LEAD BASED PAINT REMOVAL WITH ECOSTRIP VR-2 SYSTEM

PREPARED BY:

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DISCLAIMER

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ABSTRACT

Lead based paint found in a large number of homes, institutions and other architectural structures, can pose a serious health risk to individuals if proper precautions are not taken while disturbing the painted surfaces. This article offers a brief overview of the most commonly used methods of lead paint abatement/removal. It describes the development of dry stripping process using Ecostrip VR-2 system. It explains the application of this system in the antique furniture restoration, and subsequent engineering developments aimed at providing a residential lead-paint removal system which would provide an efficient and environmentally safe alternative.

The research project involved testing the performance of low-pressure media blasting and airborne emissions. The report describes results of the final test conducted in a 150 year old farmhouse where the millwork was successfully stripped down to the bare wood with the use of Ecostrip System, with no significant increase in airborne lead or leaded dust levels.

RÉSUMÉ

Le présent rapport traite du travail lié à l'élaboration et à l'essai d'un système écologique d'enlèvement de la peinture au plomb qui fournit des conditions sécuritaires pour l'utilisateur et est efficace par rapport au coût.

L'objectif principal du projet était la conception d'une méthode de décapage de la peinture qui réduirait au minimum ou éliminerait totalement l'utilisation de solvants chimiques dangereux.

La méthode actuelle la plus courante implique l'utilisation d'un décapant à base de chlorure de méthylène, qui présente un danger important pour la santé des utilisateurs. Tous les déchets solides et liquides produits au cours du décapage de la peinture sont considérés comme des déchets dangereux et l'on doit respecter les règlements en vigueur au moment de s'en débarrasser. Dans la plupart des cas, l'élimination de ces déchets représente les coûts les plus élevés de toute l'activité.

Le degré d'utilité des appareils mécaniques comme les ponceuses, les grattoirs, les pistolets thermiques, etc. dépend de nombreux facteurs comme le type de surface et de peinture, le nombre de couches et le degré de dureté de la peinture que l'on décape. Ce genre de méthode de décapage produit habituellement une quantité élevée de poussière. La poussière plombifère projetée dans l'air pendant le décapage présente un danger pour la santé et est très difficile à confiner.

Les applications de la machine à jet de sable standard sont limitées en raison des dommages que peut subir la surface peinte pendant le sablage à haute pression. De plus, l'utilisation du jet de sable produit une quantité importante de rebuts étant donné la fragmentation relativement élevée des abrasifs.

La technique à basse pression, conçue récemment par Ecostrip Inc. et décrite dans le rapport, a d'abord été mise à l'essai pour le décapage de meubles d'antiquité. L'appareil de décapage de la peinture est constitué d'une chambre à basse pression (7-20 lb/po^2 max.), motorisée et entièrement commandée par un robinet d'injection qui permet la distribution de quantités précises d'abrasif.

Le décapage de la peinture s'effectue alors grâce au frottement d'une grande quantité d'abrasif sur la surface peinte, à très basse pression, ce qui crée un effet de ponçage. Ce processus est totalement différent du décapage à la sableuse où des grains de sable sont déplacés à très grande vitesse par une pression d'air très élevée (100 lb/po^2) produisant un écaillement. Ce processus risque d'endommager toute surface peinte à l'exception du métal solide.

La méthode utilisant le système de décapage de la peinture Ecostrip VR-2 a fourni une solution efficiente et efficace pour l'enlèvement de la peinture à base de plomb des meubles en bois. Les résultats concluants du décapage à l'aide de la technique d'Ecostrip nous ont incité à pousser l'élaboration de cette méthode de décapage qui peut servir à l'enlèvement de la peinture des immeubles.

L'appareil stationnaire existant a été réduit en taille et fabriqué en trois pièces détachables facilitant leur transport jusqu'au lieu de travail et à l'intérieur de celui-ci.

- Le séparateur cyclone est maintenant fixé directement sur la chambre de pression et est facilement détachable afin que l'installation ne demande qu'une personne.

- La chambre de pression, munie d'une commande de la pression de l'air et du débit d'abrasifs, est un élément portatif installé sur des roues de caoutchouc en facilitant le transport.

- L'appareil d'aspiration de la poussière est maintenant muni d'un filtre HEPA. Il peut être placé à l'extérieur du lieu de travail (dans un camion ou une remorque) et relié à l'appareil de décapage par un boyau souple. Pour les distances plus grandes entre l'appareil de décapage et l'aspirateur de poussière, il peut être nécessaire d'utiliser un multiplicateur de dépression.

Afin de confiner à la source la poussière produite pendant le décapage, un certain nombre d'accessoires ont été conçus en fonction des surfaces à décaper. Un technicien certifié a mis ces accessoires à l'essai pour vérifier la quantité de particules de poussière projetées dans l'air.

Comme l'enlèvement complet de la peinture peut nécessiter certains travaux de décapage, un appareil de décapage spécial a été conçu pour être directement relié à un aspirateur HEPA. On a également vérifié la présence de particules de plomb dans l'air, autour de cet appareil, pendant le décapage.

Les essais finals devaient être effectués dans un logement présentant une quantité suffisante de peinture à base de plomb (1 % ou plus par unité de peinture). La maison de ferme choisie contenait des boiseries enduites de couches de peinture accumulées au cours de ses 150 années d'existence. Si l'on tient compte de l'accumulation de peinture, de sa dureté et de la rugosité de la surface d'origine, le décapage présentait un défi de taille qui a été très bien mené à terme.

Pendant le décapage, la vérification de la présence de particules dans l'air a été faite par Areco Canada. La collecte de l'échantillon d'air a duré 60 minutes et les tests incluaient aussi un essuyage de la poussière avant et après les travaux. Tous les résultats étaient conformes aux niveaux requis en matière de sécurité. La surface décapée a ensuite été revêtue de teinture et de polyuréthanne.

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SUMMARY

This report refers to the work associated with the development and testing of a lead-paint removal system which provides safe conditions for the operator, is environmentally friendly and operationally cost efficient.

The main objective of this project was to develop a paint-stripping process which would minimize or totally eliminate the use of hazardous chemical solvents for accomplishing paint-stripping tasks.

The most commonly used method at the present time involves the use of a methylene chloride-based paint stripper, which is known to present a major health hazard to the users. All the solid and liquid waste generated during the paint-stripping process is classified as hazardous waste and must be disposed of according to applicable regulations. In most instances, the cost of waste disposal generated during the paint stripping process is the most expensive item of the total operation.

The use of mechanical devices such as sanders, scrapers, heat guns, etc. have various rates of success depending on many factors such as type of surface, type of paint, the amount of layers and the hardness of paint to be stripped. This type of paint-stripping process normally generates a high level of dust. The airborne lead dust during the operation represents a health hazard and its containment is very difficult.

The use of a standard sand-blasting system has a limited application due to potential damage to the painted surface during high pressure blasting. In addition, conventional sandblasting produces a high amount of waste, since the rate of abrasive media breakdown is relatively high.

The newly developed technology, low pressure media delivery by Ecostrip Inc., described in this report was initially tested by paint stripping antique furniture. The paint-stripping system used in this process consists of low pressure chamber (7-20 psi max), motorized and fully controlled media injection valve which allows the exact amount of media to be conveyed.

The paint stripping is performed in this system by the high amount of abrasive media passing over the painted surface using very low air pressure, creating a sanding effect. This is totally different from the sand blasting process whereby sand pebbles are moved at high velocity by high air pressure (100 psi) and produce a chipping effect. With this process any painted surface other than hard metal might be exposed to potential damage.

The process using Ecostrip VR-2 paint-stripping system provided an efficient and cost effective alternative for lead paint removal from wooden furniture. The success of paint stripping using the Ecostrip technology enticed us to further development of the paint stripping system which can be used in paint removal from buildings.

The existing stationary system was reduced in size and fabricated as three detachable parts so it can be easily transported into and throughout the workplace.

- -The cyclone/media separator is now mounted directly and is easily detachable from the pressure chamber in such a manner so that the whole setup can be performed by one person.

- -The pressure chamber complete with air pressure and media flow control is fabricated as a portable unit mounted on the set of rubber wheels for the ease of transportation.

- -The dust collection system was upgraded to HEPA filter efficiency and can be located outside the workplace (in a truck or a trailer), and connected to the paint-stripping system via flexible hose. For greater distances between the paint stripping system and the dust collection, a vacuum booster may be required.

In order to contain the airborne emissions at source during the paint-stripping operation, a number of attachments were designed specifically addressing the needs of the surface to be stripped. These attachments were tested for airborne emissions by a certified technician.

Since complete paint removal may require some scraping, a special scraping assembly was developed which can be connected directly to the HEPA dust collection system. This tool was also tested for airborne lead particles in the surrounding environment during the scraping operation

The final tests were to be conducted at a residential home with suitable amount of lead paint (1% by mass of paint or more). The chosen farmhouse where the tests were conducted contained rough millwork covered with various layers of paint accumulated over the past 150 years of its existence. Taking into consideration the accumulation of paint, its hardness and the roughness of the original surface, the paint-stripping task proved to be very challenging and was successfully completed.

During the paint-stripping operation the airborne emission tests were conducted by Areco Canada, for a duration of 60 minutes for air collection sample, and included dust wipe tests before and after the process. All results were in compliance with the required safety levels. The stripped surface was then covered with light stain and polyurethane.

1. INTRODUCTION

In the past, paint stripping in housing was mainly performed for aesthetic reasons. Unfortunately, most people were not aware of the the hazards related to stripping lead based paint. Currently public awareness is greater, however, there is still a large amount of people that are either not aware of the problem or simply chose to ignore it. Most of the preparations related to stripping a surface are associated with a high degree of airborne dust particles which are free to move around the house. In a lot of cases a high amount of hazardous waste is generated and is simply disposed of through regular waste disposal techniques. If old painted surfaces are not kept up, the aged paint generally cracks and peels off, consequently turning into dust particles, which can be ingested by infants and small children. The Market Place Lead Based Paint Fact Sheet dated November 1991, states: "...young children particularly under the age of four, often play on the floor, and tend to put their hands in their mouths. Children also tend to absorb lead more easily than adults do because, their metabolism is faster. Lead affects the child's developing nervous system by slowing development. Children are particularly vulnerable up to the age of six. The effect include hearing impairment, behavioral problems and lessening of intelligence. For adults, long-term or acute exposure can cause health problems such as kidney, nerve, hearing and vision damage."

2. AN OVERVIEW OF CURRENT PAINT STRIPPING PRACTICES

The most effective chemical strippers on the market generally contain methylene chloride. This important component of stripping solvents offers efficient working speed (generally the reaction starts when applied to the paint) and is relatively cost efficient. However, the use of this product poses many environmental and personal health risks.

A summary of chemical stripping can be found in the HUD Lead-Based Abatement Demonstration (FHA) dated August 1991, - Section 6. The following highlights may give the reader a better understanding of the problems involved:"...all substrates that are chemically stripped must be thoroughly washed down and neutralized. The time allowed for reaction is critical, and if stripping compound dries out, it becomes very difficult to remove. During the chemical compound removal process, a great amount of chemical and lead based paint was generated. This waste was treated as hazardous due to the high pH values and the amount of lead particles contained... This method is quite time-consuming, requires stringent worker protection, generates hazardous waste and does not work at low temperatures." The same report deals with other methods of lead abatement and references are made to the following:

Section 1. Encapsulation - "... a quick cure which covers the lead hazard; the lead is not removed". The report also suggest that " a long-term study regarding durability and effectiveness of encapsulation be undertaken".

Section 3. Abrasive Removal - "...The use of mechanical sanding device (pad, disk, etc.) is limited to flat surfaces, and the abrasive material on the sanding pad quickly becomes clogged with paint, therefore requiring a large number of changes of the grit pad; which is costly in both time and material. This method also generates a large amount of potentially hazardous dust and is a very slow process even under ideal conditions. HEPA attachments to collect dust generated were found to be ineffective in most instances".

Section 4. Vacuum Blasting - "...The abrasive (vacuum blasting) abatement was attempted several times, the results were generally poor, but depended heavily on the substrate. Great care must be taken to protect the substrate from damage. Experience showed that this method was very costly for the abatement of small surface area substrates due to the fixed capital/rental costs of the required equipment. This method has the potential to produce a greater amount of waste, by weight, because the blast media is included with the lead-based paint removed..."

Section 5. Hand-Scraping with Heat Gun -"... The use of heat gun is very labour-intensive, it can generate high levels of airborne dust and is hard to use on detailed substrates that are not flat..."

There are also numerous chemical solvents which are environmentally friendly, unfortunately, the efficiency and the cost factor of those strippers make them not feasible on any project other than relatively small tasks. The author is not aware of any solvents that can reduce the risks to the environment and health, but offer competitive performance demanded in commercial paint stripping.

3. DEVELOPMENT OF THE ECOSTRIP VR-2 - CONTROLLED DRY-STRIPPING

After being involved in the antique restoration service it became evident that there is a need for a cleaner and safer method of removing paint and coatings.

The concept of low-pressure media delivery was derived from a intensive research into existing paint removal technologies, and enduring experiments conducted by our consulting engineer who has over thirty years of experience in project developments and adaptations.

The stripping process uses a motorized, precision controlled media delivery system which allows the air to deliver media at pressures as low as 7 psi (see Appendix A). Since the flow of the abrasive media can also be precisely controlled, different combinations can be used in the paint removal process; depending on the hardness of the paint and the type of surface which needs to be stripped.

This concept was tested on coated wooden furniture surfaces and showed very promising results. In the initial stages we have used many types of media, and the experiments were conducted in a closed booth. It was easily established that in some cases the stripped furniture could be refinished immediately after the stripping process. As an example, we refinished church pews which were made out of pine, and finished with a very dark old varnish finish (the customer wanted the stain substantially lighter than the original). In order to compare the use of our system with the standard methylene chloride stripper, we tried doing one of the pews with the chemical stripper.

When the chemical stripper was applied, the combination of the stripper and the dissolved varnish/stain turned into a molasses type of composition. By the time we were able to start the cleaning procedure, the combination of the solutions started to penetrate the wood deeper, making it harder to clean. After the final rinse was applied the pew had to be left to dry. After the drying process was completed, we noticed raised grain and lots of areas that had to be scraped, or re-stripped (specially in the crevices of carved decorative sections).

The process of dry stripping furniture involved using a selected media at about 8 psi working pressure. The surface was stripped with ease leaving only a light coating of stain. After dry stripping, we used denatured alcohol in very minimal amounts. With the use of fine steel wool the alcohol allowed the stain to be spread out evenly throughout the workpiece, providing a perfect priming coat for the finish. At this point, the refinishing process was started which consisted of spraying tinted (light walnut) polyurethane. Three coats were used, with some minor sanding between coats, providing a durable and appealing finish.

Note: Waste generated was treated as nonhazardous (no-lead, no methylene chloride) and regular waste disposal techniques were applied. The media breakdown was only evaluated at about 15% for the whole job. Needless to say we were able to finish the complete job at prices far below what other shops would charge for stripping service only.

There are of course some instances where stripping may not be as easy, specially in instances where the base coat used on the wood surface is composed of some sort of aged milk paint which is extremely hard to remove. In a one instance, an old press-back chair was covered with almost 1/4 of an inch of paint consisting of types ranging from milk paint, exterior lead based enamel to latex. In this case we were forced to use a coarse media to remove heavy top coats to the last milk paint base-coat, then apply a non-methylene chloride stripper to areas where there was an excessive build up of paint, and finish the stripping process by applying fine media at low pressure with a heavy density (about 8 lb/min).

We had an opportunity to compare our stripping process to that of a commercial high volume "dip and strip" system; the result of our system was superior. The chemical process left a green residue on the stripped chair, resembling pressure-treated wood. The dry system with some finish sanding showed the true oak/ash colour which was ready to accept stain. The customer expressed grateful appreciation.

4. USE OF ECOSTRIP FOR RESIDENTIAL LEAD PAINT REMOVAL - FIELD TRIALS

As it became clear that the use of dry-stripping provides great opportunities in paint removal, steps were taken to apply this system into emission free lead paint removal in houses. Unlike vacuum blasters, the Ecostrip VR-2 has the ability to operate at low pressures, reducing the emission problems substantially. Steps were taken to upgrade the standard dust collection system by building an airtight enclosure filtered by HEPA filters. Special lightweight stripping/recovery nozzles were fabricated, and tests were conducted for emission levels by a Certified Technician from Occupational Health Centre at Queen's University. The testing was done in a mobile construction trailer, and the interior of this trailer was thoroughly washed with trisodium phosphate in order to eliminate any possibilities of previous contamination. As described in Appendix B, the tests were conducted with a two horsepower electric dust collector (trial #1) and also a three horsepower collector (trial #3), in order to determine whether 800 CFM of suction is sufficient, or 1800 CFM is required. It become evident that the greater CFM (cubic feet per minute) is needed to achive the desired safety level.

Upon obtaining the satisfactory results, concurrent tests were performed in reference to various paint combinations and surfaces. It was discovered that the hardness of paint and combinations thereof do not allow for setting of standard operating guidelines at this point, since the distance of the nozzle from the surface, the angle, the delivery pressure and flow rate may vary from one surface to another. Therefore individual tests must be conducted at each job-site before

parameter settings are determined. This can be accomplished by starting at lowest delivery pressure and minimum flow rate and continue to increase the above until satisfactory stripping process is achieved.

Once the settings are determined, the same parameters can be used throughout the job-site. There may be some spots where paint build-up is excessively heavy and the stripping process is not as complete as other areas; it was established that rather than going over the same spot with the nozzle assembly (which may pose potential for surface damages), a simple hand scraping technique (with the use of a special assembly connected to the HEPA exhaust system) provided a paint ready surface.

It should be noted that hand scraping is only effective after the surface was exposed to the media, and that when scraping was attempted before the stripping process, the sharpest scraping edges could not penetrate the surface of paint or varnish without the use of excessive force.

Subsequent to developing satisfactory performance and emission levels controls, preparations were made to conduct the final test in a house. The house chosen was located in Merrickville. The 150 year old residence provided a perfect testing sample for our purpose. The walls provided a plaster surface covered with various paints and bottom sections were finished with V-grove pine wainscotting covered with an extremely hard composition of paints. The millwork was mostly hand planed and it proved to be even a greater challenge as the surface was relatively rough.

Preliminary tests were conducted using lightweight plastic media which proved to be most efficient in the past; it showed absolutely no results until the pressures would reach 25-30 PSI(too high for the wood substrate - causing damage). As an alternative, we decided to use substantially more aggressive (sharper and harder) media. This approach provided superior results. There were some areas where milk paint remained on the boards which I speculate was due to the fact that some of the wood used for the wainscotting was not as dry as other sections when the first coat of paint was applied. This problem was easily corrected by going over the imperfections with the lightweight media. At this point the surface was ready for repainting and with the use of quality latex paint the surface would resemble the original appearance.

The same process was used on window and door frames. With the use of a special media, the risk of etching, scratching or breaking the glass was totally eliminated. This advantage can be greatly appreciated in comparison to such methods as the use of a heat gun, when the heat can easily break the glass.

It was the homeowner's wish to have the millwork stained and varnished. Due to the original rough condition of the surface, it needed to be smoothed for a better appearance. Instead of using any mechanical abrasive removal techniques and taking risks of airborne hazards, we used a special scraper assembly where the scraper was connected to the dust collection system. The special feature of this assembly is the type of blade, which is light gauge steel sharpened to a razor sharp profile. By maintaining the razor-sharp

edge (achieved by frequent light filing) the final results could be compared to that achieved with the use of fine sand paper. The special blade-profiling machine allowed the fabrication of blades as required in different sections of the millwork.

Since we are in the process of developing a prototype of a semi-automatic nozzle assembly, test were also conducted on the wainscotting. This system consists of the Ecostrip VR-2 device connected to a special automated nozzle assembly. The nozzle assembly is constructed in a three square foot enclosure (16" x 27"), where the nozzle travels in horizontal and vertical movement. The movement is controlled by a computer program which can regulate the travel speed, the number of steps in the vertical movement and provide digital readouts of the functions. The dust/media collection is also connected to this system allowing for a safe working environment.

The performance of this system showed tremendous potential due to the consistency of the stripping process. Once proper perimeters were established, an area of about three square feet was stripped to a paint-ready finish in less than two minutes. This assembly is still under development, and test were not conducted in relation to airborne emissions, however no problems are anticipated.

5. DESCRIPTION OF TESTING ON THE JOB-SITE

Monitored testing took place in a farmhouse near Merrickville, Ontario. A 34" x 54" door was completely stripped to bare wood. A floor area of about six square feet around door was separated by a polyethylene sheets (only as a safety precaution for the observers). The testing was coordinated by Areco Canada from Nepean, Ontario. An independent consultant was present to monitor the tests. The object of the test was to monitor lead in air levels, within the small plastic work tent, and the deposition of lead dust upon the floor. A personal air sampling pump was located in the test area, and three new, washed floor tiles were placed on the floor in different locations. The air sampling test lasted for 60 minutes, and included the paint stripping process with the use of Ecostrip system and also the scraper assembly.

As illustrated in Appendix C the Air Sample test result was below the permissible levels. The Lead in Dust by Swab Method (wipe tests on the tiles) showed a very minimal increase as compared to the clean tiles before the process. The levels of leaded dust on the exposed tiles were from 23-102 ug/ft2, which is less then 200 ug/ft2 that the US HUD requires on floors after they have been cleaned. In other words even in their uncleaned state, the tiles showed a level of lead dust that would pass a stringent post-cleaning inspection. The stripping did not create a significant quantity of leaded dust.

6. CONTINUING DEVELOPMENT

The prototype described in this report proved to be a functional and very efficient lead paint stripping apparatus. We are motivated to continue our research and development of wider range of equipment which can be related to different tasks. The described Ecostrip VR-2 can be classified as system designed to perform medium size jobs such as complete abatement of an interior of a residential home. Ecostrip Vr-2 requires a consistent supply of compressed air provided by a compressor.

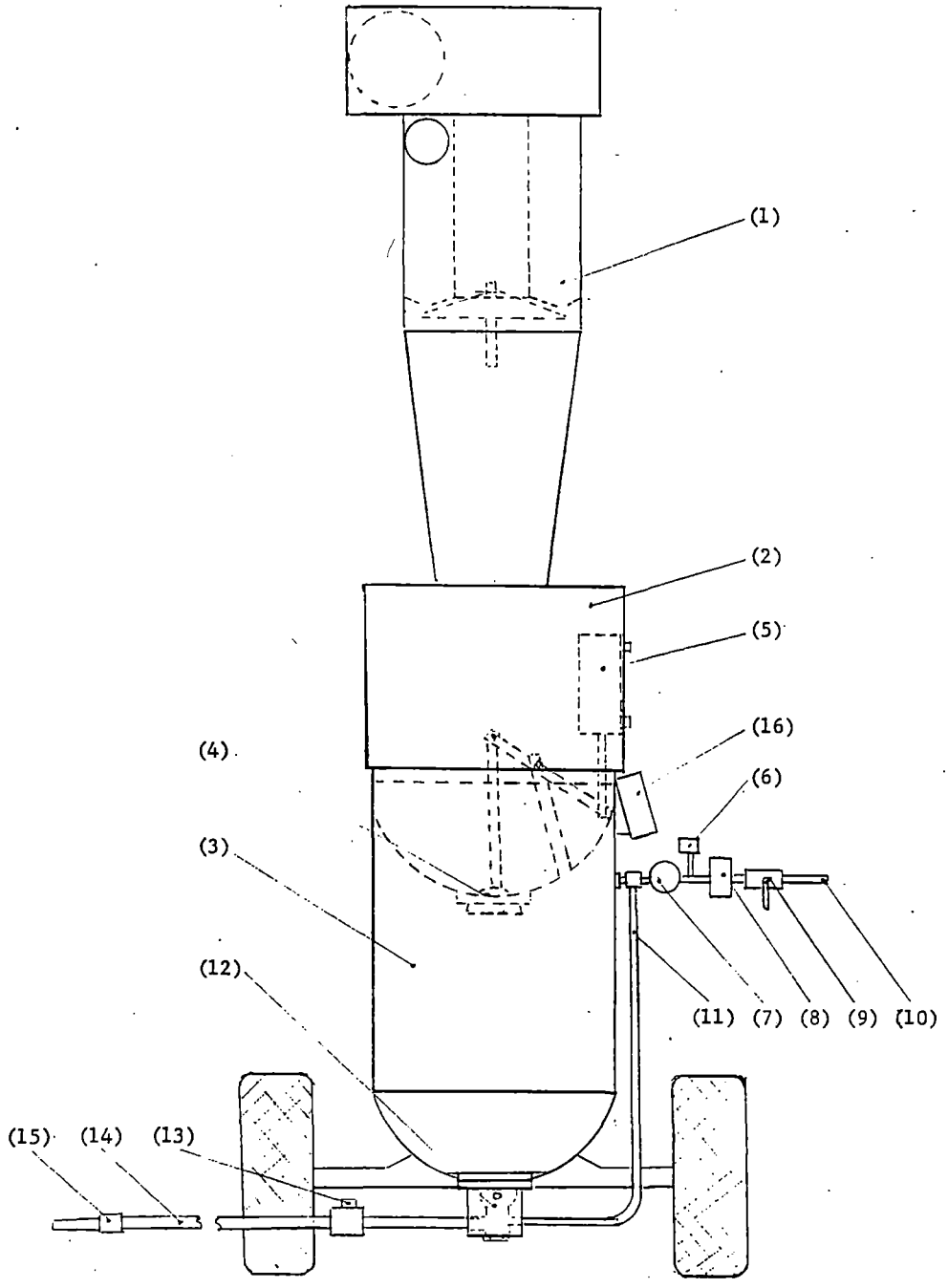
The Ecostrip VR-2-SA (under development) is a semi-automatic paint /coating machine designed to perform larger jobs such as walls, floors and ceilings of industrial, institutional and commercial buildings. This system offers tremendous potential for cost efficiency, related to speed of the striping process as well the reduction of operator hazards related to stress, usually associated with continuous conventional stripping methods.

We are currently designing a compact system which will be aimed at performing smaller jobs, such as window sills, baseboard and trim, in residential home. The reduction of the size will allow a contractor to use air supply which can be provided by the use of a smaller portable air-compressor. It is anticipated that with the introduction of such a system the low capital investment will encourage contractors to provide a low-cost abatement service, which in turn may encourage home owners to take steps in protecting themselves from the potential dangers of lead related hazards.

7. CONCLUSION

Based on our experience in the stripping of paint on a wide range of surfaces, we feel that the dry stripping method which is described in this report offers controlled airborne environment, low operating cost, and substantial reduction in hazardous material disposal costs.

APPENDIX A



LEGEND

(1) - Abrasive media seperator
(2) - Abrasive media storage hopper
(3) - Pressure pot (blast pot)
(4) - Abrasive media entry valve
(5) - Air piston
(6) - Electromagnetic control valve
(7) - Manual air-pressure regulator
(8) - Electromagnetic air valve (ON/OFF)
(9) - Manual air valve (ON/OFF)
(10) - Compressed air input line
(11) - Compressed air push line
(12) - Rotary metring valve
(13) - Air pressure sensor
(14) - Air/media conveying line
(15) - Blast nozzle c/w control
(16) - System's controller

PAINT - STRIPPING SYSTEM

APPENDIX B

OCCUPATIONAL HEALTH CENTRE
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Queen's University
Kingston, Canada
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PRELIMINARY TESTS OF THE ECOSTRIP VR-2 SYSTEM

ECOSTRIP, MALLORYTOWN

CONDUCTED BY: Tom Beardall, MHSc., CIH, ROH
ON: 1993.09.08
REQUESTED BY: Mark W. Janusz, Ecostrip
REFERENCE NO.: 4135

Airborne lead was sampled during the stripping of paint from wood with the Ecostrip VR-2 system. Sampling was conducted during three trial 15 minute periods during which time different elements of the VR-2 system were utilized. Trial 1 was conducted with the Ecostrip nozzle assembly attached to a cyclone and exhaust air from the cyclone was ducted to a HEPA filtration unit. During trial 2, paint was stripped by means of the Ecostrip scraper assembly. Local exhaust air was ducted directly to the HEPA filtration unit, bypassing the cyclone. Trial 3 was conducted again with the nozzle assembly and cyclone, but air was exhausted through a bag collector system (non-HEPA) using a higher cfm fan. The presence of lead in the paint being stripped from wood boards was qualitatively confirmed with Lead Test swabs.

Airborne lead was collected on mixed cellulose ester filters by means of personal sampling pumps. Pumps were calibrated at a nominal flow rate of 4 litres per minute, pre- and post-survey, by means of a primary standard.

The evaluated locations and corresponding airborne lead concentrations are shown in Table 1, attached. A lead dust level of 0.11 mg/m^3 was sampled at the blast side of the nozzle assembly during trial 1. Levels were below the analytical detection limits at all other evaluated sites and times including the nozzle assembly during trial 3 when the higher cfm exhaust unit was utilized.

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TABLE 1. PRELIMINARY TEST RESULTS.
AIRBORNE LEAD CONCENTRATION ASSOCIATED WITH ECOSTRIP VR-2,
1993.09.08

LOCATION	DURATION (min)	AIRBORNE LEAD CONCENTRATION (mg/m^3)
TRIAL 1 (Cyclone + HEPA Exhaust Unit)		
Nozzle, Blast Side	15	0.11
Nozzle, Vacuum Side	5*	<0.10
Top of Cyclone	15	<0.03
At HEPA Filtration Unit (In Exhaust Air)	15	<0.03
TRIAL 2 (HEPA Exhaust Unit Only)		
Scraper Assembly	15	<0.03
TRIAL 3 (Cyclone + Bag Collector Exhaust Unit)		
Nozzle, Blast Side	15	<0.03
Nozzle, Vacuum Side	15	<0.03

< Denotes result below analytical detection limit
* A flow fault in the sampling train caused an early shutdown of the pump. Detection limit higher due to shorter duration sampling

APPENDIX C

REPORT OF ANALYSIS

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TELEPHONE: (613) 228 1145 FAX: (613) 228 1148

LABORATORY I.D.:	171293-8	CLIENTS JOB NUMBER:	Ecostrip
SAMPLE MATRIX:	Air/Dust	DATE SUBMITTED:	17/12/93
REPORT NUMBER:	5610601	DATE REPORTED:	06/01/94
LOCATION:	Merrickville, Ontario		

METHOD: Pb IN AIR BY ICP-AES - NIOSH METHOD 7300
SAMPLER: Filter , 0.8um, cellulose ester membrane
FLOW RATE: 2 L/min for 1 hour
TOTAL VOLUME: 120 L

SAMPLE I.D.	RESULTS Pb, mg/m^3
Air Filter	<0.01
Blank Filter (LAB)	<0.01

Note: Permissible Exposure Limits (mg/m^3): OSHA: 0.05
NIOSH: 0.1
ACGIH: 0.15

METHOD: Lead In Dust by Swab Method
AREA SWABBED: 1 square foot

SAMPLE I.D.	RESULTS Pb, ($ug/ft.^2$)
BLANK 1	7
BLANK 2	10
BLANK 3	11
EXPOSED 1	23
EXPOSED 2	102
EXPOSED 3	30

note: actual area swabbed approximately one half square foot

M. Lawther-Thoms

Analysed by
M. Lawther-Thoms
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