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**F.M. Callahan & Son, Inc.**

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**Solving a Shocking Failure  
Through Custom System  
Design and Analysis**

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COVER PHOTO: F.M. CALLAHAN & SON, INC. | Malden, MA

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## INDUSTRY NEWS

**20** Regional Press

As we type this, we're watching the Boston Celtics get crushed by the Miami Heat. We hope, that by the time this issue is published they'll have become the second Boston team to overcome a 3-0 deficit on route to the championship round, but they're in for a mighty tall task. As our man Kevin Garnett said, "anything's possible!" And we live by that. While we're watching our favorite teams, living our daily lives, and growing our businesses. Do you believe?

Anyway, enough with the random rant.

How are things? How's business? What new processes or services are you incorporating into the mix? We'd love to hear about it, so let us know.

In this month's issue, we shine the spotlight on F.M. Callahan & Son, Inc., out of Malden Massachusetts. The company has been around since 1910 as a full-service electroplater provider, working out of their state-of-the-art 40,000 square foot facility. F.M. Callahan & Son, Inc. has proven excellence and quality with customers in the following industries: Aerospace, Medical, R.F. Communications, and automotive as well as with general commercial companies. This feature was once again penned by our own Richard Taylor. Nice work, Richard!

The second feature within these pages is a pretty interesting case study brought to us by Hutchinson who worked with the United States Navy to help them with an issue related to the electronic control equipment in a Columbia-class submarine. Their work in creating custom system designs really sets them apart in the industry. Sure, they have thousands of turnkey designs available, but the one-size-fits-all approach isn't really a notion to hang your hat on. Check out the feature to learn all about the issue, diagnosis, solution, and ongoing support for their customers.

We hope you all are doing well, and again, if you've got a story to tell, let's get it told.

Warm regards,



June-July 2023

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F.M. CALLAHAN: WHERE THE FINISH COMES FIRST



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**F.M. Callahan & Son (Malden, MA) has been plating parts since 1910 and is a NADCAP and ISO 9000 certified electroplater as well as being ITAR Registered. They are a full-service company with over a 40,000 square foot state of the art facility and has 100 plus years of family ownership.**

The company plate precious metals of silver and gold, electroless nickel, sulfamate nickel, zinc, copper, tin, and tin-leads. Our surface treatments include black oxide, pickling, passivating, conversion coating, and chromating.

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- Rack Plating - An industrial plating process with special designs for critical parts to prevent damage.
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### Certifications

The company has been NADCAP certified for approximately twenty years. This important standard indicates that accredited shops follow documented guidelines on how the parts are processed. The result is a consistently plated part.

Company President Eric Jacklin is in a good position to compare the two quality certification programs.



“NADCAP tends to be more specific and a lot more intense than ISO”, he says. “For NADCAP, the auditors that come in are trained in metal finishing. They may have particular expertise in one area, such as anodizing; but they have also worked in the finishing industry and in the labs. Thus, they have a very specific checklist”.

“We have ISO 9000 as well, and it is looking at specific quality things. But it is more general than the NADCAP. It deals with what you are actually doing; whether it is welding or chemical processing or something else”, he concludes.

Jacklin believes the NADCAP certification is worth the intense auditing process. “If you are NADCAP certified you are probably also GE certified or Rolls-Royce certified, he says. “The Boeings of the world really trust the NADCAP system. They are leaning more on the NADCAP auditors and doing a lot fewer specific prime audits themselves.”



### The Role of F.M. Callahan & Son with the Aerospace and Aircraft Industry:

George Abelli, the company's Technical Support Manager, recently commented on the role of importance that the company has in the Aircraft and Aerospace industries throughout the USA and abroad.

"Our continued presence at the SAE meetings gives F.M. Callahan the opportunity to work with all of the prime aerospace contractors in working out the needs and requirements in today's demanding aerospace and defense metal finishing market. This allows F.M. Callahan to better provide their customers with the latest and most up to date process requirements required in today's market," Said Mr. Abelli.



### State-of-the-Art Testing: The F.M. Callahan Analytical Lab

F.M. Callahan & Son has once again moved forward with recent renovations and equipment upgrades of its state-of-the-art Analytical Lab which is a key component in ensuring maximum quality control in in-process chemicals and final inspections of the plated finish to give their customers the very best in industrial plating.

- *Precious Metal Plating* - Silver plate. Bright and matte finish available. Gold plate. Both hard and soft finishes available.
- *Bright Nickel Plating* - Ideal as an ornamental finish for sales appeal where cost is a predominating factor.
- *Tin* - Used on items that come in contact with foods or in electrical field.
- Bright and matte finish available.
- *Zinc Plating* - Lustrous zinc coatings can be produced over ferrous and non-ferrous metals for increased eye appeal.
- *Electroless Nickel* - Assures absolute uniformity of plate inside and out regardless of irregularities of shape. RoHS compliant available.
- *Tin-Lead, 60/40, 90/10* - Applied to parts that have to be soldered after assembly.
- *Copper Plating* - Primarily used as an undercoat and also for selective carburizing.
- *Sulfamate Nickel* - Ideal for aircraft and nuclear applications but has many industrial applications.





The analytical laboratory is responsible for maintaining precise tolerances of the various process solutions used in the plating and anodizing lines at F.M. Callahan. Chemical testing includes volumetric and atomic absorption analysis on the process solutions, Hull Cell testing, Salts Spray testing, Coating Weight testing, Hydrogen Embrittlement testing, and various Hardness and metal purity testing.

This is combined with Quality Control Improvements already made this year which included state of the art thickness testing equipment, microscopes, and mechanical inspection equipment. Also added were new real time video equipment that will allow F.M. Callahan to forward real time video inspections of crucial aerospace parts that can be forwarded to their customers. All of these new renovations will allow F.M. Callahan to move into the future and grow while meeting the demands of their customers.

The X-Ray machines are used for checking the thickness of the electroplated coatings while The Eddy Current Testing Machine is used for checking the thickness of anodize and hardcoat anodize coatings.

Both X-Ray and Eddy Current are used in the Quality Control Department.

The Atomic absorption machine is used exclusively by the lab. Its main purpose is for testing our wastewater effluent discharge assuring the various metals have been removed and assuring that they meet the environmental requirements set forth by various agencies. It is also used for testing the concentration of metals in various plating solutions.



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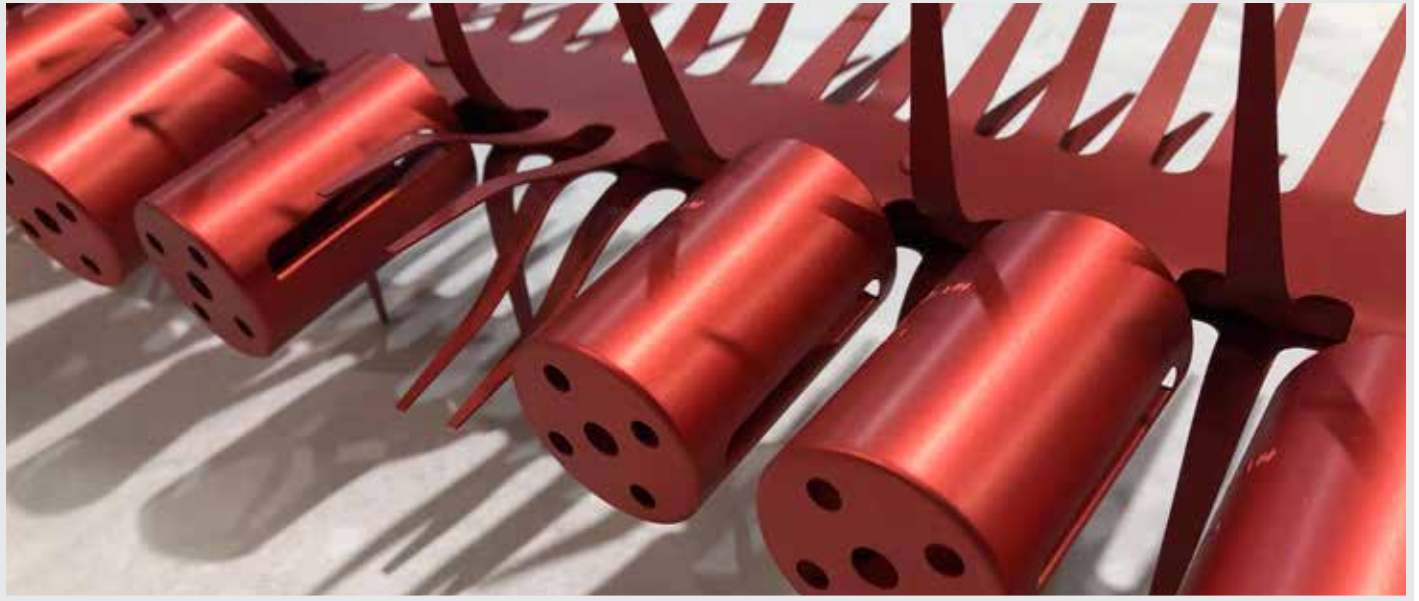
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**Sulfamate Nickel Plating** - AMS 2403; AMS 2424;  
AMS-QQ-N-290;

**Electroless-Nickel Plating** - AMS 2404; AMS 2405;  
AMS(MIL)-C-26074; ASTM B733;

**Aluminum Anodic Coating** - AMS 2471; AMS 2472;  
MIL-A-8625, Type II and Type III;

**Aluminum Conversion** - AMS 2473; MIL-  
DTL(C)-5541;

**Acid/Alkali Cleaning** - P4TF2; P4TF3;

**Titanium Cleaning** - P4TF3; S-421;

**Black Oxide** - AMS 2485; MIL-DTL-13924;

**Gold** - AMS 2422; MIL-DTL-45204;

**Tin** - AMS 2408; ASTM B545; MIL-T-10727

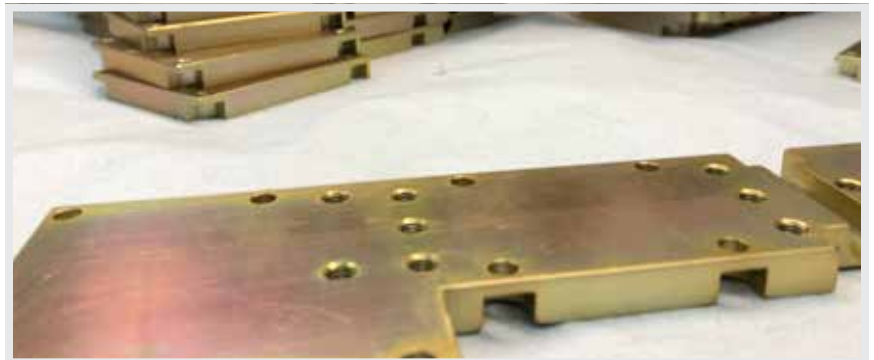
**Zinc** - AMS 2402; ASTM B633;

**90/10 Tin Lead** - MIL-P-81728;

**60/40 Tin Lead** - MIL-P-81728;

**Passivation** - AMS-QQ-P-35; ASTM A380; ASTM  
A967; AMS 2700;

**Chem Film** - AMS 2473, AMS 2477, MIL-DTL(C)-5541



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- Pratt & Whitney
- Raytheon
- Rolls-Royce
- Rockwell Collins
- Sikorsky
- SpaceX
- Textron
- Timken Aerospace

**Approvals**

F.M. Callahan & Son, Inc. currently plates precious metals of silver, gold, electroless nickel, sulfamate nickel, zinc, copper, tin, and tin-leads in a 40,000 square foot facility on Eastern Avenue. Their services also include black oxide, pickling, passivating, iridating and chromating. F.M. Callahan & Son, Inc.'s history of military and aerospace work continues under the quality certifications of NADCAP and ISO 9001.

F.M. Callahan & Son, Inc. also has proven excellence in partnering with medical, R.F. Communications, automotive, and general commercial companies.

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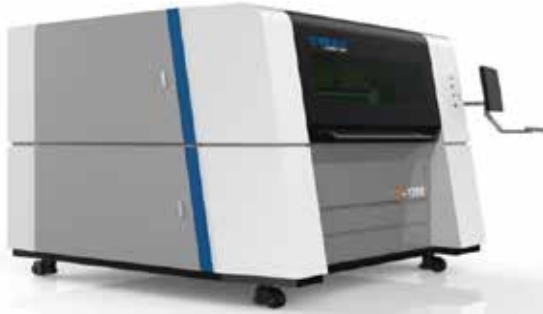
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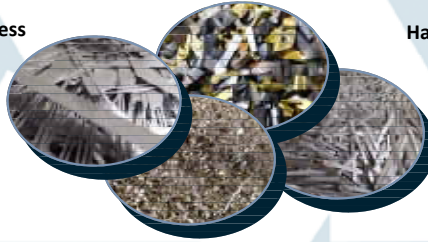
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SOLVING A SHOCKING FAILURE THROUGH CUSTOM  
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Almost every United States service member, from an Air Force pilot soaring through the sky to a Navy submarine crewmember diving deep underwater, relies on advanced precision technology to complete their missions. With the success of military operations so deeply tied to this equipment, it must consistently function as intended.

Shock and vibration problems are common hurdles engineers encounter when working to ensure the reliability of military equipment. Hutchinson Aerospace and Industry specializes in creating engineered products such as vibration isolation mounts to address these challenges, not only for military applications but for other key industries as well.

While Hutchinson has thousands of turnkey designs available, the company's expertise far exceeds a one-size-fits-all approach. Hutchinson's custom system design experts work to provide highly specified solutions for customers' unique shock and vibration, electromechanical system assemblies and electrification issues.

So, when one well-known defense company needed to solve a shock problem related to electronic control equipment for the Navy's Columbia-class submarine,

the Hutchinson team was mission ready. After conducting a robust system and design analysis, they helped create a modified solution that ultimately saved their customer a year's worth of time and money.

### **Diagnosing the Problem**

The first step Hutchinson took was to gain a comprehensive understanding of the customer's shock challenges. The company's engineers discovered their customer had been working with a competitor on a bulkhead-mounted enclosure with an internal circuit card deck. This deck had a limited amount of deflection space and had to remain within the customer's maximum acceleration limit during shock events.

But when the customer performed 901E shock testing, the competitor's isolator and proposed isolator configuration were not mitigating shock as needed. The system routinely transmitted high acceleration levels to the internal circuit card assembly during shock events, resulting in a test failure.

Given the limited time available to solve the problem, Hutchinson's engineers quickly started analyzing the system and designing a solution.



## A Custom Solution

Hutchinson's team used in-house, proprietary software along with customer-provided shock input time history to conduct a thorough analysis of why the system had failed testing. With a system analysis and extensive materials knowledge in hand, the team determined that a custom solution would be necessary to achieve the customer's desired results.

Hutchinson engineers concluded that a custom elastomer blend used in one of their company's existing designs, as well as a completely different mounting system, was the key to passing shock testing. With the customer's approval, Hutchinson created an elastomer formulation that was 50 percent stiffer than a standard elastomer.

Once Hutchinson's team formulated the elastomer, they began using it in their existing isolator geometry to solve the shock problem. They also implemented stabilizer mounts in the upper corners of the system's card deck to allow for streamlined motion control and lower transmitted acceleration.

Hutchinson was happy with the results—but before sending the customer samples of the isolator to use in trial testing, company engineers made sure they were confident in the solution they had developed. They validated the isolator's performance in the Hutchinson Test Lab, and the custom product was out the door and on its way to the customer.

## Passing the Test

As Hutchinson expected, the team's isolator and stabilizer mount solution helped the system pass 901E shock testing. In fact, the isolator was successful in meeting the customer's maximum acceleration levels using only half the allowable deflection space.

“Our engineering team worked extremely hard to solve this customer's shock problem,” said Tim Russell, regional sales engineer for the northeast United States and defense aftermarket sales manager. “When we learned that our custom solution did the trick, we were excited, but not surprised. We had done so much testing up front to make sure it would meet the customer's demands the first time around.”

Without design and analysis support, the customer would have had to undergo an expensive and time-consuming redesign of the entire system assembly. But thanks to the skilled engineering team at Hutchinson, they had a solid solution and were able to meet their abbreviated timeline.

### **Hutchinson's Continuing Impact**

Hutchinson started in 1943 to solve shock and vibration problems for the U.S. military. Eight decades later, the company is still making a big impact on the lives of uniformed men and women. (To read more about Hutchinson's history, visit: [www.hutchinsonai.com/intro-to-hutchinson/](http://www.hutchinsonai.com/intro-to-hutchinson/).)

Since World War II, many other critical business sectors have realized the positive potential of Hutchinson's shock, noise and vibration solutions. Today, the company provides turnkey and custom products for applications in industries including rail, trucks and electric vehicles.

This shock-testing example demonstrates the Hutchinson team's ability to quickly adapt their expertise in materials and system analysis to unlock custom solutions. From the very beginning of a relationship with a customer, Hutchinson works hand-in-hand to analyze any current system, run industry benchmarks, conduct modeling and develop prototypes through comprehensive prototyping and testing services.

Hutchinson engineers leverage full analytical and CAD capabilities and proprietary analytical tools to ensure they understand customer problems thoroughly before getting to work. The company is truly a value-added engineering partner that provides the finest, most cost-effective solutions to their shock, noise or vibration challenges.

The Hutchinson team is constantly working to innovate and improve the performance of their materials and has recently made advancements to heat resistance, fatigue life, damping, electrical conductivity and more. They continuously develop and test a wide range of structural elements and manufacturing processes so Hutchinson can deliver high-quality, repeatable products to customers every time.



*If one of Hutchinson's thousands of turnkey designs won't solve your shock or vibration issue, the company is always ready and able to develop a custom solution so you can succeed. If you would like to learn more about how Hutchinson's custom system design and analysis services or products can benefit you, reach out online at [www.hutchinsonai.com/contact-information-and-locations/](http://www.hutchinsonai.com/contact-information-and-locations/), or call (508) 417-7000.*

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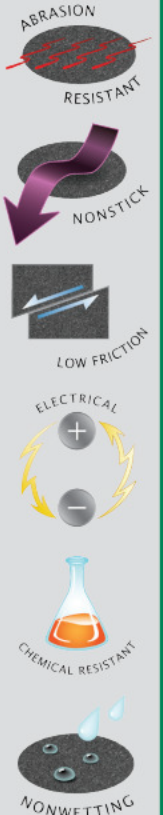


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## Belt Technologies Gives An Assist To A High School Robotics Team

TAGAWAM, Mass. – When the students on the robotics team at Lansdale Catholic High School in Pennsylvania needed a metal belt to perfect their robot for competition, they turned to Belt Technologies, Inc. Not only did the donated drive tape perform beyond expectations, but it also helped the team rank first out of 29.

“Our team recently competed in its second competition with a robot featuring the donated drive tape, and both the team and robot performed extremely well,” said John Cross, president and CTO of ASI Drives, a corporate sponsor of Lansdale’s team. “The team ended up with the top-ranked robot out of 29 other teams present, beating robots that had previously won at other competitions. We also won the ‘Engineering Inspiration’ award given to the team that inspired, helped and demonstrated strong engineering competence throughout the season.”

Scott MacDougal, senior sales engineer at Belt Technologies, said, “We were excited for the opportunity to support these students and are so proud of their accomplishments. Growing and encouraging interest in STEM education is important to us. These students and others like them are the leaders of tomorrow.”

Belt’s PureSteel® metal drive tapes are made from the same high-quality stainless steel used in its endless metal belts. Unlike metal conveyor belts, drive tapes are not endless; they are open-ended with anchor attachments at each end. They are frequently used in design applications that require accurate and reliable motion profiles, such as XY plotting assemblies for robotic arms and equipment. Stainless steel drive tapes are non-stretchable and offer a high strength to weight ratio and accurate and reliable motion.



“This is the best performance the team has had in 26 years of competing,” said Cross. “All the students are very grateful for the donation and support from the folks at Belt Technologies.”

### About Belt Technologies

*Belt Technologies, Inc. has been producing custom metal belt conveyor solutions for new and existing conveyor systems for more than five decades. Sophisticated engineering, advanced manufacturing processes, and an unlimited variety of configurations and coatings are available to custom-design belts to suit any application. Metal belts, timing belts, and metal drive tapes are superior, high-quality options for automated production and robotic facilities. A subsidiary, Belt Technologies Europe (BTE) located in Tyne and Wear in the U.K., serves as the sales office for Europe and Asia. To learn more about Belt Technologies and metal conveyor belts, visit [belttechnologies.com](http://belttechnologies.com).*

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## **EASTEC 2023, The Northeast's Largest Manufacturing Trade Show, Unites Manufacturing Ecosystem**

WEST SPRINGFIELD, Mass.--(BUSINESS WIRE)--SME and AMT welcomed back a throng of over 9,500 manufacturing professionals for another successful installment of the region's largest and most influential industry event, EASTEC 2023, which took place May 16-18 at Eastern States Exhibition in West Springfield, MA.

The three-day event had over 450 exhibiting companies; the Bright Minds Student Summit where 200 high-school students and educators from New England engaged with keynote speakers and toured the show floor; a Digital Solutions Showcase where manufacturers discovered innovative solutions to achieve their goals such as increasing productivity, reducing costs, or improving quality; as well as several presentations at the Smart Zone Theater covering the regional economic impact of manufacturing.

"SME's EASTEC event demonstrates the historical importance of manufacturing in the Northeast region while showcasing its future in leading-edge industries such as aerospace, medical devices, automotive, industrial equipment and defense," said SME Executive Director and CEO Robert 'Bob' Willig. "The technology on the show floor runs the gamut from high-end manufacturing equipment to smart technologies such as additive manufacturing and automation. EASTEC provides the Northeast region with the ideal opportunity to make and renew business connections, explore the latest technology, learn from industry experts and shape the future of manufacturing."

### **About EASTEC**

*EASTEC 2023, the largest Northeast manufacturing trade show, was held at the Eastern States Exposition in West Springfield, Massachusetts from May 16-18, and is produced by SME and AMT. EASTEC provides manufacturing professionals with the ideal opportunity to make and renew connections, explore the latest technology, learn from industry experts and shape the future of their businesses. EASTEC has been providing solutions to manufacturing challenges for more than 35 years with attendees from a variety of industries including Aircraft and Aerospace, Automotive, Medical, Defense, Industrial and Commercial Machinery, and more.*

*EASTEC is part of the Manufacturing Technology Series – bringing together strategic events under one umbrella. The Manufacturing Technology Series creates a consistent platform to ensure an unparalleled experience, bringing decision-makers from diverse industries together with leading suppliers of advanced manufacturing technology, equipment and tooling. Learn more at [mtseries.com](http://mtseries.com).*

### **About SME**

*We believe in the power of technology and the innovation of people to drive competitiveness, advance our nation and solve the world's greatest problems. A nonprofit organization established in 1932, SME leads the manufacturing ecosystem to elevate manufacturers, academia, professionals, and the communities in which they operate. We build the bridge from today to the future by developing the next generation of manufacturing talent and capabilities. And we accelerate the widespread adoption of technologies that can propel manufacturing operations into excellence.*

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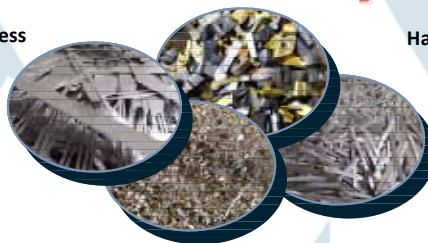
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