Remtech Engineer's News Flash

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Emergency Response & Site Remediation Specialists

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Remtech is committed to providing quality and cost-effective emergency response, environmental assessment and turnkey cleanup services. Remtech's goal is to minimize environmental damage and claims by applying innovative engineering technologies to preserve the world's resources for future generations. Remtech publishes this newsletter on a periodic basis to keep clients and friends informed. For current information on Remtech's turnkey site remediation products and services visit our website at www.remtech-eng.com.

Best Wishes to You and Yours this Holiday Season!

Contents

What's New?

New Equipment Additions

Norfolk Southern's (NS) Whistle-Stop Tour stopped in five south-eastern cities in 5 days (October 7 through 11, 2003). As part of Transcare, NS Whistle-Stop Tour offered training, demonstrations, and presentations to local emergency response groups emphasizing risk management practices on rail and intermodal incidents. Remtech participated in the Forsyth and Augusta, Georgia stops by demonstrating its new MicroCell Foam Patching Technology and Major Incident Emergency Response Unit (equipped with pressurized and non-pressurized rail and intermodal hazmat capping kits, monitoring, decon, and PPE for industrial and WMD incidents. (See Feature Article on page 2).

Remtech's Major Incident Response Unit

HC-2000 Developments

Gasoline Bio-Fence Cleanup - HC-2000 is a native bioremediation accelerator developed by Remtech Engineers. Remtech recently received State DNR approval for the completion of a HC-2000 enhanced bioremediation project for a gasoline tanker roll over in a marsh area in southern Georgia. Three biofence reactors consisting of 30 enzyme injection points and an automated watering system were installed at the one acre site. This project was completed in sixteen (16) weeks with average site soil Gasoline Recoverable Organic concentrations reduced 98.7% and average groundwater benzene concentrations reduced by over 84%.

HC-2000 Bio-Fence System in Marsh

HC-2000 Bioremediation in New York - Remtech manufactured a mobile bioremediation trailer for a major beverage distribution company to deliver its proprietary bioremediation accelerator HC-2000. This system is equipped with telemetry reporting and remote control. Groundwater contaminated with gasoline is located under an 8,000 square foot building and asphalt parking lot. Remtech installed five air/enzyme injection wells and five vapor extraction wells to enhance treatment under the building and parking lot. Site geology consists of sandy CLAY and glacial till with a shallow groundwater (3 feet BLS). After one month of system operation, analyte concentrations were reduced: benzene - 82%, ethylbenzene - 86%, toluene - 54%, 1,2,4-trimethylbenzene - 55%, 1,3,5-Trimethylenzene 39%, and total xylenes - 27%. System operation will continue until State regulatory limits are met.

Mobile HC-2000 System Operating in New York

Recent Projects Completed

Mold Assessments, Remediation, & Expert Witness

Remtech completed a mold assessment of a two story 22,000 squarefoot research facility for a major chemical company. The building had been closed for approximately seven years. Storm and wastewater entered the building through floor drains, porous cinder block walls, and roof leaks. Mold damage was documented on walls, inside wall cavities, wood studs, behind wall paper, behind paneling, and floor tile. Estimates for mold remediation exceeded the value of the building. Controlled building demolition was recommended.

Mold Growth Behind R & D Facility Paneling

Extensive mold damage in the restroom and laundry room of a parsonage required removal of carpeting, wood subfloor, drywall, insulation, and vinyl flooring. Mold damage was caused by a ruptured PVC water line. A plastic airlock was setup with HEPA negative air filtration to contain mold spores during remedial activities with Level C PPE.

Mark Ryckman served as expert witness in a case involving sewage backup and mold growth in an apartment complex. Occupants had developed pneumonia other respiratory ailments. Partial removal of building carpet padding by another contractor was deemed inappropriate as sanitary wastes contacting porous surfaces including drywall, wood studs, insulation, and carpeting require complete removal and replacement according to generally accepted good environmental engineering health practices for “dirty” water.

Mold Abatement Inside Airlock

Sulfuric Acid Emergency Transfer & Cleanup Operations

Remtech was engaged by a major railroad intermodal facility to transfer 1,200 gallons of concentrated sulfuric acid (93.2%). Two trailers were stacked vertically on an articulating well intermodal rail flatcar. Four (4) composite poly totes failed in the top trailer with wire cages breaking at welds. Wire cage elements punctured totes releasing product. Acid from the top trailer leaked onto the bottom trailer damaging the shell and finish. Pavement and trailers were neutralized with a soda ash solution. Forensic evidence (documented by Remtech) demonstrated that the release was caused by defective containers that failed under a loadshift with improper loading and bracing. The intermodal rail company was able to transfer liability to the truck carrier who intern transferred environmental cleanup costs to the shipper.

Transfer of 1,200 gallons of Sulfuric Acid

Emergency Ethylene Glycol and Sulfuric Acid Cleanup

Feed pump lines ruptured to a sterilization system at a medical supply manufacturing facility. Five hundred gallons of ethylene glycol and sulfuric acid were released on a 15,000 square foot warehouse floor and spread under palletized medical supplies and into heated sterilization rooms. Vacuum pumps were used to collect bulk contaminates. Pressure washering and vacuum extraction were used to collect residual waste for disposal at a wastewater pre-treatment facility.

Glycol/Sulfuric Acid Cleanup

Feature Article

Remtech’s MicroCell Foam Leak Patching Technology

INTRODUCTION

Remtech showcased it’s new proprietary MicroCell Foam (MCF) leak patching technology at Norfolk Southern’s Whistle Stop Tour. This technology is designed to stop leaks of liquids and solids in non-pressurized rail cars,

intermodal containers, truck tankers, storage tanks, totes, and pipelines. Remtech developed this system to provide enhanced leak control over conventional patching systems.

SYSTEM DESIGN

MicroCell Foam Properties

MicroCell polyethylene foam is compressible and conforms to irregular surfaces and punctures. Polyethylene has excellent short term chemical compatibility with a variety of chemicals. As a gasketing material, MicroCell foam resists liquid transmission and has a compressive and shear strength that is well above hydrostatic pressures exerted by products in most non-pressurized containers. In aggressive material compatibility environments, Santoprene, Teflon, Viton, Neoprene, or Butyl facings can be laminated on a MicroCell backing. This foam can be used directly as a Damage Control Plug (DC) or as a patch held in place by one of the anchoring systems described below.

Anchoring Systems

Remtech's MicroCell Foam patches can be held in place by magnetic feet (pods) in a tripod, bridge, or strap configuration. The patch is seated over the leak and a compression clamp holds the patch in place. Magnetic elements (1,200 pounds of magnetic pull per pod) are mounted on a flexible HDPE back that permits elements to contact flat or curved surfaces with diameters as small as 30 inches.

Straps may be placed around a container circumference (as a tourniquet) and tension applied with ratchets. Nylon straps are rated at 5,000 psi. Vertical pressure is exerted against the patch by placing a spacer between the patch and strap. Straps may also be attached to catwalks, ladders, or other container appurtenances. Remtech recently stopped a leak of granular sodium polyphosphate from a hopper rail car. The MicroCell gasket was anchored with a dual strap/ratchet system as illustrated on page 4.

Cans ranging in diameter from 4 to 19 inches may be placed over leaking container outlet valves or flanges. A Microcell gasket placed between the lip of the can is held in place by nylon straps. Drain valves are installed on each can.

PERFORMANCE TESTING

Chemical Compatibility

MicroCell Foam Chemical Compatibility - closed cell polyethylene foam offers good short term compatibility with a host of acids, bases, solvents, and other chemicals. Polyethylene also holds up for short periods of time against gasoline, petroleum products, and other materials that are generally not considered for long term contact applications.

The effectiveness of a MC polyethylene foam DC plug was demonstrated by sealing a 1-inch diameter clear poly tube with a 30-inch head of gasoline applied. No gasoline migration was observed through the plug for a period exceeding 48 hours. DC plugs or gaskets may be shaped on site with a utility knife to fit a specific puncture.

MagnaPatch Tripod System Placed On Tank Car

Gasket Compression Against Container over Weld Seam

MagnaPatch Bridge Systemwith Santoprene Gasket Facing

MagnaPatch Strap System

Air Pressure Tests

A four (4) foot diameter 550-gallon steel tank was used to determine patch failure pressures over a 1.5-inch diameter tank fitting opening. Patch failures were defined when soap bubbles formed at a specific applied air pressure. Non-pressurized rail cars are generally nine (9) feet in diameter. Higher failure pressures are anticipated for containers with diameters greater than four (4) feet.

Patch Anchor	Patch Description*	Failure Pressure Air-psi, (ft of water)
Magnetic Pods		
Tripod	7-inch dia. with 1.7-inch thick MCF	26.5 psi (144)
Tripod	6 x 6-inch x 1-inch thick CCFSP	31 psi+ (72+)
Single Bridge	6 x 6-inch x 1-inch thick CCFSP	31 psi+ (72+)
Strap	6 x 6-inch x 1-inch thick CCFSP	15 psi (35)
Strap Ratchets		
4-inch Can	1.7-inch thick MCF	13 psi (30)
4-inch Can	1.7-inch thick MCF (Note - 2 ft water head also applied)	18 psi (42)
6-inch Can	0.5-inch thick SP	22 psi (51)
19-inch Can	2-inch thick CCF with 2SP	6.8 psi (16)

* MCF = MicroCell Polyethylene Foam
CCF = Closed Cell Polyethylene Foam
SP = Santoprene Gasket
2SP = Santoprene Gasket on both faces of Foam Gasket

Leaking Sodium Phosphate Hopper Car Patched

Bottom Outlet Valve Can Cover

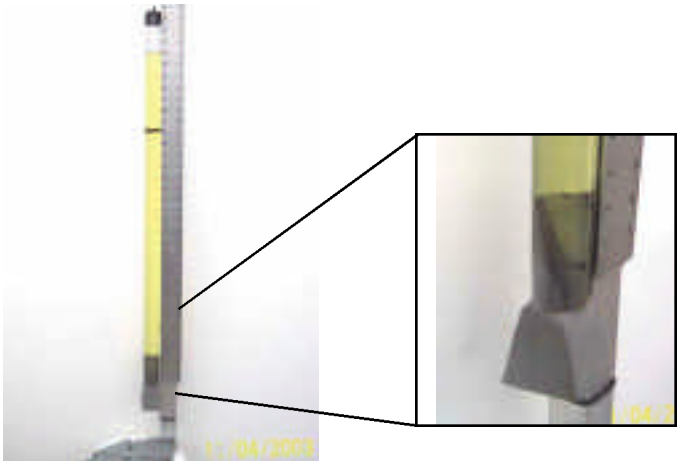
OTHER PLUGGING TECHNOLOGIES

Every patching situation is unique and requires a specific repair technique that is often controlled by what is available. Patching and plugging approaches can be broken down into three classifications - adhesive, mechanical, and overpak/capping kits. The first two classifications are used on non-pressurized vessels and capping kits may be used on pressurized containers.

Valve/Flange Containment Cans

Adhesive Patches

Epoxy quick set glues and putties generally have bonding problems under spill conditions. If contact surfaces are dry during the curing period, a good seal can be obtained. Other types of adhesive patches include metal and fiber tapes.



Gasoline Immersion Test on MCF Plug

MagnaPatch Tripod Pressure Test

Mechanical Patches

Mechanical patches generally provide the best seal. Sheet metal screws and toggle bolts with gasketed heads work well on small symmetrical punctures. Larger punctures can be sealed with mechanical or inflatable test plugs. Inflatable pillows can be used to plug sewers and isolate hazardous materials. Damage control plugs (wood, plastic, **MicroCell** foam) can be inserted in punctures to slow or stop leaks. Compressible/expandable plugs generally provide better seals. Other mechanical patches include pipe clamps, radiator clamps, lead wool, oakum, magnetic sheeting, and steel or plastic banding.

Remtech Air Cylinder Inflatable Sewer Plugs

Overpaks/Capping Kits

Leaks from pressurized vessels can be stopped with can and bridge systems such as Chlorep Kits for chlorine (small and one-ton cylinders, and 90-ton rail cars), the Midland Kit (for vinyl chloride, anhydrous ammonia, and other select chemicals), and compressed cylinder overpaks. Standard drum overpaks can not be used on pressurized containers.

Remtech Midland & Chlorep Capping Kits

SUMMARY

Remtech's **MicroCell** DC plugs or gasketing with strap or magnetic anchors frequently provide better seals when compared to other patching technologies on non-pressurized containers.

Mold Due Diligence

INTRODUCTION

Mold remediation claims (currently estimated at $12 billion/year) are projected to eclipse asbestos and Superfund claims combined. Recent scientific evidence linking mold to a myriad of health problems has increased public awareness. Insurance companies and financial institutions are scrambling to limit financial exposures by canceling or buying back insurance policies, defining mold exclusion clauses, and identifying mold problems prior to property transfers. Commercial property and home owners are encountering remediation costs well above insurance coverage limits. This article presents an introduction to due diligence inquiries to assist with evaluating and limiting potential mold exposure to individuals and institutions.

C Kit Placed on Leaking 90-Ton Chlorine Car

Wood Braces Hold Epoxy Putty Stopping Leak in 8,000 gallon Diesel Fuel Tanker

Midland Kit Placed on Vinyl Chloride Dome

MOLD HEALTH HAZARDS

Poorly constructed and tighter buildings (for energy conservation) trap moisture and increase mold growth. Molds are part of the fungus family and reproduce by spores which are the root cause of diseases. Mold spores are small (diameters ranging from 0.5 to 100 microns) and are resistant to elevated temperatures and adverse environmental conditions. Spores can be air, water, or insect-borne. Mold spores can stay dormant for years until activated by moisture, nutrients, or a host organism. Common indoor molds include: Cladosporium, Penicillium, Alternaria, Aspergillus, and Mucor. The Center for Disease Control has documented that nine (9) percent of hospital-acquired infections are caused by fungi and mold.

Extensive Wall and Flooring Mold Damage

The most common health effects of mold exposure include nasal stuffiness, eye and skin irritation, or wheezing. People who are allergic to molds may have more serious reactions including fever and shortness of breath or acute allergic reactions. Individuals with lung diseases may contract mold infections. People with suppressed immune systems (HIV or chemotherapy patients) are more susceptible to mold related diseases. Molds can also produce toxic substances known as mycotoxins. Over 200 mycotoxins have been identified from common molds. Symptoms of mycotoxins exposure in the work place are: mucous membrane irritation, skin rash, nausea, immune system suppression, acute or chronic liver damage, central nervous system damage, and cancer. Additional research needs to be performed to determine the health risk of mycotoxins in indoor environments.

Mold Attacks Wood Subfloor

ENVIRONMENTAL OCCURANCE

Molds are ubiquitous in the environment and are present indoors and outdoors year round and live in soil, plants, and on dead or decaying matter. Elevated levels of mold are found in damp and nutrient rich environments. For example, molds are found indoors in high humidity areas such as showers, damp basements, air conditioning systems, and crawl spaces. Mold growths are common after sewer backups, localized flooding, water line brakes, roof leaks, and in abandoned buildings, if water and contamination are not controlled or remediated within a 24 to 48 hour period.

Mold Growth on Wood Studs

MOLD IDENTIFICATION & HEALTH STANDARDS

There are currently no health standards for mold exposures. *The Toxic Mold Safety and Protection Act* charges regulatory agencies with the establishment of mold health standards. The Center for Disease Control recommends that musty odors, the visual presence of mold, or adverse reactions of a mold sensitive individual are triggers for mold removal and control of moisture and indoor humidity levels. Environmental sampling for mold is generally not recommended due to the lack of mold standards and the wide variation of individual mold sensitivities.

Mold in Wall Cavity from Water Line Break

CONTRACTOR QUALIFICATIONS

There is currently no approved licensing program for mold assessors or abatement contractors. Mold assessments and remediations should be conducted by experienced environmental health engineers or scientists with specific mold experience. Related existing speciality certifications include; Hazardous Waste Management engineers (The American Academy of Environmental Engineers), Certified Hazardous Materials Managers (Institute of Hazardous Materials Management), and Certified Industrial Hygienists.

ASSESSMENT GUIDELINES

Mold can occur in variety of indoor locations. Knowing where to look and how to trace moisture and water sources in a building are essential. Places where moisture can accumulate in buildings include: bathrooms, under tile, in wall cavities, insulation, drywall, wood studwork, basement floors or walls below grade, crawl spaces, under stucco facades, under coated wall paper, and in HVAC systems and ductwork. Identification of “clean” (drinking water or steam) or “dirty” water (rain, stormwater, sewage) and porosity of contacted surfaces dictates the appropriate remedial action.

Mold Growth on Joists Under Subfloor

REMEDIATION GUIDELINES

OSHA recently issued (October, 2003) a *Safety and Health Bulletin with Guidelines for Mold Remediation*. Although not mandatory, employers can be cited for violating the General Duty Clause of the Occupational Safety and Health Act which dictates that the workplace be kept free from recognized hazards. Remediation options include cleaning of impermeable construction materials and removal and replacement of porous materials. Generally, non-toxic surfactants are recommended for cleaning. Where bleach is used, care should be exercised to remove residual chlorine. A chlorine dioxide solution or gas fumigation may be used in select applications. Dead mold frequently leaves a toxic residue that should be removed by wet cleaning or HEPA vacuuming. Work zones that should be setup include: a contaminated zone, contamination reduction zone, and clean room. Work areas should be enclosed in plastic airlocks under negative pressure with HEPA air filtration. Personal protective gear should include full face respirators with radionuclide particulate cartridges, tyvek, nitrile gloves, and poly shoe coverings.

Mold Damage from Downspout Seepage

COSTS & REIMBURSEMENT

Mold assessment and abatement costs can be substantial. Typical claims range from $10,000 to $100,000 not including personal injury claims. Mold claims may be covered by the following insurance policies: Builders Risk and Property, General and Umbrella Liability, Homeowners, Contractors Pollution Liability, and Professional Liability. Interpretation of mold exclusion clauses determines coverage.

Other sources of reimbursement have been through liability claims against insurance companies, contractors, owners of buildings, or errors and omissions of building designers or professionals who fail to exercise best management practices over site and structural water infiltration sources. *The Toxic Mold Safety and Protection Act* proposes tax credits and a national toxic mold hazard insurance program to assist with defraying assessment and abatement costs.

Mold Attacks Soffit from Roof Leak

CONCLUSION

Due diligence should be exercised to avoid mold related health and financial risks to banks, insurance companies, developers, design engineers and architects, realtors, property owners, and contractors. The best protection is to ensure that your building is sited in a well drained environment and constructed of materials that limit water infiltration, leaks, or retention. Early detection and correction of building water leaks can dramatically reduce mold damage. Mold assessments conducted by competent professionals prior to property transactions and on a periodic basis can limit liabilities to homeowners and lending institutions.

Other mold risk control tips for existing buildings include: frequent inspections and preventative maintenance of roofs, foundations, water and sewage utilities; maintaining relative humidities below 50% with good ventilation and humidity controls; keeping gutters and downspouts open and ensuring that they drain away from structures; using

Block Wall Seepage Causes Mold

HEPA air filters and changing on a regular bases; minimizing dust accumulation by frequent cleaning with HEPA vacuums and wet cleaning techniques; cleaning HVAC ducts on a regular basis; inspecting air conditioning condensate pumps for leaks; providing freeze protection on water lines penetrating exterior walls; cleaning sewers and traps on a regular basis; keeping large root bearing plants away from foundations; ensuring that landscapes drain away from structures; and checking basements and crawl spaces on a regular basis for settling, cracks, and/or moisture buildup.

About the Authors

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Mark D. Ryckman is President and Founder of Remtech Engineers. He is a licensed engineer in ten (10) states and possesses specialty certifications as a Diplomat in Hazardous Waste Management and Water and Wastewater Treatment from the American Academy of Environmental Engineers. He earned undergraduate degrees in Mathematics and Civil Engineering and a Masters in Environmental Systems Engineering from Clemson University. He has served as project principal on over 2,500 envirionmental projects during the past 28 years.

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