The Industry Benchmark
AMG Advanced Metallurgical Group N.V.

Risk Mitigation Handbook for Residual Hydrocracking and Hydrotreating Spent Resid Catalyst

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I. INTRODUCTION

AMG Advanced Metallurgical Group N.V. ("AMG") is "***The Industry Benchmark***" for long-term sustainable solution for the responsible management of hydrotreating and hydrorefining spent resid catalyst ("Resid Catalyst"). Our pyrometallurgical process for full metals reclamation provides the oil refiner with the highest level of environmental stewardship and risk mitigation.

Decades of experience have allowed us to develop The Industry Benchmark for managing the risks associated with Resid Catalyst recycling and metals reclamation. We feel obliged to share our acquired knowledge of the Resid Catalyst recycling industry, the legal and environmental risks, and the rationale for applying our best-in-class practices to Resid Catalyst management and reclamation.

In developing this handbook, U.S. standards and our recycling and metal reclamation operations formed the foundation of The Industry Benchmark for protection of human health and the environment. We then looked to our refinery partners' safety, security and environment control frameworks, as well as Canadian Regulations and other guiding principles including, but not limited to, regulations in the European Union ("E.U."). As a result, this handbook is an extremely useful tool for evaluating the practices of any processor offering Resid Catalyst recycling. It also provides a framework for considering the legal, ethical, financial, and reputational risks of deviating from The Industry Benchmark. While the applicable laws are complex and vary from jurisdiction to jurisdiction, we hope that sharing our hard-earned knowledge will help you evaluate your approach to Resid Catalyst recycling and provide you with "the right questions to ask" before selecting a vendor to recycle your Resid Catalyst.

At AMG, we operate a permitted U.S. hazardous waste "Treatment, Storage and Disposal Facility" specifically designed for full Resid Catalyst recycling and metals reclamation. Ferrovanadium (Ferovan®), ferro-nickel-molybdenum (FeNiMoly®), and calcium-aluminate slag (Revan™) are what we market to the steel industry. We are an environmental service provider whose primary purpose is to mitigate ongoing environmental risk and liability to refineries. Operating under U.S. laws and environmental permits that regulate our air emissions, waste management practices, and stormwater control, leads to great transparency with the regulators, as we continually report to, and are inspected by, the United States Environmental Protection Agency ("EPA") and the Ohio EPA. We recognize that remaining in compliance with environmental regulations and permit requirements is core to maintaining the trust we have earned with refinery partners throughout the decades.

Our proprietary "Cambridge Ferovan® Process" to recycle Resid Catalyst and reclaim metals generates no process wastewater, minimal solid waste, and results in 99% conversion of raw materials to saleable finished goods. Additionally, we have developed beneficial reuse outlets for the spent lime and baghouse dusts generated in our process. Transforming generated waste into saleable goods eliminates the long-term liability of our refinery partners because spent

materials are providing value rather than going to landfill. This alleviates the need for the refinery to set aside certain financial reserves for future mitigation.

We specifically designed our facility to allow full metals reclamation – making it the only one-stop-shop in North America that can store, process, and reclaim metals from significant quantities of Resid Catalyst. We receive spent Resid Catalyst and store it in purpose-built containment buildings that are regulated by a hazardous waste permit and US law. We specifically designed and constructed these containment buildings to safely store the Resid Catalyst and contain the free oil. The Resid Catalyst is roasted to convert metal sulfides to metal oxides in preparation for metals recovery in the Electric Arc Furnaces. Thus, Spent Resid Catalyst is recycled with full metals reclamation all within the Cambridge Ferovan® Process.

Risks exist in the Resid Catalyst processing industry. For instance, self-heating occurs when reactive sulfides in the Resid Catalyst are exposed to air. The oil coating helps to protect the Resid Catalyst from air, but thermal desorption strips the oil off the Resid Catalyst, without removing the coke or sulfur. This actually exacerbates the self-heating properties. Full roasting, like we do at AMG, removes coke and sulfur, so the risk of self-heating is eliminated. Further, the roasting process eliminates the self-heating properties of the Resid Catalyst by converting metal sulfides into metal oxides; ***a significant advantage over thermal desorption***, which, rather than reducing the self-heating risk, leaves the Resid Catalyst more vulnerable to fires in storage and/or transit.

Our facility has been audited by every major oil refiner operating in North America and when refineries search the globe for a partner for spent Resid Catalyst recycling and metals reclamation, they select AMG. We endeavor to maintain the trust of the refiners as they look to eliminate environmental, human health, financial, and reputational risks related to the disposition of Resid Catalyst. After a full review of this handbook, we are confident that the processes and facilities of AMG will lead you to the same conclusion that others have come to: ***we are The Industry Benchmark***.

II. THE INDUSTRY BENCHMARK

A. Spent Resid Catalyst – The Essential Background

Resid Catalyst is used in refinery processes to promote chemical reactions and is "spent" when it has lost chemical activity, become fouled, or otherwise requires replacement. When Resid Catalyst can no longer be reused at the refinery, AMG can reclaim valuable metals using the Resid Catalyst as a raw material.[1] We believe the following considerations are fundamental to the discussion and understanding of spent Resid Catalyst reclamation:

1) Resid Catalyst is comprised of a porous alumina substrate that has been coated with active metals such as molybdenum and nickel. These metals must be handled safely and responsibly to ensure exposure to people and the environment do not occur.

2) Resid Catalyst becomes spent after exposure during the refinery process and then poses additional risks from reactive sulfides, or reactive carbon. These additional risks can include self-heating, leading to combustion of the carbon coatings, when exposed to oxygen in air; or emissions of toxic, flammable and corrosive hydrogen sulfide.

3) Resid Catalyst may also contain remnants of the refinery processes it has been exposed to such as toxic hydrocarbons and metals deposited from processed materials such as vanadium and selenium.

4) Spent Resid Catalyst containing residual process oils can present further recycling and recovery challenges as they require removal and separation of the oils from the metallic components.

Spent Resid Catalyst management and reclamation is a difficult process with many risks and we encourage all refineries to employ vendors using nothing less than The Industry Benchmark.

B. Material Classification of Spent Resid Catalyst in the United States

As previously noted, AMG applies exceedingly stringent standards for Resid Catalyst management and reclamation to its operations. In the U.S., Resid Catalyst is a listed hazardous waste, meaning any handling, treatment, storage, transportation, or disposal of the material is highly regulated by law and permit authorizations.

The US EPA's 1998 rule, in accordance with the Resource Conservation and Recovery Act ("RCRA"), listed spent hydrotreating catalyst (waste code K171) and spent hydrorefining catalyst (waste code K172) as hazardous wastes.[2] After a thorough study, the EPA determined that Resid Catalyst **was shown to pose an unacceptable risk to human health and the environment when mismanaged**.[3]

The EPA regulates listed wastes for the constituents that caused the waste to be listed and any other qualities of the waste that *could possibly cause harm to human health and the environment when the wastes are land disposed.*"[4] Spent hydrotreating and hydrorefining catalyst (Spent Resid Catalyst)

was listed as K171/K172 because of hazardous constituents (benzene and arsenic) and hazardous characteristics (self-igniting qualities).

The EPA considered the self-heating property of spent Resid Catalysts to be very important in its decision to list these wastes, supported by actual environmental and health damages that the spent Resid Catalysts can cause.[5]

The EPA listing explanation cited knowledge of actual damage cases, where self-heating caused fires and other incidences in commercial facilities, for spent Resid Catalysts.[6] The EPA found it appropriate "to consider the physical properties of these wastes that may result in hazards if there is improper management through co-management with combustibles." Actual damages are one of the factors considered under the EPA's criteria for listing hazardous wastes.

The EPA also applied its Land Disposal Restrictions (LDR) universal treatment standards to Spent Resid Catalyst. This standard requires certain treatments standards to be met before the wastes can be land disposed and prohibits the land disposal of untreated hazardous wastes. **Before Spent Resid Catalyst can be sent to a landfill, it must meet the EPA's stringent treatment level standards, not just the test for whether the waste is hazardous or not.**

The EPA's treatment standards for K171 and K172 Resid Catalyst are based on metals (arsenic, antimony, nickel and vanadium) and polycyclic aromatic hydrocarbons ("PAHs"). According to the EPA, these constituents "are each present at significant concentrations in the K171 and K172 wastes and if not adequately treated would present risks to human health or the environment."

Because Resid Catalyst is a listed waste, removing some of the characteristic hazards does not remove the listing. Thermal processing (thermal desorption or roasting) of spent Resid Catalyst can remove benzene from spent Resid Catalyst, but it does not remove the metals contained in the waste (e.g., antimony, nickel, vanadium, and arsenic), nor does it eliminate the self-heating tendency. Therefore, the **EPA expects that thermally processed Resid Catalyst will be handled under RCRA in the same manner as "raw" spent Resid Catalyst.**

In summation, U.S. law demands a strict management regime for Resid Catalyst as a listed hazardous waste under RCRA – and has set standards that preclude Resid Catalyst from being disposed in a solid waste landfill. The "Cambridge Ferovan® Process" allows us to meet all of these requirements as the Spent Resid Catalyst is handled as a valuable raw material, with zero Resid Catalyst going to landfill. Over 99% of the "derived from" materials are saleable products, not wastes. Finally, we have designed our facility and processes to mitigate the hazards and potential actual damages associated with Resid Catalyst.

C. AMG Advanced Metallurgical Group – The Industry Benchmark

Transforming waste into valuable goods eliminates long-term environmental liability for refineries and, so long as it is done appropriately, can eliminate human health, financial, and reputational risks as well. AMG has designed its processes to achieve over 99% conversion of oil refinery wastes to saleable finished goods, while generating no process wastewater. Thus, our process is The Industry Benchmark. Anything less is not.

We operate as a U.S. Treatment, Storage, and Disposal Facility, which utilizes Resid Catalyst as the primary raw material in the production of ferroalloys (Ferovan® and FeNiMoly®), Revan™ (Electric Arc Furnace slag), and LimeAdd™ (lime from the sulfur scrubbing system). Baghouse dust and recovered oils are also sold for beneficial use, rather than going to landfill. This is good for the environment, the refineries, and our customers.

AMG's pyrometallurgical "Cambridge Ferovan® Process" centers around three main operations; (1) Spent Resid Catalyst Receiving and Storage; (2) Multi-Hearth Roasting Operations; and (3) Electric Arc Furnace ("EAF") operations.

Spent Resid Catalyst Receiving and Storage

Resid Catalyst is delivered to our facility, primarily in bulk railcars. The railcar is unloaded, via enclosed conveyor, into a Raw Material Storage Building ("RMSB"). Throughout the facility, all operations and storage occur indoors and Resid Catalyst transport occurs via enclosed conveyance. We protect the material and the environment by keeping materials indoors, covered or contained, and as will be further described below, with dust collection through baghouses to minimize particulate emissions to the environment.

AMG's RMSBs are designed to meet EPA standards and are frequently inspected by environmental regulators. During the time the Resid Catalyst is being stored, free liquids (including oil) migrate from the surface of the Resid Catalyst and are collected in the subfloor dual-liner containment system. The fluids are removed from the containment system on at least a daily basis and collected for off-site recycling.

The oil on the Resid Catalyst forms a protective layer, preventing reactive sulfide and/or reactive carbon exposure to oxygen. Such exposure leads to self-heating of the Catalyst. Thus, the Resid Catalyst temperatures are monitored to ensure that self-heating does not ensue as oil drains off of the Resid Catalyst during storage.

Multi-Hearth Roasting Operations

While AMG's roasting process primarily serves to remove reactive carbon and sulfur from the Resid Catalyst in preparation for melting, it provides a very important environmental and safety benefit by eliminating the "self-heating" nature of the Resid Catalyst – which is not accomplished via thermal desorption. During roasting, Resid Catalyst is exposed to temperatures and air in excess of that required for sulfur and carbon combustion, thus eliminating the reactive sulfides and carbon that make Resid Catalyst pyrophoric. Furthermore, the roasting process fully destroys benzene and any hazardous PAHs.

Proper control of Air emissions is a fundamental concern with any Resid Catalyst roasting process. We utilize a Circulating Dry Scrubber ("CDS") and baghouse which are the Best Available Control Technology ("BACT") to control sulfur dioxide ("SO2") and Best Available Technology ("BAT") for particulate matter ("PM") from the roaster exhaust. The CDS employs hydrated lime to capture over 96% of the SO2 and the used lime, known as LimeAdd™, is sold for beneficial reuse.

The associated baghouse is BAT for controlling PM, including PM10 (PM less than 10 microns in diameter, respectively).

Furnace Operations

The pyrometallurgical process converts vanadium-bearing raw materials, such as roasted Resid Catalyst, into ferroalloys (Ferovan® & FeNiMoly®) and a calcium aluminate slag (Revan™).

The Melt Shop consists of two Electric Arc Furnaces ("EAFs"). The Primary EAF converts the raw materials to a molten state so that the metallurgical reactions can take place, separating the vanadium from the nickel, molybdenum, sulfur, phosphorous, and other elements that would impact the quality of the Ferovan®. The Secondary EAF is utilized to further refine the Ferovan®.

Raw materials consisting of various vanadium bearing feedstocks (e.g. roasted Resid Catalyst), fluxes, and reducers are fed into the Primary EAF and are melted in order to promote the metallurgical reactions.

Initially, the raw material includes oxides of vanadium, nickel, molybdenum, and iron. Once the material is molten, the bath is refined as the nickel oxides, molybdenum oxides, and some of the iron oxides are reduced to metals, sinking to the bottom of the furnace. The molten FeNiMoly® alloy settles to the bottom of the furnace due to its higher density, leaving the molten vanadium oxidebearing intermediate slag ("Intermediate") on the top, ready for conversion in the Secondary EAF.

Throughout each day, a portion of the vanadium bearing Intermediate is transferred to the Secondary EAF for conversion to Ferovan®. Occasionally, the FeNiMoly® product is decanted from the Primary EAF and cast into molds.

Reducers and fluxes are added to the molten Intermediate in the Secondary Furnace, to promote metallurgical reactions, primarily the reduction of iron and vanadium oxides to a metallic form. The more dense metal (Ferovan®) settles to the bottom of the furnace, while the now vanadiumdepleted slag (Revan™) floats on the top.

The control of pollutants generated is required here, as at the Roaster. During the melting processes, over 99% of the dust and fumes generated (from the handling of the feed and melting process) within the furnace enclosure are captured and collected in a baghouse that services the EAFs. The baghouse dust can be sold for beneficial reuse, re-introduced into the EAFs for metals recovery or shipped offsite for proper disposal.

After each of FeNiMoly®, Ferovan®, and Revan™ is decanted into ladles from the EAFs, the molten materials are cast in chill molds and then prepared for shipment to the customer. The Revan™ is relocated to a storage area to be loaded onto trucks.

We also take measures to protect the facility stormwater by first designing and implementing Best Management Practices (BMPs) to prevent pollutants from entering the stormwater system. Stormwater is collected from the process region of the facility in retention ponds and passed through engineered wetlands to remove pollutants from the stormwater discharge.

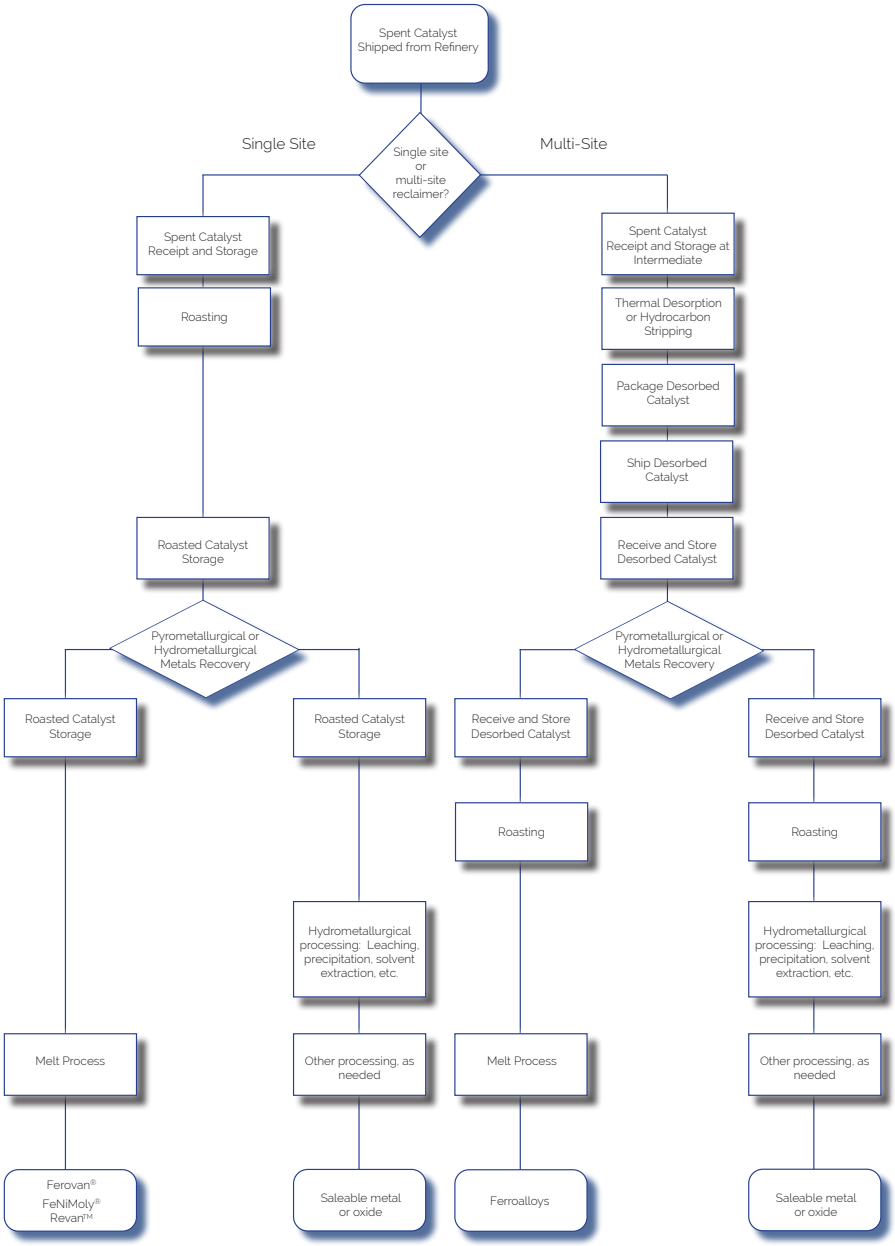
Ferovan®

FeNiMoly®

III. WARNING!!! – NOT ALL RESID CATALYST RECYCLERS ARE CREATED EQUAL

A. Comparing Recycling Approaches — Process Flowchart

Refineries should demand that their Resid Catalyst processor meet The Industry Benchmark. This section provides a visual comparison of AMG's process to alternatives. This is followed by our observations of risky practices in the industry that could implicate a Resid Catalyst generator in serious environmental, human health, and reputational risks.



B. The Risky Practices we are Observing in the Industry

As the best-in-class Resid Catalyst recycler and through decades of experience, we at AMG have developed sophistication and familiarity with the industry. While some of our competitors may manage Resid Catalyst in a safe and effective manner – many others do not. In fact, we have become increasingly aware of certain practices within the global industry that are extremely risky for the refinery as the Resid Catalyst generator. This section flags those practices that we find most concerning in the Resid Catalyst recycling industry, and we feel obligated to ensure that our partners are aware of both the practices and the risks they create. Overall, there is tremendous environmental, human health, financial, and reputational risk to any refiner not demanding The Industry Benchmark for Resid Catalyst recycling and metals reclamation.

i. Partial Processing and Shipment Overseas

In the Resid Catalyst recycling industry, certain facilities are desorbing Resid Catalyst, instead of roasting, and then transporting to other facilities for metals reclamation. In some instances, the processor will designate desorbed Resid Catalyst as non-hazardous for simplified international transport. The process of desorbing simply removes residual oil coatings, the Resid Catalyst has not substantially changed from original form, still presenting significant transport risks. Moreover, removing the oils can actually increase self-heating tendencies by allowing better air contact with active carbon and sulfides on the Resid Catalyst, further increasing risk. The desorbed Resid Catalyst is also more toxic as the susceptibility to metals leaching increases dramatically.

The practice of thermal desorption and transporting overseas can also significantly increase pollution loading at the facilities receiving the desorbed Resid Catalyst. Desorption does not remove the sulfur from the Catalyst and therefore, SO_2 emissions will be generated at the facility that is roasting and reclaiming the metals. These facilities are often in second and third world countries and do not have the pollution control equipment necessary to properly address these emissions.

They also may not have the facilities to store Resid Catalyst indoors (potential stormwater pollution loading) or the regulations governing the disposal of Resid Catalyst (potential landfill or other earthen area disposal issues). The consequence is large-scale environmental contamination risks, human health risks, financial, and reputational risks that may ultimately be tied back to the refiner that generated the waste Resid Catalyst.

ii. Storage at Processor Facilities

Improper storage of Resid Catalyst can result in self-heating, fire, and toxic fumes during indoor storage, or stormwater exposure due

to outdoor storage. Some processors have been storing Resid Catalyst in containment buildings that are not properly designed and are unable to segregate Catalysts to prevent cross contamination. Others are storing unprotected Resid Catalyst outside. In short, this practice can create the same large-scale risks described immediately above in Section (i) – and potentially result in a catastrophic fire incident.

iii. Placement in Landfill

Landfilling of Resid Catalyst, or components of same, by processers is highly undesirable and should be avoided. This is still common practice in some countries and represents long term liability to the generator of the Resid Catalyst.

Landfills are notorious for leakage over the long term and the self-heating nature of the catalyst will not have been mitigated. Environmental and health and safety impacts to communities, representing significant risk, financial liability, and reputational damage, are well-documented. The liabilities may not be able to be transferred through sales or processing contracts and could come back to the generator in the future. Even if the legal liability is transferred, reputational damage is highly likely.

Rogue processors sending Resid Catalyst to foreign countries may not fully or accurately disclose the final destination of the Resid Catalyst to the refineries. Certain foreign countries do not adequately regulate disposal of Resid Catalyst. Such practices create unmitigated liabilities for the environment, surrounding communities, and the refinery (financial and reputational impacts). These generator liabilities may surface years after the date of disposal.

iv. Not Properly Documenting the Fate of Resid Catalyst

Generators of Resid Catalyst often require a Certificate of Destruction to identify the final destination of the spent Resid Catalyst or components. This is a sound due diligence process to manage future liability. Material placed in landfill, even with a "Certificate of Good Care" is a potential liability to the refiner in the future as environmental regulations evolve. The progression of environmental regulations is difficult to predict, but we have seen landfill regulations tighten over recent years.

The only way for a refiner to completely avoid this risk is to ensure that none of its material is land disposed. If you don't have a "Document of Destruction", certifying that your Resid Catalyst has been reclaimed, it could be anywhere. Such "hanging" liability is not in the best interest of our partners, or any refinery.

v. Transport/Shipping

Improper Identification and Labeling

Unfortunately, the practice of designating thermally desorbed Resid Catalyst as something other than hazardous K171/172 waste during shipping is an all too common occurrence. Resid Catalyst may pass self-heating classification tests in small quantities; however, the bulk material may be self-heating and smolder or combust during transport. This creates a significant safety hazard as marine barge and overland shippers may be unaware of the Resid Catalyst's ability to self-ignite. Further, the misclassification when transporting is illegal in much of the world. Some of the notable recent instances of improper identification include labeling desorbed Resid Catalyst as a "vanadium concentrate" for

transportation as a non-hazardous material, when in fact, it is still hazardous. As liabilities go, our concern is that the refineries would ultimately be blamed for such a transportation incident should it occur.

Improper Packaging of Self Heating Material

Similarly, certain processors in the Resid Catalyst recycling industry are using SuperSacs for Resid Catalyst shipping. These plastic weave bags allow direct air exposure to Resid Catalyst and oxidation to continue creating heat, fire, smoke, and fume (toxic sulfur dioxide) risks during transport. This can be especially risky during marine barge transport of large quantities possibly endangering vessels and crew. Again, the environmental, human health, financial, and reputational liabilities to the generators, the refineries, are untold in the event of such an incident.

vi. Occupational Health and Safety for Workers is Substandard or Not Fully Implemented

In many second and third world countries, metals reclamation facilities do not have employee protection standards and practices that meet refiner expectations. The Resid Catalyst recycling industry, sadly, has its examples of second and third world facilities using personnel to crush raw material on their hands and knees, implementing no form of personal protective equipment, and utilizing no pollution control equipment. The Resid Catalyst these facilities are processing originates at sophisticated refineries that have put their trust in rogue vendors who merely desorbed and sent the Resid Catalyst to such facilities for reclamation. In these instances, we note that the potential ramifications to a generator's reputation, and/or the potential liabilities, arising from fires while in-transit and in storage, personnel exposures to airborne contaminants, and uncontrolled emissions, could ultimately be borne by the refinery that generated the Resid Catalyst.

IV. MITIGATING RISKS

A. Issues in Resid Catalyst Treatment (Desorption or Roasting) and Reclamation (Hydrometallurgical or Pyrometallurgical)

With US regulations as a starting point, we at AMG have adopted the exceedingly stringent Industry Benchmark for Resid Catalyst management and metals reclamation. For our partners' reference, we have here compiled the key aspects of the rigid U.S. standards for Resid Catalyst recycling and metals reclamation to share our knowledge of the minimum standards that should be applied in Resid Catalyst recycling.

i. Air Emissions

The Clean Air Act

The Clean Air Act[7] (CAA) is the U.S. federal law designed to control air pollution. Under the CAA mandates, EPA sets National Ambient Air Quality Standards (NAAQS) for the criteria pollutants: Particulate Matter (PM), ground-level ozone, SO2, nitrogen dioxide (NO2) carbon monoxide (CO) and lead (Pb). EPA also regulates the emission of hazardous air pollutants. Implementation of the NAAQS is a joint program between EPA and the states, where the individual state is typically delegated the authority to implement and enforce the provisions of the CAA through state law and regulation. State permitting serves as an important mechanism by which the CAA requirements are promulgated and enforced. These state requirements are part of a State Implementation Plan (SIP) that is approved by EPA. The Ohio EPA serves as the delegated authority for permitting and enforcement in Ohio.

Air Pollution Control Permits

The permits issued to a facility by the state specify what air pollution control technologies must be utilized and provide emission limits, monitoring, record-keeping, and reporting requirements for each emission unit. Failure to comply with permit limits and operating requirements could result in civil penalties for each day a permit emission limit or operating condition is violated. AMG has proactively selected pollution controls that are BACT so it meets or exceeds its permit and regulatory requirements for each emission unit. Thus, we can operate our recycling process knowing that it is in compliance with the CAA and protective of the environment. This is in contrast to many of our competitors, whose facilities have minimal or no pollution controls and fail to protect human health and the environment.

Our stringent emission limits were established in the Permits to Install ("PTI") and facility-wide Title V Operating Permit. Ohio EPA set those permit limits based upon our permit applications that required in-depth analysis of the potential to emit ("PTE") for each criteria pollutant. PTE is calculated based upon maximum operating rates, maximum hours of operation and maximum emission rates — literally the "worst case scenario" for emissions. That analysis performed by AMG determined which control

technology was required as BACT or BAT and the appropriate emission limits for each emission unit and pollutant to ensure protection of the NAAQS.

Through our permits, we are required to control SO2 emissions from the Roasters by utilizing a CDS, which must achieve a 96.1% control efficiency. SO2 emissions are monitored via a certified Continuous Emissions Monitor ("CEM") that continuously records emission data to be utilized for compliance reporting to the Ohio EPA.

PM emissions from the Roasters are controlled by a baghouse with a 99.95% control efficiency and are limited to 0.010 gr/dscf and visible emissions ("VE") less than 20% opacity as a 6-minute average. The emissions and VE limits are monitored via stack testing and VE readings.

The remaining Roaster emissions are all monitored via stack testing to ensure compliance with permit limits for NOx, VOC, and CO. All of the Roaster permit limits were established by the Ohio EPA to protect the NAAQS and to protect human health and the environment. Each of the pollution control devices represent either BACT or BAT for controlling air pollution.

A similar approach is taken at the EAFs except that all emissions are monitored through stack testing and visual emission inspections. Baghouses control PM, PM10 and PM2.5 emissions. Similar to the Roasters, both baghouses serving the EAF are BAT controls for PM and PM10.

We also have permit limits for material crushing, screening and handling operations. Baghouses are employed to capture and control particulate emissions at the hydrated lime and LimeAdd™ silos, raw material crusher, raw material blending station, Ferovan® crusher and the Ferovan® blending and packaging stations. All of these permit requirements serve as BAT for limiting PM and PM10 emissions.

All of AMG's permit limits and operational restrictions are enforced through stack testing, monitoring, record-keeping and reporting requirements. We are required to conduct daily or weekly visual inspections of all baghouses serving the EAFs, Roasters, and material crushing and handling to ensure the baghouses are operating correctly and that we are not exceeding our VE limits. It also has to conduct periodic visual inspections of the EAF building to ensure that the EAFs are meeting the fugitive PM and opacity limits. AMG is also required to monitor its baghouses for pressure drop or other operating parameters to ensure that each baghouse is operating correctly and meeting the permit requirements.

Spent Resid Catalyst

For reporting, we must submit quarterly deviation reports to the Ohio EPA for all emission sources, including the EAFs and Roasters. Those reports identify any time when a source was operating outside of its permit limits or requirements. We also submit semiannual emission reports to the Ohio EPA which details our compliance with emission limits for each source. Finally, we are required to report malfunctions any time air pollution control equipment or the source itself experiences a malfunction that causes an emission limit exceedance.

Contrary to many of our competitors, AMG has expended the capital to install BACT and BAT air pollution controls for each of our emission units thus ensuring compliance with the stringent CAA and EPA-issued permits. That commitment to environmental stewardship separates AMG's Industry Benchmark from all of its competitors when it comes to limiting air emissions and protecting human health and the environment.

ii. Waste Issues

The Resource Conservation and Recovery Act ("RCRA")

In 1976 Congress passed RCRA to ensure that hazardous waste is safely managed from generation to storage and disposal. EPA regulations enforce the congressional intent of RCRA by providing explicit, legally enforceable, requirements for waste management. RCRA regulates waste as hazardous if it meets RCRA definition of solid waste, and is either specifically listed as hazardous or exhibits a characteristic of hazardous waste. Spent petroleum Resid Catalysts are listed as hazardous wastes[8] due to the hazardous constituents contained in spent Resid Catalysts (e.g., arsenic, antimony, nickel, and vanadium) and the fact that these wastes can at times exhibit pyrophoric qualities.

AMG's RCRA Permit and Variance

We are authorized to handle hazardous waste pursuant to our RCRA Permit and RCRA Variance. The Permit governs our handling of Resid Catalyst while the Variance allows us to handle and process Resid Catalyst as a raw material. The Variance further allows Resid Catalyst "derived from" products, such as slag, baghouse dust, and even roasted Resid Catalyst, to be sold as valuable products when processed at AMG. EPA regulation and oversight of both RCRA Permit and Variance is robust, ensuring AMG's continued compliance and allowing for a strong working relationship with state and federal environmental regulators. With these authorizations, we are recognized by the state and federal government as a best-in-class U.S. Treatment, Storage and Disposal facility.

Storage of Hazardous Waste Under RCRA

Under RCRA, the EPA promulgated regulations establishing the requirements for hazardous waste management units to store hazardous waste. Hazardous waste must be stored in containers, tanks, containment buildings, drip pads, waste piles, or surface impoundments that comply with RCRA regulations.

AMG stores Resid Catalyst in specially designed RMSBs which allow for Resid Catalyst segregation, collection of oil from a dual containment liner system, and prevents Resid Catalyst reactions with the surface it is stored on. A hazardous waste containment building is a completely enclosed structure that houses an accumulation of hazardous waste that is not placed in a container. The EPA designated containment buildings as hazardous waste management units to address the difficulties associated with management of bulky, large volume hazardous wastes and the requirements for hazardous waste management in the regulations.[9]

Containment buildings facilitate the management of large quantity materials without triggering land disposal restrictions. Under the EPA's land disposal restriction program, hazardous wastes must meet certain standards that require treatment of the waste to reduce its hazardousness before land disposal. The EPA interprets the statutory definition of land disposal to exclude waste placed in containment buildings from constituting land disposal. Therefore, containment buildings can be used for treatment or storage of hazardous waste without triggering or violating any treatment requirements under land disposal restriction programs. These containment buildings establish The Industry

Benchmark for AMG's storage of Resid Catalyst. Storage in unpermitted buildings, or even outside, creates liabilities for the refineries in the form of environmental and human health risks as contaminates from the Resid Catalyst can become mobilized.

Treatment/Handling of Hazardous Waste Under RCRA

The EPA's requirements for handling hazardous waste depend on the type of material being treated and the type of recycling process used for the waste. Our handling, roasting, and melting processes are approved by both a RCRA Permit and a RCRA Variance – meaning the highest standard of care has been achieved and approved by the U.S. government. All personnel engaged in handling Resid Catalyst at AMG are specifically trained per RCRA, provided all appropriate personal protective equipment, and are knowledgeable of all contingency and emergency plans in the event of any accident. In short, The Industry Benchmark requires attention to how Resid Catalyst is handled through storage, roasting, and melting – and worker safety must always be considered.

Disposal Under RCRA

We do not send any Resid Catalyst to landfill and maintain a 99% conversion rate for all raw material. This is an essential part of AMG's promise to its partners as RCRA land disposal restriction program prohibits the land disposal of hazardous wastes and requires the EPA to specify either concentration levels or treatment standards that must be met before a hazardous waste's land disposal. The land disposal restrictions are applicable to generators of hazardous waste and facilities that treat or dispose of hazardous waste. The EPA lists for hazardous wastes the specific regulated hazardous constituents that must be treated prior to the waste's land disposal. To meet treatments standards, regulated hazardous constituents must be at or below the listed concentrations prior to disposal. For environmental, human health, financial, and reputational purposes, **refiners should never allow its Resid Catalyst to be landfilled**.

RCRA Financial Assurance

AMG maintains over $20 million dollars in financial assurance for the storage and handling of hazardous waste at their facility. Financial assurance is the mechanism to ensure that, should the permitted facility close, the regulated materials are properly disposed of and the facility properly decontaminated. Thus, the burden of these costs will not revert to the state or refineries who generated the Catalyst. This set-aside money provides refineries with the comfort that we will guard their financial accountability for any Resid Catalyst sent to our facility. If a processor fails to post an adequate amount of financial assurance, the generator (refinery) is exposed, to potential liability under the Comprehensive Environmental Response, Compensation, and Liability Act.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)

The key U.S. law that should concern Resid Catalyst generators is CERCLA. CERCLA grants the U.S. federal government broad authority to respond directly to releases, or threatened releases, of hazardous substances that may endanger public health or the environment. CERCLA is designed to cleanup inactive hazardous waste sites and hold transporters of hazardous substances and current and former owners of facilities of hazardous wastes liable for the costs of the cleanup.

Through CERCLA, the EPA has the power to pursue parties responsible for any release of hazardous substances and enforce their cooperation in the cleanup. The EPA cleans-up hazardous waste sites when potentially responsible parties cannot be identified or

located, or when they fail to act. Through various enforcement tools available, the EPA obtains private party cleanup through Orders, Consent Decrees, and other settlements. The EPA also recovers costs from financially viable individuals and companies once a response action has been completed.

The EPA has three enforcement tools available to it under CERCLA: (1) it may conduct the response itself and seek to recover costs from the potentially responsible parties in a subsequent cost recovery action; (2) compel the potentially responsible parties to perform the cleanup themselves through either administrative or judicial proceedings; or (3) it can enter into settlements with the potential responsible parties to perform all or portions of the work.[10]

CERCLA imposes joint and several liability on all potentially responsible parties ("PRPs"), or those parties who contributed hazardous material to the site (even if such parties were never "owners" or "operators" of the contaminated site). This means that when a site is remediated, any party that generated, transported, or sent waste to the site is financially responsible for cleanup costs because all are considered potentially responsible parties. Whether the party was directly involved in the contamination requiring the cleanup order is not a defense; joint and several liability attaches regardless of the party's practices and lack of culpability.

A Resid Catalyst recycler must establish adequate financial assurance in order to protect the refineries. As noted above, AMG maintains over $20 million dollars in financial assurance held by the U.S. government in the event of any closure or response. Combined with our best-in-class operations – refineries can take comfort that CERCLA risks are best mitigated when Resid Catalyst is sent to AMG for reclamation. CERCLA should be a "top line" concern to any refinery considering any Resid Catalyst reclamation vendor not subscribing to The Industry Benchmark.

iii. Stormwater

The Clean Water Act

U.S. federal and state law prohibit the discharge of a pollutant directly into surface water from a point source without a permit.[11] Discharges to ground water are also prohibited unless authorized by a permit, such as through an underground injection disposal well. Both U.S. EPA and Ohio EPA have adopted extensive regulations covering permitting requirements and water quality standards that have to be followed. The permit program and regulations covering discharges to surface water is called the National Pollutant Discharge Elimination System ("NPDES"), and Ohio EPA has received delegated authority from U.S. EPA to manage and administer the NPDES permit program in the state of Ohio.

The NPDES program covers both, (i) an industrial process discharge to a surface water after required treatment and (ii) a stormwater discharge from a site where industrial activities take place or where the pollutants being discharged have the potential to cause or contribute to a violation of a water quality standard. Industrial process wastewater that is discharged into a public sewer for final treatment and disposal by a publicly owned treatment facility also requires a permit. In most situations, the industrial process discharge is required to undergo pretreatment by the industrial facility before being discharged to the public sewer.

AMG Facility's Stormwater Discharges and NPDES Permit

In general, and by way of example, the AMG NPDES includes:

- Effluent limitations on certain parameters/pollutants, and monitoring requirements;
- Required monitoring reports, toxicity (bioassay) testing, and evaluating the effectiveness of the wetlands used for stormwater treatment;

- General Conditions, such as narrative effluent limitations, facility operation and quality control requirements, unauthorized discharge provisions, and notice and reporting requirements;
- Requirements for stormwater control measures and the pollution prevention program, such as requiring controls and BMPs, spill prevention, erosion and sedimentation controls, corrective actions, inspections, recordkeeping, and the preparation and implementation of a comprehensive Stormwater Pollution Prevention Plan (SWPPP) document.

It should be noted that hydrometallurgical processes, by their nature, generate wastewater that must be managed. *AMG's process, The Industry Benchmark, generates no process wastewater.* In the hydrometallurgical process, the leaching, precipitation and solvent extraction processes that are employed to chemically separate the metals and metal oxides utilize significant quantities of water and contaminated tailings. Many processors have established on-site "tailings ponds," and these represent a significant potential environmental liability to the Resid Catalyst generator. Refineries should be wary of Resid Catalyst processors that generate process wastewater. Make sure that you know how that water is being handled.

Periodic Ohio EPA Biological and Water Quality Surveys

The impact of our stormwater discharges on the water quality of the receiving stream, health of the fish and insects, and quality of the habitat are assessed by Ohio EPA on a regular basis as part of Ohio EPA's rotating watershed biological and water quality survey program. Ohio EPA assesses the waterbody where our facility is located, including immediately downstream of our outfalls, for compliance with numeric chemical water quality criteria, biological criteria for fish and insects, and habitat quality criteria to ensure the beneficial uses of the waterbody are protected. These criteria have been adopted by Ohio EPA in regulations which are part of their water quality standards. Ohio EPA publishes the results of the watershed assessment and posts the reports on their website.

Spill Prevention, Control and Counter Measures Plan

In order to protect water ways from oil contamination, U.S. Federal law requires any site that stores a sufficient quantity of oil to prepare and implement a Spill Prevention, Control and Countermeasures (SPCC) Plan. The SPCC Plan includes preventive measures, response actions and reporting requirements in the event of an oil spill. AMG, as a processor of oil-laden spent Resid Catalyst, has prepared and implemented a comprehensive SPCC Plan. The facility was designed to protect the waterways, as all discharges to the local waterways first go through retention ponds and engineered wetlands. The containment buildings holding the oil-coated catalyst were specifically designed to contain and allow for the management of the oil. Should an oil spill occur at the facility, equipment necessary to contain the spill is readily available. Employee training emphasizes the criticality of identifying and containing oil spills quickly.

iv. Criminal Liability for Environmental Violations

The EPA's power to enforce its regulatory programs extends beyond civil actions. In 1982 EPA created its own criminal enforcement program and Congress approved full enforcement authority in 1988. The program assists federal and state prosecutors by investigating and collecting evidence against individuals and corporations believed to have committed serious environmental crimes. Environmental crimes are generally any "negligent, knowing, or willful violation of a federal environmental law." In 2017 alone, the criminal enforcement program assisted in cases that led

to a total of 153 years of incarceration and fines of $2,829,202,563.[12] Criminal violations rarely impact only the violator and can lead to liability for parties doing business with them as well.

Case Study 1 – Dakota Catalyst Products Inc.

Dakota Catalyst Products Inc., ("Dakota") opened its facility in Williston, North Dakota with a plan to safely receive, recycle, and reclaim valuable metals from spent Resid Catalyst.[13] However, Dakota did not follow The Industry Benchmark and faced serious criminal allegations for violations of RCRA and The Clean Water Act.

Dakota relabeled hazardous waste as nonhazardous, stored more waste than permitted, and allowed "arsenic, selenium, lead, zinc, and chromium to leach into groundwater." They fooled regulators by convincing them that their primary intent was recycling and not incineration. Further, Dakota did not fully disclose their process or what and how much hazardous waste they would be incinerating. Therefore, more stringent permits and regulations for hazardous waste disposal were not required by EPA. This allowed Dakota to emit various pollutants in all mediums with minimal to almost no oversight.[14]

Dakota pled guilty to violations for unpermitted storage of hazardous waste and dumping contaminated water in the local wastewater system. Dakota's criminal plea carried a $700,000 fine.

Most importantly, Dakota's criminal actions hurt those they claimed they were helping. Oil refineries, who paid Dakota to receive and recycle their waste, had to take it all back. After the criminal action, hundreds of barrels were being removed by the oil companies responsible for sending them to Dakota.[15]

v. Transboundary Movement of Spent Resid Catalyst

The Basel Convention: Background and Applicability

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal is a multilateral agreement developed under the auspices of the United Nations Environment Programme.[16] In general, the aims of the Basel Convention are to reduce the generation of hazardous waste, promote the environmentally sound management of hazardous wastes, and to develop a system for either restricting the transboundary movement of hazardous waste or regulating such movement if it can be accomplished in an environmentally sound manner. As part of this regulation, the Convention creates a system requiring prior notice and consent for transboundary movement of hazardous waste between the exporting, transit, and importing countries.

Basel Convention: Waste Categories that Describe Spent Resid Catalyst

The Basel Convention identifies Resid Catalyst as a type of waste, and designates it as either a hazardous waste or a non-hazardous waste depending on certain criteria. One of these designations is Basel waste code B1120, which covers the following: "Spent catalysts excluding liquids used as catalysts," containing certain metals, including Vanadium, Nickel, and Molybdenum.

Waste code B1120 is included in the Annex IX list of non-hazardous wastes (not restricted under the Basel Convention). However, the wastes listed in that annex may be considered a hazardous waste in certain circumstances including: (1) substances or wastes liable to spontaneous combustion; (2) and substances that are ecotoxic. Resid Catalyst can exhibit both properties and therefore can be classified as hazardous.

Accordingly, we urge our partners to be extremely cautious before concurring that Resid Catalyst can be shipped as a non-hazardous material. For example, the U.S. and Canada have identified spent Resid Catalyst as a hazardous waste of the type restricted under the Basel Convention and classified it under in Annex VIII waste code A2030. Resid Catalyst subject only to desorption would exhibit both pyrophoric and ecotoxic characteristics causing it to be considered a hazardous waste, even if it was classified under waste code B1120.

Case Study 2 – Exporting Resid. Catalyst to Europe

AMG recently exported roasted Resid Catalyst to Europe. Prior to that shipment, our customer sought a review by the relevant government environmental protection authority of the procedures required for importation of this material. We provided detailed documentation, including a Safety Data Sheet for roasted Resid Catalyst (which identifies information on the hazardous characteristics of this material, including ecotoxicity) and information on AMG's roasting process. After considering this information, the authority advised our customer that it viewed the roasting of the Resid Catalysts as a preliminary step in the process of recovering the metals contained in the Resid Catalyst, and not as a complete recovery process. According to this authority, a complete recovery process would require, in addition to roasting, the isolation of the vanadium component contained in the Resid Catalyst.

Thus, this European environmental protection authority confirmed that it considered Resid Catalyst, both before and after roasting, to be a waste, and that the roasted Resid Catalyst must be imported under the terms of the applicable European regulations regarding the transboundary shipments of waste.

As part of its assessment, this authority determined that Basel waste code B1120 was applicable to the importation of our roasted Resid Catalyst. As discussed above, Basel waste code B1120 appears in Annex IX of the Basel Convention, which lists wastes that, in transboundary movement, are not considered "hazardous wastes" for the purposes of the Convention, with certain exceptions (generally, contamination with materials that have hazardous characteristics). However, the German authority also determined that roasted Resid Catalyst is classifiable under European waste code 16 08 02*, which is defined in a European Commission decision on waste and hazardous waste as covering Resid Catalyst containing "hazardous transition metals or hazardous transition metal compounds;" transition metals include vanadium, nickel, and molybdenum.

Without confirmation, classification of Resid Catalyst during exportation is not clear. All Resid Catalyst processors or refiners should go through a similar confirmation process as AMG before they export Resid. Catalyst to a new country, as different countries' regulatory authorities could reach different conclusions with respect to classification and the obligations that stem from such determinations. Without this disclosure and confirmation process, it should be assumed Resid Catalyst is hazardous and appropriate regulations for shipping hazardous materials should be followed.

OECD Decision on the Control of Transboundary Movements of Waste

The OECD "Decision on the Control of Transboundary Movements of Wastes Destined for Recovery Operations" is a multilateral agreement consistent with "the environmentally sound management of hazardous wastes and other wastes as required by" the Basel

Convention. In many respects, particularly the classification of wastes subject to control, the OECD Decision harmonizes its provisions with those of the Basel Convention.

Roasted Resid Catalyst

The OECD Decision establishes two categories of wastes which require different levels of control when they are transported from one OECD member country for recovery in another OECD member country, the Green List and the Amber List. The Green List wastes include wastes that present low risk for human health and the environment, and therefore are subject only to the controls normally applied in commercial transactions, including the type of spent catalysts described in Basel waste code B1120. The Amber List includes wastes presenting sufficient risk to justify their control, and for which prior notification is required to authorities in all countries concerned: export; transit; and import.

Transboundary movement of Amber Listed waste is subject to two control procedures. First, a prior notification procedure, which requires that the transboundary movement can take place only upon "prior written notification to the competent authorities of countries of export, import and transit (if any) and upon tacit or written consent from these authorities to the notified movement of waste."[17] Second, a tracking procedure, which requires that, "each shipment of waste shall be accompanied by a movement document from the point at which the transboundary movement begins to the point of recovery."

Resid Catalyst is listed on both the OECD green and amber lists depending on the nature of the risk presented to human health and the environment. A green list spent catalyst must be treated as amber list if contaminated with other materials which increase the risks sufficiently to meet the criteria for the amber list, or which prevent recovery in an environmentally sound manner. Since Resid Catalyst can be on either the green or amber list, some recyclers are tempted to classify and ship their Resid Catalyst as green list without actually determining the risks. Usually, however, Resid Catalyst is contaminated with other materials that increase the risks, and warrant an amber list designation. Adding to the classification problem is the fact that OECD member countries may classify wastes differently from the OECD lists if required by their national legislation or according to their national testing procedures.

Refiners should be cautious that any Resid Catalyst recycler is classifying Resid Catalyst appropriately under both the Basel Convention and the OECD Decision, as the applicable national laws may implement obligations under either or both of these conventions. In our experience, most often Resid Catalyst falls appropriately on the amber list.

Tariff Classification of Spent Resid Catalyst and Roasted Resid Catalyst

Both U.S. and international guidance on tariff classification make clear that imports of spent, supported refinery Resid Catalyst, of the type that is used for the extraction of metals contained therein, are appropriately classified under the tariff heading that specifically covers "Slag, ash and residues (other than from the manufacture of iron or steel), containing arsenic, metals or their compounds, heading 2620."[18] Typical elemental

analysis of Resid Catalyst indicates that aluminum is the metal which represents the highest proportion of the imported article's dry weight. On that basis, classification is appropriate under the tariff subheading for material "containing mainly aluminum," subheading 2620.40.

Our research indicates that roasting the Resid Catalyst does not result in a change in the applicable tariff classification. Some processors have shipped Roasted or Desorbed Resid Catalyst as a "vanadium concentrate", but these materials do not meet the definition of a "vanadium concentrate". For example, tariff heading 2615 covers "Niobium (columbium), tantalum, vanadium or zirconium ores and concentrates" and the word "concentrate" has a specific and narrow definition in the context of a tariff classification analysis. Accordingly, refineries should be wary of any Resid Catalyst processor exporting roasted Resid Catalyst as any form of metal concentrate.

Transportation Requirements under U.S. Law: DOT Hazardous Materials Regulations

The stated purpose of the US Statute governing transportation of hazardous materials is to "protect against the risks to life, property, and the environment that are inherent in the transportation of hazardous material in intrastate, interstate, and foreign commerce."[19] This statute assigns the Secretary of Transportation the authority to designate material or a group or class of material as hazardous based upon a determination that transporting such material "in commerce in a particular amount and form may pose an unreasonable risk to health and safety or property," as well as to prescribe regulations regarding the safe transportation of such materials.

The Hazardous Materials Regulations[20] (the "HMR"), address subjects including hazardous materials classification, hazard communication, packaging requirements, training and security, and registration. The HMR apply broadly to persons who transport or cause hazardous materials to be transported in commerce, as well as persons involved in manufacturing or maintaining packaging for use in such transportation. Hazardous materials identified as hazardous wastes and substances by the U.S. EPA are regulated by the HMR.

The HMR are incorporated by reference in Part 263 of the EPA's RCRA regulations, Standards Applicable to Transporters of Hazardous Waste (which addresses transportation within the United States),[21] and the packaging, labeling and marking requirements under the HMR are incorporated in certain sections of Part 262 of RCRA regulations, which sets out Standards Applicable to Generators of Hazardous Waste. Thus for parties transporting Resid Catalyst or heat-treated Resid Catalyst into, within, and/or out of the United States, the HMR is yet another layer of regulatory compliance that must be considered carefully.

IMO Dangerous Goods Declaration

The Dangerous Goods Declaration requires the shipper to declare that it has accurately described the goods it ships, and that it has classified, packaged, marked and labeled/placarded the goods correctly pursuant to applicable international and national requirements. Resid Catalyst should be identified accurately and as a waste, most often a hazardous waste, when shipped. Refineries should "be on the lookout" for Resid Catalyst processors shipping Resid Catalyst as a concentrate, product, or other inaccurate designation.

As the exporter of roasted Resid Catalyst, AMG has been required to complete a Dangerous Goods Declaration. Specifically, the nickel and vanadium compounds are key components in Resid Catalyst that lead to its classification as a Dangerous Material and triggers the requirement for a Dangerous Goods Declaration. Dangerous Goods Declarations provide critical information

on a material's characteristics in a uniform and consistent format. This is a document required under the International Maritime Dangerous Goods Code ("IMDG Code"), which governs shipments of hazardous materials by water, and which is maintained by the International Maritime Organization ("IMO"), an agency of the United Nations.

B. Occupational Health and Safety

Spent Resid Catalyst processors should follow these key Life-Saving Rules to form the foundation of their Safety Program:

- Always work with a valid permit when required
- Gas tests should be conducted when required to ensure safe levels of vapors

- Verify isolation before work begins and use the specified life protecting equipment
- Obtain authorization before overriding or disabling safety critical equipment
- Do not walk under a suspended load
- Do not smoke outside designated smoking areas
- No alcohol or drugs while working or driving
- While driving, do not use your phone, do not exceed speed limits and always wear your seat belt

These safety concepts are included in the laws and regulations relating to the Occupational Health and Safety Act as administered by the U.S. Occupational Health and Safety Administration ("OSHA"). AMG is required to comply, but recognizes that these are minimum standards and often administers enhanced safety measures as enforced through our rules, policies, practice, and procedures. We strictly adhere to the rules and regulations administered by OSHA, including but not limited to, the provisions on reporting of incidents required by law, recording and maintaining records concerning recordable events, conducting investigations of workplace injuries, and maintaining reports of safety issues and administering corrective action where required or appropriate.

We have observed the unfortunate trend in the industry for minimally processed Resid Catalyst to be sent to second and third world countries that lack appropriate health and safety standards. In these countries we have observed severe safety hazards such as unguarded equipment (rotating equipment, pinch points, crush hazards), unguarded pits & other fall hazards, exposed electrical hazards, and lack of adequate PPE. We have observed personnel working in very poor ergonomic situations (e.g. manually crushing rocks with a hammer on hands and knees), which could lead to long term impacts to the employees' health.

Specific implemented controls are required to manage safety risks including, without limitation, the following:

- **Respirator Protection and training of employees** – Employees use protection and are trained for situations where they are exposed to certain vapors and particulates.
- **Working at Heights** – Employees use fall protection gear and are trained how to use fall protection equipment.

- **Use of Personal Protective Equipment (PPE) and training** – Examples of PPE used in AMG's facilities include eye protection, face protection, protective footwear, headwear, hearing protection, and skin protection.
- **Hot Work** – Employees who work in a flammable environment are trained and safety procedures have been established to reduce the risk of hazards to them.
- **Confined Work Space** – Employees are trained to comply with OSHA's confined space standards relating to situations where employees may be exposed to confinement or entrapment hazards.
- **Lifting and Hoisting** – Periodic internal and external inspections are conducted to comply with OSHA standards. Routine maintenance is conducted to address damage that naturally or inevitably occurs from use overtime. Training of employees is administered to ensure safe lifting and hoisting procedures are followed.
- **Energy Isolation – Lock-Out Tag-Out (LOTO)** – Policies and procedures are created and maintained, equipment is inspected and monitored on a periodic basis to ensure LOTO mechanisms are operating properly, employees receive periodic training and testing to assure compliance with the policies and procedures. Records are maintained concerning inspections, monitoring, and training on LOTO.
- **Proper guarding of machinery** – Policies and procedures are prepared and employees are trained to ensure that equipment is properly guarded and guards are not removed without the equipment being de-energized and lock-out/tag-out procedures followed.
- **Noise Exposure** – Noise levels are monitored and employees use PPE to reduce risks of noise related injury.
- **Chemical Hazard and Safety Program** – OSHA's hazardous communication standard is prepared and complied with. This includes worker education and training, labeling, documentation, monitoring, and recordkeeping.
- **Powered Industrial Trucks (e.g., forklifts)** – Operators are educated, trained, and tested to ensure competent and safe operation of the machinery. Powered trucks are inspected and maintained to ensure they remain in good repair, are not defective or otherwise unsafe. AMG conducts daily inspections of its powered industrial trucks to ensure that a condition does not exist that would adversely affect the safety of the vehicle.
- **Reporting** – Policies and procedures are in place to promote reporting by employees of any perceived safety concerns. Employees are trained periodically on the protocol for reporting suspected safety concerns.

V. A COMPARISON TO THE CANADIAN STANDARDS

While AMG's principle place of business is in the U.S., its role as The Industry Benchmark has attracted refinery partners in Canada for Resid Catalyst recycling and metals reclamation. This section shares our knowledge of the Canadian standards for our customers' benefit.

Hazardous Waste and Hazardous Recyclables in Alberta

In Alberta, the Waste Control Regulation[22] ("WCR") regulates the identification, handling, and storage requirements of hazardous wastes and hazardous recyclables for facility approvals and operations. Pursuant to this regulation, waste or recyclables are hazardous if, when tested in accordance with the methods set out in the Alberta User Guide for Waste Managers, 1996, it meets stated criteria on ignitibility, toxicity, acidity, the presence of polychlorinated biphenyls, or leachability.

The Alberta User Guide for Waste Managers, 1996, also identifies certain specific waste types, commercial products or off-specification products that are considered hazardous in Alberta, as well as certain types of waste that are specifically excluded. It is the responsibility of the person who generates hazardous waste or hazardous recyclables to characterize and classify the waste prior to consigning it for transportation.

An approval from Alberta Environment and Parks, issued by one of its Directors, is required for the construction, operation or reclamation of a fixed facility for processing more than 10 tonnes per month of hazardous recyclables. The approval would specify the maximum quantities of materials that can be stored at the facility.

Storage Requirements

In Alberta, storage of hazardous waste and hazardous recyclables in containers or tanks must comply with the WCR, and the Alberta Hazardous Waste Storage Guidelines, 1988.[23] The WCR requires that a person who stores hazardous recyclables store it in an amount and in a manner so that it does not cause an adverse effect and any leaks are contained in the facility. The facility and the recyclables must be properly labeled, identified, and separately stored if they are incompatible. Finally, routine inspections of the recyclables and the facility are required.

Any waste generated at the facility must be identified, characterized and classified in accordance with the Industrial Waste Identification and Management Options, 1996[24] and the Alberta User Guide for Waste Managers, 1996, and compiled in an Annual Waste Management Summary Report.

Transportation Requirements

In addition to the personal identification number required in Alberta under the Environmental Protection and Enhancement Act, for any person who accepts hazardous waste for transportation, treatment or disposal, any shipment of hazardous recyclables must be accompanied by a recycle docket.[25]

Financial Security Requirements

Similar to the U.S., the WCR requires that financial security be provided prior to granting an approval for a hazardous recyclable facility. Such security must be sufficient to ensure completion of conservation and reclamation activities, based on (a) the estimated costs of conservation and reclamation submitted by the applicant; (b) the nature, complexity and extent of the facility's operations; (c) the probable difficulty of conservation and reclamation, giving consideration to such factors as topography, soils, geology, hydrology and revegetation; and (d) any other factors the director considers to be relevant.

Groundwater

The approval holder for a hazardous waste and hazardous recyclable facility is required to develop a proposal for a Groundwater Monitoring Program for the facility. This proposal would likely need to include a description of the facility with a map of its surface water drainage patterns, its bedrock materials, and any current or historical potential sources of groundwater contamination. The monitoring program would also need to include information regarding the proposed monitoring wells. This includes, among other things, the well locations, depths and monitoring protocols. The holder must compile and submit an Annual Groundwater Monitoring Report in the years following the issuance of the approval.

Stormwater

An approval holder is required to collect and dispose of industrial wastewater and runoff in accordance with local bylaws. In addition, it will be required to prepare and submit an Annual Industrial Wastewater and Industrial Runoff Report compiling prescribed information, namely: an assessment of the operation and performance of the industrial wastewater control system and the industrial runoff control system, an overview of the operation of the facility, and a summary and evaluation of management and disposal of the industrial wastewater and industrial runoff for the previous year.

Transboundary Movement of Hazardous Waste and Hazardous Recyclable Material in Canada

Canada implemented its international obligations under the Basel Convention, the OECD Decision and the Canada-US Agreement through the promulgation of the Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations[26] ("EIHWHRM") under the Canadian Environmental Protection Act, 1999[27] ("CEPA"). The EIHWHRM set out the conditions for the environmentally sound management of the export, import and transit of hazardous waste and hazardous recyclable material across Canadian borders. The EIHWHRM set out the responsibilities of exporters, importers, carriers, disposal and recycling facilities, including:

- **Notification Requirements** – Any individual or corporation proposing to export, import, or convey hazardous waste or hazardous recyclable material must notify ECCC of the proposed shipment and obtain a permit before the movement can take place. The notification serves as the application for a permit and must be submitted within 12 months before the export, import, or transit.

- **Permit Requirement** – Once the notification requirements under the EIHWHRM have been met, ECCC will notify the authorities in the jurisdiction of destination, and, if applicable, it will also notify the competent authorities of transit countries. If all of the authorities consent to the shipment and all of the permitting criteria have been met, ECCC will issue the requested permit. Permits are usually valid for up to one year, and the export, import, or transit of the hazardous waste or hazardous recyclable material must take place within the period of time specified within the permit. The permit will also prescribe a total quantity of the waste or recyclable material that will be shipped within the time period covered by the permit
- **Time Limits** – The EIHWHRM set out specific time limits for any interim operations that may take place prior to final disposal or recycling of the hazardous waste or hazardous recyclable material, after which time the waste or recyclable material must undergo final disposal or recycling. The EIHWHRM also prescribe time limits within which the authorized facility performing final disposal or recycling operations must complete those operations.
- **Conditions for Exports** – The EIHWHRM set out the conditions for the export of hazardous waste and hazardous recyclable material, including to where the waste or recyclable material may be exported, what material may be exported, the conditions a person must meet in order to fall within the definition of an exporter, requirements for export permits, and requirements for the completion of movement documents for the Canadian exporter and the foreign receiver;
- **Contracts** – The EIHWHRM require the existence of a written contract or series of contracts for import and export of hazardous waste or hazardous recyclable material. The EIHWHRM set out specific information that is required to be included in the contracts, such as provisions requiring completion of particular sections of the movement document, provisions requiring the exchange of copies of the movement document, and provisions requiring the completion of the disposal of the hazardous waste or recycling of the hazardous recyclable material within the time limitations set out in the EIHWHRM.
- **Insurance** – All Canadian exporters, Canadian importers, authorized carriers of hazardous waste and hazardous recyclable material, and authorized carriers involved in international shipments of hazardous waste in which Canada is involved must be covered by liability insurance. Insurance must cover (a) any damage to third parties for which the exporter, importer, or authorized carrier is responsible, and (b) any costs imposed by law on the exporter, importer, or authorized carrier to clean up the environment in respect of any hazardous waste or hazardous recyclable material that is released. The EIHWHRM also specify the amount of liability insurance required for exports or imports of hazardous waste and hazardous recyclable material and the time period for insurance coverage for imports, exports, and transits of hazardous waste and hazardous recyclable material.

VI. AUDITING

A robust, layered auditing and inspection program is an important mechanism for ensuring that a Resid Catalyst processor is doing what is necessary to protect employee safety and the environment all day, every day. Daily audits performed by the processor helps to find and address issues early, generally while damage can be readily corrected. Our facility has been audited by every major oil refiner operating in North America and is frequently inspected by the U.S. EPA and Ohio EPA. Third party inspections, both regulator and refinery, of every processor handling the Resid Catalyst and its derivatives, are crucial to refinery risk management. We here share our knowledge of refinery, internal, and regulatory audits and inspections.

Refinery Audit Programs

Refineries audit the processor prior to an initial contract and typically every 3-5 years thereafter. Key components of such an audit include:

- **General Facility Information** – including a description of the property description and ownership, facility units and services provided, management/management systems, and facility appearance.
- **Waste Handling Operations** – including waste services provided, waste description and transport, customer information, and waste acceptance and analysis procedure.
- **Facility Design** – including (as applicable) general facility design, storage, and transfer information container/drum operations, storage tank operations, waste stockpiles, stormwater management, wastewater management, recycling/treatment, landfill operations, waste surface impoundments, incinerators/thermal treatment/cement kilns, drum reconditioning, land farming, injection wells.
- **Regulatory Compliance** – including regulatory status and permitting, inspections/audits, deficiencies/violations, remedial actions and releases, health / safety / training, and emergency protocols.
- **Environmental Evaluation** – including location, geology, and hydrology.
- **Community Relations** – state and local.
- **Facility Security** – all aspects.
- **Financial Strength** including financial status and other financial liabilities.
- **Financial Assurance / Insurance** including financial assurance for closure and post closure, insurance coverage.

Such audits are completed in multiple phases to include documents to be prepared by processor, documents to be provided by processor (permits, etc.), an on-site facility audit and, if necessary, interviews by the auditor of regulatory agencies, facility neighbors, and other interested parties.

AMG Audits

Our air, hazardous waste, and stormwater permits each contain requirements for routine monitoring, the results of which are reviewed by the regulatory agencies. Issues are expected to be identified, documented, reported, and corrected with documentation of corrective actions. Matters of permit non-compliance are required to be disclosed to the reviewing regulatory agency. Quarterly third-party safety audits are performed to confirm OSHA compliance.

We maintain a robust auditing program for environmental and safety systems in accordance with our ISO 14001 and 45001 certifications. Incident investigations to determine root cause and corrective action are integral to the company's continuous improvement program.

Regulatory Inspections

Ohio EPA performs regular inspections of our facility in accordance with the issued air, hazardous waste, and stormwater permits. Each division performs inspections of our facility and includes a review of records, facility permits, and site compliance inspections. Additionally, we are required to submit reports to the various EPA divisions on monthly, quarterly, semi-annual, and annual bases.

We perform a quarterly internal refinery contract compliance audit to ensure that terms of the contract are being met by all AMG stakeholders.

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[1] Metals recovered from Resid Catalyst that can be resold include vanadium, nickel, and molybdenum.

[2] Hazardous Waste Management System; Identification and Listing of Hazardous Waste; Petroleum Refining Process Wastes; Land Disposal Restrictions for Newly Identified Wastes 63 Fed. Reg. 42110 (August 6, 1998) [hereinafter Petroleum Refining Process Wastes].

[3] Definition of Solid Waste, 80 Fed. Reg. 1694, 1738 (January 13, 2015).

[4] U.S. Environmental Protection Agency, Petroleum Refining Listing Determination Proposed Rule, Response to Comments Document, Part IV, p. X-4 (1998) (emphasis added), *available* at https://nepis.epa.gov.

[5] While the EPA recognizes that spent petroleum Resid Catalysts can be a valuable source of recoverable metals, "*the risk of these hazardous secondary materials spontaneously igniting when in contact with air is not a property that most metal recyclers would be expected to address, and thus, present additional risks that are not presented by other types of metal-bearing hazardous secondary materials and therefore may be most appropriately managed as hazardous waste when recycled.*"[5] Ultimately, the EPA's decision to list K171 and K172 "is based on the risks they pose, and how [the] listing may ultimately affect competing treatment technologies is not a central issue in the Agency's decision." *See* Id. at 42158.

[6] Petroleum Refining Process Wastes, 63 Fed. Reg. 42110, 42157 (August 6, 1998).

[7] 42 U.S.C. § 7401 *et seq.*

[8] *See* 40 C.F.R. § 261.32.

[9] U.S. Environmental Protection Agency, Introduction to United States Environmental Protection Agency at p. 2 (2005), *available at* https://www.epa.gov/sites/production/files/2015-07/documents/con-bld05_0.pdf.

[10] U.S. Environmental Protection Agency, Comprehensive Environmental Response, Compensation, and Liability Act, *available at* https://www.epa.gov/enforcement/comprehensive-environmental-response-compensation-and-liability-act-cercla-and-federal.

[11] *See*, generally, Clean Water Act, 33 U.S.C. 1251 et seq. (CWA); Ohio Rev. Code Ch. 6111 (RC Ch. 6111).

[12] U.S. Environmental Protection Agency, 2017 Major Cases, *available* at https://www.epa.gov/enforcement/2017-major-criminal-cases

[13] *See* Eric Whitney, Dreams of new industry go up in smoke, High Country News (09/14/1998) *available at* https://www.hcn.org/issues/138/4448

[14] Id. (State regulators described Dakota's incineration process as being so fluid that "if you test it today, what they're doing a week from now may not be same" and questioned the state's inability to test the smokestack more than once in four years.")

[15] *See* Whitney, supra note 13.

[16] Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, Basel.int. *available* at http://www.basel.int/, (*last accessed* September 26, 2019) (Hereinafter "Basel Convention").

[17] OECD Decision § II(D), adopted 03/29/1992, *available at* https://legalinstruments.oecd.org/en/instruments/OECD-LEGAL-0266

[18] Harmonized Tariff Schedule of the United States Chapter 26, *available at* https://hts.usitc.gov/current, (*last accessed* October 24, 2019).

[19] 49 U.S.C. §1501.

[20] 49 C.F.R. § 171-180.

[21] *See* 40 C.F.R. §263.10(a) and accompanying note.

[22] *Waste Control Regulation*, Alberta Regulation 192/1996, s.18(1).

[23] Alberta Environmental Protection Services, Hazardous Waste Storage Guidelines, (June, 1988) *available at* https://open.alberta.ca/dataset/6996d1fa-2536-46df-96ab-31ae61e542a7/resource/70c67648-f292-4176-9fa2-831ad083ca37/download/1988-hazardouswastestorageguide.pdf

[24] Alberta Environmental Protection Services, Industrial Waste Identification and Management Options, (October 1996) *available at* https://open.alberta.ca/dataset/e5bcfb8f-454a-4e91-9ef7-b5c44b815f23/resource/bb45f6c4-e746-4d06-9a18-fd2c386d535b/download/1996-industrialwasteidentificationmanagement.pdf

[25] Alberta Environmental Protection and Enhancement Act §169.

[26] Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations, SOR/2005-149.

[27] Canadian Environmental Protection Act, 1999, S.C. 1999, c. 33.

KEY QUESTIONS TO ASK WHEN SELECTING OR AUDITING A RESID CATALYST RECYCLER

Many refineries have asked about AMG's process, meeting The Industry Benchmark, and how to educate their personnel on selecting a Catalyst recycler that will protect the liabilities and reputation of the refinery. Accordingly, we offer this checklist to aid refinery personnel engaged in selecting or auditing a Catalyst recycling vendor. These questions provide a starting point for a robust processor evaluation, with an aim at protecting the oil refiner, human health, and the environment.

Catalyst Processor Evaluation Criteria	
Process Overview	
Does the processor hold a permit to handle Spent Resid Catalyst? What is the maximum quantity of Spent Catalyst that can be stored?	
Is metals reclamation achieved through pyrometallurgical or hydrometallurgical processing?	
Does the processor partially process Catalyst and then transport to another facility[1] for metals reclamation, or does processor fully reclaim spent catalyst on-site[2]?	

Catalyst Processor Evaluation Criteria	[1] Intermediate Processor			[1] Metals Reclaimer			[2] One-Stop Full Metals Reclaimer		
	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A
Storage of Raw Spent Catalyst									
Is Catalyst or Intermediate produce stored in containers, tanks, containment buildings, drip pads, waste piles, or surface impoundments to fully contain the material?									
Is oil that expresses from the Catalyst collected from the primary containment?									

Catalyst Processor Evaluation Criteria	[1]Intermediate Processor			[1] Metals Reclaimer			[2] One-Stop Full Metals Reclaimer		
	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A
Does Catalyst storage have secondary containment with leak detection?									
Are procedures in place to prevent tracking of Catalyst and oil from storage?									
Are protocols in place to prevent unauthorized entry into the processing area?									
Is the Catalyst stored to ensure proper segregation from incompatible materials to minimize risk of fire?									
Intermediate and End Product Characteristics after Processing									
Does the process remove reactive sulfides to fully mitigate self-heating risk?									
Does the product contain leachable arsenic, antimony, nickel or vanadium?									
Does the process remove Polycyclic Aromatic Hydrocarbons (PAHs)?									
Does treated material meet Land Disposal Requirements?									
Landfilling Waste									
Are any wastes from the process going to landfill?									
Will the landfill properly handle the wastes to minimize potential future liability?									
Is there adequate financial assurance for remediation?									
Will the processor provide a Certificate of Destruction that certifies the final disposition of all material?									
Is the processor properly defining and documenting destruction?									
Pollution Control Equipment, Procedures and Permitting									
In the permit application, has the facility provided a full process flow diagram that identifies all emission units?									
Does the process flow identify and quantify emissions from all emission units and fugitive emissions?									
Do the quantities of products, wastes and emissions identified in the process flow account for all of the Catalyst and other raw materials?									

Catalyst Processor Evaluation Criteria	[1] Intermediate Processor			[1] Metals Reclaimer			[2] One-Stop Full Metals Reclaimer		
	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A
Hazardous Waste									
Does the processor employ sufficient practices to prevent the migration of pollutants into stormwater (including from fugitive emission sources, storage piles, etc.)?									
Does the facility have a Spill Prevention, Control and Countermeasures (SPCC) Plan or equivalent to prevent water pollution as a result of oil spills?									
Do the reporting and record-keeping requirements ensure compliance?									
Are regulatory inspections or audit requirements prescribed in the permits or regulations?									
Stormwater Emissions									
Has the facility been issued a permit that establishes emission limits in stormwater for each relevant element of toxicity?									
Do permits include limits for each pollutant and monitoring (e.g monthly sampling of stormwater) protocols?									
Is facility stormwater controlled to enable regular monitoring of pollutants?									
Does the facility have a plan to prevent Storm Water (surface water) Pollution?									
Does the facility Storm Water Pollution Prevention Plan address erosion control, corrective actions, inspections, recordkeeping?									
Do the reporting and record-keeping requirements ensure compliance?									
Are regulatory inspections or audit requirements prescribed in the permits or regulations?									

Catalyst Processor Evaluation Criteria	[1] Intermediate Processor			[1] Metals Reclaimer			[2] One-Stop Full Metals Reclaimer		
	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A
Process Wastewater									
Does the process generate wastewater that is other than clean, non-contact wastewater?									
Does the facility have on-site wastewater treatment that eliminates pollutants prior to discharge?									
Is the facility permitted to treat and discharge process wastewater?									
Air Emissions									
Has the facility been issued a permit for air pollutant emissions?									
Does Air permit include limits for each pollutant?									
Are emission estimates based on the "worst case" full potential to emit?									
Does the Air permit prescribe compliance monitoring protocols (continuous monitoring / parametric monitoring / stack testing / observations for visible emissions)?									
Is the proposed Air pollutant emission control technology "Best Available Technology" or "Best Available Technology"?									
Do the reporting and record-keeping requirements ensure compliance?									
Are regulatory inspections or audit requirements prescribed in the permits or regulations?									
Financial Assurance									
Has the processor provided adequate protection from future liability?									
Has potential future financial liability from facility closure or incident been adequately addressed by the refinery for your choice?									
Does the financial assurance posted by the processor adequately cover all costs of closure of the processing facility?									
Does the processor have the financial capacity to remain viable in low market values?									
Is the processor's investment adequate to discourage it from exiting the business, abandoning the facility and material?									

Catalyst Processor Evaluation Criteria	[1] Intermediate Processor			[1] Metals Reclaimer			[2] One-Stop Full Metals Reclaimer		
	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A
Identification, Labeling and Packaging									
Is the Catalyst and / or any resultant materials after processing appropriately packaged to protect from risks of self-heating, metal leachability and other concerns?									
Is the Catalyst and / or any resultant materials after processing appropriately classified and labeled to acknowledge risks from self-heating, metal leachability and other concerns?									
Has the material been appropriately (and conservatively, in case of doubt) identified as hazardous or non-hazardous for the purposes of Basel Convention and / or OECD									
Has the Catalyst been appropriately and conservatively identified as Catalyst (not an ore or Metal Concentrate) for the purposes of Customs Tariff Classification									
Has the material been appropriately (and conservatively, in case of doubt) identified as hazardous or non-hazardous for the purposes of Transportation Regulations									
Has the material been appropriately (and conservatively, in case of doubt) identified as hazardous or non-hazardous on the International Maritime Dangerous Goods Declaration									
Can the processor supply an import consent document issued by the EPA, or the importing country identifying the Catalyst as hazardous waste or hazardous recyclables?									
Is the processor exporting thermally processed Catalyst properly labeled as Catalyst?									
Is the processor making the appropriate notices and disclosure regarding The Toxic Substances and Control Act or its equivalent?									

Catalyst Processor Evaluation Criteria	[1] Intermediate Processor			[1] Metals Reclaimer			[2] One-Stop Full Metals Reclaimer		
	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A
Safety									
Does the processor fully address the key aspects of employee safety, including policies, practices, training and auditing?									
Does the processor provide adequate Personal Protective Equipment for employees such as eye, foot and hand protection (including for thermal and chemical exposure)?									
Does the processor enforce Life-Saving Rules?									
* Work with a valid work permit when required									
* Conduct gas tests when required									
* Verify isolation before work begins and use the specified life protecting equipment									
* Obtain authorization before entering a confined space									
* Obtain authorization before overriding or disabling safety critical equipment									
* Protect yourself against a fall when working at height									
* Do not walk under a suspended load									
* Do not smoke outside designated smoking area									
* No alcohol or drugs while working or driving									
Auditing and Inspections									
Has an adequate internal auditing program been established by the processor to support environmental excellence and employee safety programs?									
Do the regulatory agencies issuing operating permits to each of the facilities perform inspections frequently enough to ensure compliance with permit requirements?									
Does the processor have HSSE Management Systems, Procedures and record keeping implemented to meet the requirements of the contracts?									
Does the processor hold current registrations for ISO 14001 (environmental) and OHSAS 18001 or ISO 45001 (safety)									


AMG