSION
Because potash is a corrosive material, specialty materials such as alloys are often employed on processing equipment. For example, stainless steel is often used at the front end of equipment in order to counteract the product’s eroding characteristics.

CLUMPING
Potash is also apt to clump during the drying process. For this reason, knocking systems can be added to
a rotary dryer as a means of dislodging material that may have built up on the interior of the drum. A variety of knocking system design options are available, and can be retro-fitted to an existing system.

Another solution used to avoid clumping is to employ a screw conveyor; the feed trajectory of a screw conveyor will “fling” or “throw” the potash into the dryer, breaking up clumps in the process.

**FEECO ROTARY DRYERS AT A GLANCE**

<table>
<thead>
<tr>
<th>DIAMETER</th>
<th>3” - 15” (1 - 4.6m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAPACITY</td>
<td>1 TPH - 200 TPH+ (1 MTPH - 181 MTPH)</td>
</tr>
<tr>
<td>CUSTOMIZABLE?</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Drying potash creates a multitude of benefits, resulting in an optimal final product with minimal moisture, clumping, and dusting issues. With so many challenging material considerations, it is clear that potash drying requires well-designed equipment to get the job done right.

**COOLING**

Cooling is also an important step in the potash manu-

facturing process. While a straightforward task, cooling is still a large undertaking that requires flexibility and expertise in order to finish with a better potash product overall.

**WHY USE A POTASH COOLER**

Cooling provides a number of advantages that translate to an improved potash product. This includes:

**INCREASED POTASH PROCESS EFFICIENCY**

Adding a cooler to the manufacturing process offers facilities the ability to handle, bag, and store potash immediately, avoiding other time-consuming cooling methods.
REDUCED POTASH STORAGE ISSUES
Cooling potash before bagging prevents issues such as sticking, caking during storage, or condensation in cold climates.

ENHANCED POTASH GRANULE ROBUSTNESS
The process of cooling potash creates a more resilient final product that is less likely to wear down as granules come into contact with each other and also allows for direct loading into trucks and railcars.

FEECO ROTARY COOLERS AT A GLANCE

<table>
<thead>
<tr>
<th>DIAMETER</th>
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<tr>
<td>CUSTOMIZABLE?</td>
<td>Yes</td>
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</table>

ROTARY VS. FLUID BED DRYERS AND COOLERS
When selecting both dryers and coolers, potash producers are faced with the decision of choosing between rotary equipment and fluid bed equipment. Both types are standard in the industry, and with comparable costs, the choice between the two has historically been one of preference. However, the heavy-duty construction of rotary equipment is especially suitable for handling a challenging material such as potash.

In a rotary dryer, as the drum rotates, flights within the cylinder lift the potash and shower the material through the air stream. While not as gentle as the fluid bed type, the tumbling action within the drum benefits the material by further polishing the granules.

Fluid bed dryers and coolers work by suspending potash in a stream of air. This method provides gentle material handling, preventing erosion and wear between granules.

In general, both options handle material gently and avoid attrition, key qualities in industrial drying and cooling equipment. The advantages and disadvantages of each type should be carefully considered:

SPATIAL FOOTPRINT
In general, rotary equipment is much larger than fluid bed equipment. However, because of this greater size, rotary dryers and coolers are able to handle higher material volume, making them an ideal choice for potash processing facilities running at high capacities.

Despite their larger footprint, rotary dryers and coolers have the advantage of requiring less air flow than their fluid bed counterparts, and therefore smaller dust collection systems and fans.

Fluid bed dryers and coolers are a modular, smaller equipment option. This makes fluid beds suitable for facilities with limited space or with a likely potential for operational growth.

OPERATIONAL CONSIDERATIONS
Rotary dryers and coolers require less supervision than their fluid bed counterparts.

Rotary equipment is largely unaffected by fluctuations in feedstock or other processing conditions such as reduced feed, or lapses in energy. They offer a consistently reliable processing solution in settings where inconsistencies are to be expected.
Conversely, fluid bed dryers and coolers are highly sensitive to fluctuations in feedstock size or processing conditions, requiring a very consistent processing environment.

ENERGY CONSUMPTION
The choice between rotary and fluid bed equipment is also a matter of energy. Fluid beds work by fluidizing the material, which requires a high magnitude of air. For this reason, it is not always practical to run high-volume, heavy materials through a fluid bed, because of the extra energy required to fluidize the material. Additionally, because it takes a certain amount of energy to fluidize a material, energy is not reduced when running at lower capacities.

Rotary dryers require less energy to dry material, and unlike fluid bed dryers, energy consumption is reduced when running at decreased capacities.

In terms of thermal efficiency, the two dryer types are comparable.

MAINTENANCE AND LIFESPAN
In terms of maintenance and lifespan, rotary and fluid bed equipment are comparable.

AN INTRODUCTION TO POTASH HANDLING
Handling a demanding material such as potash requires dependable performance from each piece of equipment in a processing facility. The need for reliability holds especially true for material handling equipment, which transports potash from one area of a processing facility to another, adding automation and flexibility to an overall system.

The following will give an overview of the handling equipment commonly employed when working with potash, as well as the various customizations available to combat the challenges potash can present.
COMMON HANDLING EQUIPMENT

Bucket Elevators are commonly utilized in potash processing facilities, with double chain, continuous-style bucket elevators being the most popular choice. Single chain options are also available, but a double chain is most often selected due to its increased capacity and height capability, which is often required in potash processing operations. Bucket elevators transfer potash vertically, operate at low speeds, and are able to handle a high capacity of material. Bucket elevators are highly customizable, with a variety of options available to fit a facility’s unique needs. This might include large access doors for ease of maintenance, various types of drive arrangements, service platforms, and more.

Belt Conveyors are very commonly used in potash processing facilities. Belt conveyors consist of a continuously moving carrying surface (known as the belt) that rotates around two or more pulleys. As the belt rotates, material is transported to the desired location. Various conveyor options are available to assure proper load and transfer points are accomplished. There are also a variety of optional pieces of equipment (e.g. belt trippers, loading skirtboards, belt cleaner systems) to achieve the best material conveying solution for the job.

Potash processing facilities especially benefit from adding a belt tripper to a potash conveyor system. This complementary piece of equipment offers the flexibility to use more than one discharge location (fixed or movable) off of a conveyor system. When storing potash, this option is especially useful in creating a long, continuous pile.

EQUIPMENT CUSTOMIZATIONS

Depending on the manufacturer, there are a variety of ways to customize material handling equipment in order to withstand the abrasive and corrosive aspects of potash. The customizations listed below are specific to FEECO.

MATERIAL OF CONSTRUCTION

Various alloys may be used to defend against corrosion and other issues. Example: Bucket elevator boot sections may be constructed of stainless steel to prevent damage that may otherwise occur from regular use of a wash down system.

REINFORCING AREAS OF WEAR

High-wear areas are enhanced with heavy-duty
construction, helping these vulnerable zones to better accommodate the abrasive material. Example:
Transfer chutes and inlet loading areas (standard high-wear areas on a conveyor) are equipped with wear-resistant liners.

**DUST BUILDUP PREVENTION**
A buildup of potash fines can cause failure issues. As a result, protective measures are implemented in areas that would be otherwise damaged by dust buildup. Example: Auxiliary seals for bearings are often used in these areas.

**COVER COMPOUNDS**
Potash treated with a special solution may cause wear or service issues for certain equipment areas. To counteract this issue, special cover compounds are utilized. Example: Potash that is treated with amine solution adversely affects rubber components such as conveyor belts.
Potash granules created in the FEECO Innovation Center
PROCESSING CHALLENGES

As a key component in fruitful crop production (among other things), potash is produced extensively around the globe, with projections estimated to reach 61 million tons by 2018.\(^3\) However, potash’s widespread use does not mean it is always easy to process; demanding material characteristics combined with unique processing requirements can present challenges during processing.

As mentioned, there are two primary methods by which potash is processed: tumble growth agglomeration (pelletizing) on a disc pelletizer, or through compaction granulation in a compactor. Each of these methods, combined with the characteristics of potash, presents its own unique challenges. The following list highlights some of the most common challenges experienced during potash processing when utilizing these two approaches.

PELLETIZING

MOISTURE LEVELS

Throughout the pelletizing process, achieving and maintaining ideal moisture levels is a critical consideration, affecting nearly all parts of the process, as well as the outcome. Moisture levels must be carefully monitored during conditioning, pelletizing, and drying. Conditioning potash in a pin mixer prior to the disc pelletizer is a common practice in the pelletization method of processing potash. Here, two things are accomplished: raw material fines are vigorously mixed with a binder to create a homogeneous mixture, and raw material is brought up to the appropriate moisture level for optimum pellet formation. Too little or too much moisture in this stage will cause the material to be ill-prepared for pellet formation on the disc pelletizer.

Once the potash is fed onto the pelletizer, pellet formation begins. Here, additional binder is added to increase tackiness and foster desired pellet growth. In this stage, moisture is also of crucial concern; too little or too much will not allow for desired pellet size or characteristics.

After the potash has been pelletized, the “green” (wet) pellets must be brought down to the moisture level required for the end product. It is here that the industrial drying system is employed. A dryer specifically designed around the material and process requirements will achieve the best results.

COMPACtion GRANULATION

ATTIRITION

The process of compaction granulation creates compacted potash granules with rough surfaces and jagged edges. Consequently, rough surfaces and jagged edges wear against each other and break down, a phenomenon referred to as attrition. Not only does the size and shape of the compacted potash granules change through attrition, but a large amount of unwanted potash fines are also produced, resulting in a dusty product and material waste. However, there are ways to reduce the occurrence of attrition. One way is through the use of a polishing drum, where granules are tumbled to break off loose edges.

As an alternative to a polishing drum, a pug mill may be added after compaction. In this configuration, compacted granules go from the compactor to the

pug mill, where they are wetted and then dried in a rotary dryer. This act of wetting and drying the granules helps to eliminate sharp edges, as well as fill in surface cracks on the granules that would otherwise contribute to attrition.

**GENERAL ISSUES**

**CLUMPING**

Potash, due to its hygroscopic quality, is often prone to clumping, sticking, and caking issues. These issues may show up during drying, or storage. However, there are steps that can be taken to combat this.

Drying: Knocking systems can be added to rotary dryers as a method to break up lumps amongst the material itself, as well as dislodge any material that may be sticking to the interior of the drum.

Screw Conveyors: Another equipment-based solution to prevent clumps is the addition of a screw conveyor. The screw conveyor utilizes a feed trajectory that “flings” potash into the dryer. This motion efficiently conveys the material and breaks up lumps in the process.

Anti-Caking Additives: Anti-caking additives are applied to finished granules through the use of a pug mill or coating drum. A variety of anti-caking additives are available, depending upon material characteristics and end product use.

**CORROSION**

Another potash processing challenge that manufacturers experience is corrosion. Since potash is a corrosive material, it can progressively destroy metal through chemical action. For certain equipment, special accommodations must be made in order to counteract the corrosive nature of potash. One example of this customization is the use of stainless steel or nickel alloys on areas...
of the equipment that come into contact with potash during processing.

Additionally, because potash is hygroscopic, dry potash can pull moisture from the air over time. If allowed to sit in equipment for extended periods of time, buildup is likely to result in corrosion. For this reason, seasonal operations should be especially careful, ensuring equipment is properly cleaned prior to off-season.

POTASH PROCESS & PRODUCT DEVELOPMENT

With the unique and varying challenges that potash can present, testing is often a key component in the success of a potash processing operation. Whether the goal is to design a new process, improve on an existing one, or even enhance product characteristics, testing offers the opportunity to confirm the viability of an intended process, as well as to work out process variables and other unknown data points. This can define a recipe for success, and reduce the opportunity for surprises after process scale-up.

Process engineers in the FEECO Innovation Center work with customers to develop customized testing programs around their unique project goals. Both methods of agglomeration can be tested, with continuous process loop testing available.

For all types of testing, depending on what information the customer already knows and is looking to gather, testing commonly starts at batch scale, with small samples of material being tested to gather initial data and determine feasibility of the intended goal. Once batch testing has been successful, continuous pilot-scale testing can be conducted. This is a much larger scale test, where the process is tested as a continuous process loop.

Potash producers are often targeting a set of parameters that will ensure their agglomerates perform...
as intended. During testing in the Innovation Center, a variety of particle characteristics can be measured and adjusted, including:

- Attrition
- Bulk Density
- Compression
- Crush Strength
- Flowability
- Green/Wet Strength
- Moisture Content
- Particle Size Analysis
- Physical Characteristics
- Solubility
- Temperature

**BENEFITS TO TESTING WITH FEECO**

Some of the many advantages to testing in the FEECO Innovation Center include:

**MATERIAL EXPERIENCE:**

FEECO has been a pioneer in material processing since the 1950s, and has extensive knowledge around hundreds of materials and processing methods, including potash and its many derivatives.

Customers gain a valuable familiarity with their material and its unique characteristics through testing in the Innovation Center.

**COMPLETE PROCESS KNOWLEDGE:**

FEECO has expertise in each aspect of potash processing, from agglomeration (pelletizing, compaction) to thermal processing (drying, cooling), allowing us to look at how the process will function as a whole, instead of each individual portion.

**PROCESS SCALE-UP:**

Once the process configuration has been defined, FEECO can aid in process scale-up, as well as manufacturing the equipment needed to get the job done.

**AUTOMATION & DATA COLLECTION:**

FEECO is a Rockwell Automation partner, providing integrated process control solutions for our customers, both as a service in the Innovation Center, and as part of a system purchase. This provides customers with state-of-the-art data collection and reporting capabilities.

The FEECO Innovation Center features a Rockwell Automation PLC/MCC system, which utilizes current technologies for optimizing testing operations. During the testing process, this provides for optimal process transparency; various data points can be monitored,
trended, and adjusted in real-time, all from a single interface or mobile device. This includes everything from current (amps), feed rate, and flow rate, to horsepower, speed, and torque, and just about everything in between.

Historical data is also available for returning customers, allowing them to pick up exactly where they left off.

VIRTUAL LAB:
FEECO offers a unique Virtual Lab where customers can view their material being tested in real time, without having to come to the FEECO facility.

Whether you’re looking to test the feasibility of an idea, improve your existing process, or are looking to enhance product characteristics, testing in the FEECO Innovation Center offers unmatched capabilities in both process and product design from start to finish.

CONCLUSION
With widespread use and a well established and growing industry, potash requires an experienced hand to produce the desired results.

FEECO has been serving the potash and agriculture industry since 1951. We offer material testing, process and product development services, custom engineered equipment, and aftermarket services.

No matter what your potash processing needs, FEECO International has you covered.
PROCESS

Potash materials are frequently tested in the FEECO Innovation Center for a variety of reasons. This might include to test the feasibility of a new product or idea, enhance the characteristics or performance of an existing product, improve upon or troubleshoot a process, or even develop a new process.

Our process experts can work with you to develop a customized testing program around the answers you’re looking for. Depending on your needs, we offer testing services in four categories:

1. Feasibility/Proof of Concept - An initial, non-witnessed batch testing phase in which the possibility of creating a product is explored.

2. Proof of Product - A more in-depth batch testing phase in which more time is spent determining whether a product can be made to desired specifications.

3. Proof of Process - A continuous testing phase that aims to establish the equipment setup and parameters required for continuous production of your specific material.

4. Process/Product Optimization - An in-depth study to optimize your specific material’s characteristics and/or production parameters in an industrial setting.

Equipment Commonly Tested:
- Disc Pelletizer
- Roll Compactor
- Rotary Dryer
- Pin Mixer/Pug Mill
- Screen
- Hammer Mill
- Conveyor
- Bucket Elevator

Most often, customers are looking to create a durable pellet or granule capable of breaking down quickly in standard field conditions, while also counteracting dust and improving product handling. To achieve this, various binders are also used during the agglomeration tests, to create a product that is durable enough to withstand subsequent processing and handling.

Commonly Tested Potash Materials:
- Potash (MOP, SOP, Langbeinite)
- Various Fertilizer and/or Mineral Blends
- Polyhalite

Processes Commonly Tested:
- Potash Pelletizing
- Potash Compaction
- Potash Drying
- Potash Glazing
THE INNOVATION CENTER ADVANTAGE

Testing in the FEECO Innovation Center provides an invaluable opportunity to test in a controlled environment, allowing you to gain a familiarity with your material, while reducing the chance for unforeseen problems after process scale-up. Some of the many advantages to testing in the FEECO Innovation Center include:

**Material Experience:**
FEECO has been a pioneer in material processing since the 1950s, and has extensive knowledge around hundreds of materials and processing methods. FEECO is highly experienced in working with potash and its many forms, as well as various fertilizer blends.

Customers gain a valuable familiarity with their material and its unique characteristics through testing in the Innovation Center.

**Complete Process Knowledge:**
FEECO is familiar with each aspect of a process, from agglomeration and kiln processing, to drying and cooling, allowing us to look at how the process will function as a whole, instead of each individual portion.

**Process Scale-up:**
Once the process configuration has been defined, FEECO can aid in process scale-up, as well as manufacturing the equipment needed to get the job done.

**Automation & Data Collection:**
FEECO is a Rockwell Automation partner, providing integrated process control solutions for our customers, both as a service in the Innovation Center, and as part of a system purchase. This provides customers with state-of-the-art data collection and reporting capabilities.

A variety of data points can be monitored, trended, and adjusted in real time, all from a single interface or mobile device.

Historical data is also available for returning customers, allowing you to pick up exactly where you left off.

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**Commonly Targeted Material Characteristics:**
- Crush Strength
- Abrasion/Attrition
- Material Composition
- Bulk Density
- Flowability
- Moisture Content
- Green/Wet Strength
- Sieve Analysis
- Solubility

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**SCHEDULE A TEST**
To discuss your testing needs with one of our process engineers and schedule a test, contact us today at: FEECO.com/contact
ADDITIONAL RESOURCES
For further information or reading on potash, we have provided some additional resources below. Please note that the inclusion of any resource or company is not an endorsement and the views of that resource do not reflect those of FEECO International.

ASSOCIATIONS & PUBLICATIONS
Potash Development Association
www.pda.org.uk

International Potash Institute
www.ipipotash.org/en

International Plant Nutrition Institute
www.ipni.net/topic/potassium-k

PotashWorks Magazine
www.potashworks.com

BOOKS
Potash: Deposits, Processing, Properties and Uses
by D.E. Garrett
THE FEECO COMMITMENT TO QUALITY

FEECO International, Inc. was founded in 1951 as an engineering and equipment manufacturer. FEECO is recognized globally as an expert in providing industry-leading process design, a range of engineering capabilities, including everything from process development and sample generation, feasibility studies, to detailed plant engineering, as well as manufacturing to a variety of industries, including: fertilizer and agriculture, mining and minerals, power/utility, paper, chemical processing, forest products and more. As the leading manufacturer of processing and handling equipment in North America, no company in the world can move or enhance a concept from process development to production like FEECO International, Inc.

The choice to work with FEECO means a well-rounded commitment to quality. From initial feasibility testing, to engineering, manufacturing, and aftermarket services, we bring our passion for quality into everything we do. FEECO International follows ISO 9001:2015 standards and procedures.
For more information on processing potash, material testing, or custom equipment, contact FEECO International today!

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