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# CPRC

CANADIAN POLICE RESEARCH CENTRE



# CCRP

CENTRE CANADIEN DE RECHERCHES POLICIERES

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## ***TM-14-93***

# ***Vacuum Fingerprint Chamber Evaluation***

*By Canadian Police Research Centre*

### TECHNICAL MEMORANDUM

Submitted by  
Edmonton Police Service, Houston Police Department, London Police, Ontario Provincial Police  
Ottawa Police, Sûreté du Québec, Vancouver Police Department, Winnipeg Police Department  
and York Regional Police

**October 1993**

NOTE: Further information  
about this report can be  
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## Executive Summary

Since July 1992 ten police departments participated in evaluating the *Watkin Vacuum Fingerprint Chamber*: the Sûreté du Québec, Ottawa Police, London Police Department, York Regional Police, Ontario Provincial Police, Winnipeg Police Department, Edmonton Police Service, Calgary Police Service, Vancouver Police Department and the Houston Police Department.

Overall the departments were pleased with the performance of the chamber. However the evaluations were delayed due to a faulty vacuum gauge which ETM Industries replaced.

As with any new technology there is always a period of trial and error involved during its initial use. Some of the concerns noted were, frequency of oil changes, lack of instruction on pump maintenance, and absence of a particle/vapour filter. One department noted that many more objects could be processed in the chamber if the dimensions were different i.e. shorter and wider. Efforts are being made by ETM Industries to review the questions, concerns and suggestions expressed by the evaluators.

CPRC relies on feedback from the police to assist in the development of technology. Their input is critical for technology development.

This following Technical Memorandum includes evaluations received by the CPRC from the police departments that participated in this *Technology Platform*, project.

## Résumé

Depuis juillet 1992, dix services de police participent à l'évaluation de la chambre dactyloscopique de Watkin: la Sûreté du Québec, la police d'Ottawa de London, la police régionale de York, la Police provinciale de l'Ontario et la police de Winnipeg, d'Edmonton, de Calgary, de Vancouver et de Houston.

Dans l'ensemble, les services de la police étaient satisfaits de la performance de la chambre à vide. Toutefois, les évaluations ont été retardées, en raison d'une défectuosité du vacuum ètre, qui a été remplacé par ETM Industries.

Lorsqu'on utilise pour la première fois une nouvelle technologie, il y a toujours une période de rodage. On a signalé un certain nombre de problèmes, notamment la nécessité de changer fréquemment l'huile, le manque d'instructions pour l'entretien de la pompe et l'absence d'un filtre à particules ou à vapeur. Un service de police a fait observer que l'on pourrait prélever des empreintes sur de nombreux autres objets avec la chambre à vide, si ses dimensions étaient différentes, c'est-à-dire si la chambre était moins haute et plus large. ETM Industries examine actuellement les questions, les problèmes et les suggestions des évaluateurs.

Pour mettre au point de nouvelles technologies, le Centre canadien de recherches policières (CCRP) s'appuie sur les commentaires des services de police, dont la contribution est indispensable.

Le document technique suivant présente les évaluations transmises au CCRP par les services de la police qui ont participé au projet de la Plate-forme technologique.

**WATKIN VACUUM FINGERPRINT EVALUATION  
EVALUATING DEPARTMENTS**

- 1. Edmonton Police Service**
- 2. Houston Police Department**
- 3. London Police**
- 4. Ontario Provincial Police**
- 5. Ottawa Police**
- 6. Sûreté du Québec**
- 7. Vancouver Police Department**
- 8. Winnipeg Police Department**
- 9. York Regional Police**

**WATKIN VACUUM FINGERPRINT EVALUATION**

**EDMONTON POLICE SERVICE**



EDMONTON  
POLICE  
SERVICE

8620 - 103A AVENUE  
EDMONTON, ALBERTA  
CANADA T5H 0H7  
PH: (403) 421-3333  
FAX: (403) 425-6663

Address all replies to Chief of Police

1993 April 06

Mr. John Arnold, Chief Scientist  
Canadian Police Research Centre  
National Research Centre  
Ottawa, Ontario  
K1A 0R6

Dear Mr. Arnold:

RE: **CPRC TECHNOLOGY PLATFORM  
WATKIN VACUUM FINGERPRINT CHAMBER**

The Edmonton Police Service, Identification Division, has been evaluating the Watkin Fingerprint Chamber since July 1992. As you are aware, we have encountered some problems with this endeavour, but have also had some success. An evaluation has been prepared to assist you in overall project evaluations. Since the evaluation criteria were fairly open-ended, we have covered several pertinent areas that we felt had to be addressed.

We would like to thank you and the CPRC for considering the Edmonton Police Service in the first Technology Platform project. Our research is still on-going. If we can be of further assistance please do not hesitate to contact us.

Yours truly,

**D.B. STEVENS, Inspector**  
i/c Identification Division

DBS/blp  
Enclosure  
Lettr128



C.P.R.C. TECHNOLOGY PLATFORM  
WATKIN VACUUM FINGERPRINT CHAMBER  
EDMONTON POLICE SERVICE EVALUATION

**SUMMARY**

On March 4, 1992 the Edmonton Police Service was approached by C.P.R.C. to enter into an agreement for evaluating a vacuum Fingerprint Chamber. The E.P.S. agreed to participate in this project on March 11,1992 and received the Watkin Vacuum Fingerprint Chamber in the first week of July 1992 from E.T.M. Industries. An evaluation of the chamber and the processes used has been ongoing since that time. The evaluation covered the following areas:

1. The chamber and it's physical characteristics
2. The technical and chemical processes
3. Examination of "test" latent fingerprints and,
4. Examination of "field" latent fingerprints

**EVALUATION PROCESS**

Evaluation began with familiarization of the physical capabilities/limitations of the system, the fingerprint developing procedures, latent visibility through alternate light sources and photographing the latent. Following initial familiarization, Identification members were instructed on use of the chamber and all work was catalogued. Due to increased maintenance procedures, processing of exhibits was changed to only 2 days per week with select members responsible for this task and the associated maintenance. This change has caused some dissatisfaction by members of the technology set-up as supplied.

**THE WATKIN VACUUM FINGERPRINT CHAMBER**

The size configuration of the Watkin Vacuum Fingerprint Chamber has generally been adequate for most of the latent fingerprint examinations required. There is some concern; however, with both the length and width. The length of the chamber is very inconvenient when changing the chamber "filter". Inconvenience breeds discontent. If the chamber was shorter, this filter would be able to be changed without the use of a special tool designed specifically for this purpose. The width of the chamber does not allow slightly larger objects (drug scales) to be fumed using this method.



The instrumentation initially supplied proved to be inadequate. When we finally received a replacement gauge, February 4, 1993, repairs had to be completed prior to operation. The wiring junction box was insecure as mounting threads had been stripped during installation. We were fortunate in having the old one still available for replacement. Not all the screws securing the wires were tight, creating a potentially dangerous situation if not checked. The front panel would not fit into the framework and bolt holes had to be redrilled. We also made an addition to the panel, which proved to be helpful. Switch indicator lights were installed and provided an easy visual check when the power is on.

We found that experimentation was somewhat limited in allowing for flexible methodologies. There is only one inlet port available on the unit and it is utilized for the Air Admittance Valve. It could be advantageous to have two additional ports which would allow introduction of chemical/dye/humidity following the evacuation phase. Introducing a secondary substance, for example water, prior to pump down did not cause any improvement in latent quality, because the cyanoacrylate is attracted to the water and forms a white residue on the water.

The original tray supplied with the unit did not allow optimum vacuum to be reached, as it was not a dense enough compound to retain its integrity under vacuum. The replacement tray (aluminum) works well.

The initial instructions supplied were incomplete and caused some confusion when compared with instructions from Edwards High Vacuum for operation of the EIM18. These were corrected following several phone calls. Instruction on pump maintenance was poor - especially the necessity of requiring frequent oil changes. We believe that this caused pump inefficiency and ultimately pump failure.

In testing the development of latent fingerprints, it was impossible to know what reactions were occurring inside the chamber. This could be enhanced by the installation of viewing port/window. Being able to see fingerprint development as it happens would be a great advantage in the experimental stage.

It is difficult to understand why this chamber was supplied without a particle/vapour trap placed in line between the chamber and pump. Instructional material supplied with the Edwards pump recommended the installation of a trap. Contamination of pump oil and premature pump failure was a direct result of not having this necessary equipment.

## FINGERPRINT DEVELOPMENT PROCESS

Beginning in May 1992 latent fingerprints were placed on a variety of surfaces on a weekly basis. These surfaces included gun barrels, different types and colours of plastic bags, and glass slides. These items were stored for a period of time prior to the latent fingerprint development. This resulted in a continuum of aged fingerprints to be tested which would assist in the evaluation process. The final instructions issued, while being complete, appeared somewhat lengthy for reading. A procedure flow chart was developed for quick reference by members using the chamber and it proved to be well accepted.

Latent fingerprints on the gun barrels disappeared over a lengthy period of time (possibly being "absorbed" by the gun oil residue) and could not be brought up in the vacuum chamber. This problem did not occur with the plastic bags or glass slides. Any fingerprint developed on white plastic was very hard to see following Ardrex treatment and Lumalite or UV Light illumination. The white background tended to reflect greatly and nullify fluorescence. There was very little fingerprint deterioration on black garbage bags. Additional experimentation was done with magna. It was discovered that a fingerprint treated with magna and then subjected to vacuum and CA was enhanced and contrast improved.

The development of crime scene latents using the Vacuum Chamber met with approximately the same amount of success as we had using the "aquarium". The quality of the fingerprints developed in the vacuum chamber was superior to those developed in the "aquarium". In one case it was interesting to note that a fingerprint was developed a counterfeit bill where other methods had failed. The bill seemed to have a "plastic" coating which would not allow penetration of the print into the paper. Treatment with CA, Ardrex and Lumalite illumination produced a visible print; however, the print did not fluoresce as expected.

Due to the configuration of the vacuum chamber supplied, alternate examination procedures were somewhat limited. The introduction of water into the procedure only caused the CA to bond with the water. Rebreathing the print prior to treatment had no significant effect. The development of a good visible print directly from the chamber was not able to be accomplished. It is felt that introduction to humidity or dye after vacuum pump down may enhance visibility, but this was not able to be tested with the present system.

## CONCLUSION

The Watkin Vacuum Fingerprint Chamber, while being helpful in some fingerprint examinations, has not proven to be far superior to other methods of CA fuming. The technical configuration of this chamber has not been taken far enough to allow for maximum utilization. Improvements could definitely be made in size dimensions, number of inlet ports, a viewing port and a particle/vapour trap. Experimentation with and evaluation of the chamber, as supplied, has brought mixed reactions of both enthusiasm and frustration.

## TECHNOLOGY PLATFORMS

The Technology Platform concept can prove to be a very valuable asset to the CPRC and police community at large. It is essential that all participating Departments and personnel are aware of the Platform concept and the parameters within which they are expected to work. With the Watkin Vacuum Fingerprint Chamber there were problems with design, equipment failure, poor instructions and lack of technical expertise when advice was sought. To ensure continued positive Police Department involvement in Technology Platform projects, whatever they may be, there must be a knowledgeable resource group available for the participants to access when needed.

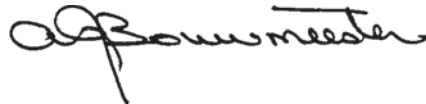
## RECOMMENDATIONS

There is a need for continued Police Department involvement in all aspects of research within the police community. In relation to the Watkin Vacuum Fingerprint Chamber specifically, it is recommended that consideration be given to accommodate design alterations to allow for further experimentation. It is difficult to evaluate and assist in the development of new technology when there are limitations for alternative testing.

The Edmonton Police Service Identification Division would like to express gratitude in being considered for and being able to participate in this project. Thanks is extended to personnel

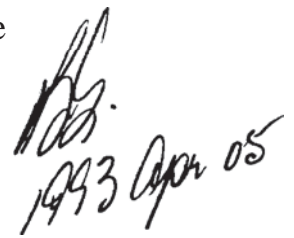
at ETM Industries, Edwards High Vacuum and the CPRC for their assistance and genuine concern to help solve the problems. While some of the evaluation procedures met with frustration, each of the above people were eager to assist or try to find an answer. We are continuing to work on this project and look forward to a successful conclusion.

Submitted by:



Cst. A.J. BOUWMEESTER  
Identification Division  
Edmonton Police Service

AJB/blp



**WATKIN VACUUM FINGERPRINT EVALUATION**

**HOUSTON POLICE DEPARTMENT**



Bob Lanier, Mayor

# CITY OF HOUSTON

Houston Police Department  
61 Riesner Street Houston, Texas 77002 713/247-1 000

CITY COUNCIL MEMBERS: Helen Huey Ernest McGowen Sr. Vince Ryan Judson W. Robinson, Frank O. Mancuso Dale M. Garzynski Christin Hartung  
John G. Goodner Ben T. Reyes Gracie Guzman Saenz Elanor Tinsley Jim Greenwood Sheila Jackson Lee Alfred J. Calloway CITY CONTROLLER: George Greanias

June 15, 1993

Sam Nuchia  
Chief of Police



Mr. John Arnold, Chief Scientist  
Canadian Police Research Centre  
Ottawa, Ontario  
Canada  
K1A 0R6

Dear Mr. John Arnold,

Re: WATKIN VACUUM FINGERPRINT CHAMBER EVALUATION

**ADVANTAGES:**

The vacuum chamber is excellent for processing polyethylene and polypropylene bags usually submitted in narcotics and burglary cases. Bags can be processed in folded positions effectively allowing the examiner to treat numerous articles of evidence in a reasonable time frame. There is minimum background interference and no more "painted" surfaces using cyanoacrylate. All nonporous evidence can be processed in the chamber without worry of over supergluing. It gives the examiner the capabilities of processing numerous items on all types of nonporous surfaces at the same time. There is no longer a need for heating plates, accelerant pads or packs, or other devices to heat the cyanoacrylate to accelerate the evaporation process.

**DISADVANTAGES:**

There is a need to filter the cyanoacrylate fumes before the pump. The solid cyanoacrylate in the pump oil dramatically increases the vacuum "pull down" time to the extent of rendering the procedure ineffective. The increased use of the chamber contaminates the pump oil rapidly. Too much time is spent changing the pump oil and eventually cleaning the inside of the entire pump (interior screens, oil reservoir, etc.). A conversion chart from metric to U. S. standard would assist in accurately explaining the pump demonstrations conducted here in Houston, Texas.



**SUMMARY:**

The Vacuum Chamber processes evidence as effectively and thoroughly as advertised or promised. It truly is an invaluable tool needed to process the numerous plastic bags and other evidence submitted annually to our fingerprint laboratory. However, maintenance is time consuming, and pump oil is not inexpensive. If a filtering device can be added between the chamber and the pump to eliminate the contamination of the pump oil by the C/A fumes, the system would function more efficiently. Enclosed you will find photographs of the interior of the pump during cleaning to illustrate this problem.

Should you need additional information, please feel free to contact my office.

Sincerely,



R. T. Fleming, Asst. Administrator  
AFIS/Latent Print Section  
Police Department  
Houston, Texas

RTF:cku  
Encl.

**WATKIN VACUUM FINGERPRINT EVALUATION**

**LONDON POLICE**





Address all correspondence to  
CHIEF OF POLICE  
POST OFFICE BOX 3415  
LONDON, ONTARIO  
N6A 4K9

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93 03 29

Canadian Police Research Centre  
Box/CP 8885  
OTTAWA, Ontario  
K1G 3M8

ATTENTION: Mr. John G. Arnold

Dear Sir:

RE: WATKIN VACUUM FINGERPRINT CHAMBER EVALUATION

On 92 07 31, the London Police purchased the "WATKIN VACUUM FINGERPRINT CHAMBER" to assist in the detection of latent fingerprints on surfaces which previously provided minimal results. We have processed knives, cigarette packages, handguns, rifles, ammunition casings, a rock, various plastic items, lottery tickets, licence plates, and scotch tape to mention just a few. As a point of interest, scotch tape was processed in the fumer and excellent latents were developed on the adhesive side of the tape. We are presently running additional tests to see if other adhesive tapes will produce similar results. This may be a process where treatment with the cyanoacrylate fumer should be considered prior to using the Gentian Violet.

One identification officer also used the fumer to develop identifiable latents on 2 lottery tickets in an attempt murder investigation. The prints have been sent away to R.C.M.P., Ottawa for a latent fingerprint search - (92 11 09). We have processed well in excess of 100 separate items during the past 6 months and the fumer has operated properly. We have had the vacuum gauge replaced approximately 3 months ago and since then the new Pirani 917 gauge has given us trouble-free operation.

There are a few recommendations that my identification officers have made which may further assist you in developing new models.

1. The vacuum gauge could be mounted with rubber washers to reduce the vibration from the motor while it is in operation. The gauge should also be simplified so that calibrations indicate maximum vacuum that must be achieved

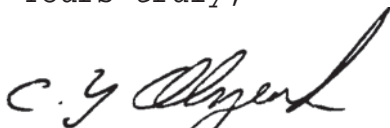
and operating range when the motor is shut off instead of reading the "MTORRS".

2. Tests have shown that the fumer produces better results if the time that exhibits are left in the chamber exceeds the recommended or suggested 20 minutes. It has varied on occasion up to 1 hour to develop better latents.
3. The filter located inside at the back of the fumer should be modified for easier access during maintenance.
4. There has been a situation where the technician was having problems getting a proper seal on the door. Even though the door must have some play to properly seal, it had to be lifted on different occasions to produce a complete seal. The "O" ring and groove are cleaned regularly. This may be something that this department is only experiencing, but I've mentioned it in case other departments are having the same problem.

The vacuum chamber has not received any negative comments from my identification officers except for the recommendation above. It has proven itself as an essential piece of equipment to detect latents on numerous types of surfaces. I would like to express my appreciation for the continued support that I have received from you and from E.T.M. Industries Inc. I have contacted Robert Graham on several occasions to clarify instructions for the proper operation of the fumer and to order supplies. Mr. Graham has been nothing short of exceptional in the manner he has dealt with me and the London Police.

I hope the information I have provided in this report is of some assistance to you. I will continue in the future to keep you informed of any other recommendations which I feel will assist you in developing future models of the VACUUM FINGERPRINT CHAMBER.

Yours truly,



C. Y. Olszewski  
Staff Sergeant  
Forensic Identification Section

CYO/mc

cc Mr. Robert Graham - E.T.M. Industries Inc.

**WATKIN VACUUM FINGERPRINT EVALUATION**

**ONTARIO PROVINCIAL POLICE**



Ontario  
Provincial  
Police

Ministry of  
the Solicitor  
General

Police  
provinciale  
de l'Ontario

Ministère du  
Solliciteur  
général

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Toronto Ontario  
M7A 2S1

90 rue Harbour  
Toronto (Ontario)  
M7A 2S1

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Telephone/Téléphone:

965-6443

Fii reference/  
Référence

January 22, 1993

John Arnold, Chief Scientist,  
Canadian Police Research Centre,  
Ottawa, Ont.  
K1A OR6

Dear John:

I am in receipt of your request for comments on the Watkin Vacuum Fingerprint Chamber. Although comments regarding results have generally been good, I am forwarding, as requested, conclusions of Mr. C.R. Foley who has spent considerable time working with the chamber.

If you have further questions regarding Mr. Foley's findings, please feel free to contact him direct.

Yours truly,

A handwritten signature in black ink, appearing to read "B.E. Dalrymple".

B.E. DALRYMPLE,  
ACTING SUPERVISOR,  
FORENSIC IDENTIFICATION SERVICES.

BED;psk

att.

### DITGASSING PHENOMENON

I have often experienced the pumps inability to pull down to the 200-500 mtorr pressure as indicated on page 3, part 7 of the operating instructions. Realistically however, this may not always be possible due to outgassing phenomenon which can vary dramatically depending on the exhibits being processed. Unaware of this phenomenon, users in this office inadvertently assumed the device wasn't working properly when they encountered this situation, and ceased vacuum processing operations. Increased gauge readings following pump shutdown, are also a feature of this process and not due to faulty equipment as some operators believe.

### OIL MISTING AND EXHAUST

Although the information package details these pump emissions, there was surprise among staff at the quantity which can sometimes be produced. I even fielded a long distance call from another ETM vacuum print chamber user who was concerned over the volume of these emissions. A mishap in our exhaust system, resulted in our lab being "smoked filled" as a result of this process. Upon contacting Edwards High Vacuum, I was informed that the heavy discharge experienced may, on occasion, occur as a normal pump manifestation. This fact, if known, would alleviate related concerns held by the inexperienced user.

### VACUUM PUMP OIL

Depending on the volatiles contained within the exhibits, rapid contamination of pump oil may occur. As a result, the information package advises that the oil be routinely monitored for signs of contamination. Page #5 of the instruction manual suggests that the oil be changed bi-weekly. Due to the cost of vacuum pump oil, and in view of the CA vapour application, the user should be informed that the use of reclaimed oil is a feasible process.

When allowed to stand undisturbed, condensed water will separate from the oil and settle on the bottom of the container. This will allow the technician to pour off or skim the "fresh" clear oil for re-use. Of course, it still remains to be seen how "fresh" and free from other significant contamination, this oil really is. Presently, however, the judicious recycling of such is a feasible option that should be left open to the user, if only for purposes of "flushing" the system in between oil changes.

### DOCUMENTATION RECEIVED

The information package received contained the following: operating instructions, Vacuum Sentry manual, Speedi-valve manual, Thermocouple Gauge instructions and the Vacuum Pump instruction manual.

Office staff have generally avoided all but the operating instructions in their perusal of the system's literature. Much of this information is of a technical nature and presents a daunting challenge to the uninitiated. I feel that key information from these sources should be paraphrased and amalgamated into our hypothetical "Layman's Introductory Guide" to basic vacuum principles, as mentioned on Page 1. Clarification of the principles and use of the gas ballast, thermocouple gauge and solenoid valve should also be addressed.

For the technically adept, I would still retain the other documentation in the information package. This approach should bolster the understanding of the various theories and principles involved, thus enabling the technician to use the apparatus with confidence.

**WATKIN VACUUM FINGERPRINT EVALUATION**

**OTTAWA POLICE**

Ottawa Police Service,  
Identification Section,  
474 Elgin Street,  
Ottawa, Ontario,  
K2P 2J6

To: John Arnold, Chief Scientist  
Canadian Police Research Center  
Box/C.P. 8885,  
Ottawa, Ontario  
K1G 3M8

Re: Watkin Vacuum Fingerprint Chamber Evaluation

Dear Mr. Arnold,

The Ottawa Police Service has been operating the Watkin Vacuum Fingerprint Chamber for the last several months.. To date 144 items have been fingerprinted with a total of nine (9) fingerprints being developed.

During the test period the chamber was inoperable for a period of time due to the installation of a new gauge panel. The supplied replacement panel was shipped with a defective solenoid switch.

The chamber design needs improvement in so far as the gauge panel is concerned. There is an excessive amount of vibration being transferred from the motor to the gauge panel causing needle vibration in the gauge ( and possibly gauge damage ). It has been our experience that placing a roll of paper towel between the unsupported upper left corner of the control panel frame and the chamber cylinder greatly reduces the vibration. ETM industries have been contacted about this problem and advised that they are looking into it.

A further design problem is with the coarse particle filters fitted into the chamber bottom. These filters are continually being dislodged when the exhibit tray is pulled out or on occasion when the speedi-valve is opened to clear the chamber vacuum. The installation of a track shelf along the chamber sides may help to alleviate this problem.

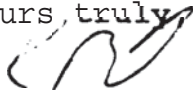


2.

The chamber has worked well and the test impressions fumed with the scene exhibits have consistently shown good quality fingerprints. The introduction of TEC dye is expected to further enhance the recovery of identifiable fingerprints.

If you have any further questions, please do not hesitate to contact me.

Yours, truly



Sgt Ron Bird  
Ottawa Police Identification Section  
236-0311 Ext. 317

**WATKIN VACUUM FINGERPRINT EVALUATION**

**Sûreté du Québec**



GRAND WARTIER GÉNÉRAL

Case postale 1400  
Succursale "C"  
Montréal, Québec  
H2L 4K7

Votre dossier .....  
Notre dossier . 461 - 1. ....

Enquêtes criminelles et  
supports techniques

Le 10 février 1993

Monsieur John Arnold  
Chief Scientist  
Centre canadien de recherches  
policières  
C.P. 8885  
Ottawa (Ontario)  
K1G 3M8

**Objet: Chambre à vide pour empreintes digitales  
Rapport d'essais**

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Suite à notre participation à votre projet CPRC "Technical Platform Project" et relatif à l'essai de la chambre à vide Watkins, vous trouverez ci-inclus le rapport que nous avons préparé à la suite des essais.

Ce rapport a été rédigé conformément à l'entente intervenue entre la Sûreté du Québec et votre organisme.

Pour toute information complémentaire relative à ce rapport et aux recommandations que nous avons formulées, je vous invite à communiquer avec monsieur Jean-François Bellemare au numéro (514) 598-4535.

Le tout vous est transmis pour votre information et pour les actions que vous jugerez utiles.

Le chef du Service de l'identité judiciaire,

Jean Fiset, lieutenant (0324)  
(514) 598-4515

JFB/mp  
p.j.

C.C. Inspecteur Jacques Trudel, Supports techniques  
Sergent Yves Charron, Scenes de crime Montreal

**SURETÉ DU QUÉBEC**

**SERVICE DE L'IDENTITÉ JUDICIAIRE**

**CHAMBRE A VIDE**

**RAPPORT D'ESSAI**

**461-1**

Par: Jean-François Bellemare  
Février 1993

## **INTRODUCTION**

Au mois de juillet 1992, la Division de l'identité judiciaire de la Sûreté du Québec acceptait de participer à un projet de recherche et d'analyse en rapport avec l'utilisation de la chambre à vide mis au point par le Dr. Watkins.

Suite à des essais d'une durée de six (6) mois et conformément aux ententes intervenues à l'époque, nous avons préparé ce rapport qui présente les résultats des essais que nous avons obtenus et les observations relatives à la chambre à vide.

## ASPECTS GÉNÉRAUX

Le projet de recherches et d'analyses consistait à:

1. Évaluer le concept de traitement des pièces à conviction au moyen des vapeurs de cyanoacrylate, en milieu de vide partiel;
2. évaluer la pertinence d'utiliser le concept de vide partiel dans le traitement des pièces à conviction;
3. évaluer la chambre à vide Watkins, sur le plan de sa conception mécanique et de la qualité de ses composantes;
4. soumettre un rapport de nos observations.

### CONCEPT DE TRAITEMENT SOUS VIDE PARTIEL

Le concept même de l'utilisation des vapeurs de cyanoacrylate en milieu de vide partiel ne fait pas de doute.

A cet effet, il a été mis en évidence que les vapeurs de cyanoacrylate s'infiltrèrent partout où il y a porosité, et développent les empreintes digitales latentes qui sont été apposées sur les surfaces.

La qualité des empreintes développées en milieu de vide partiel, est supérieure en général, à celles développées en atmosphère normale dans nos cabinets de fumigation.

**UTILITÉ DU CONCEPT  
[ SOUS VIDE PARTIEL ]  
EN LABORATOIRE D'IDENTITÉ**

Le fait que les vapeurs de cyanoacrylate s'infiltrant par toute porosité lorsqu'elles sont utilisées en milieu de vide partiel, est particulièrement intéressant sur le plan pratique, dû au fait que certains emballages plastiques peuvent être traités efficacement sans être ouverts, donc, évitant ainsi des manipulations toujours... risquées.

C'est précisément au niveau de ces applications que la chambre à vide s'avère efficace et utile en traitement d'empreintes digitales latentes.

## **UTILISATION DE LA CHAMBRE A VIDE**

L'utilisation de la chambre à vide Watkins nous a permis d'en apprécier les qualités, les limites et aussi les lacunes sur la plan de sa conception et au niveau de ses composantes.

### **APPRÉCIATION DES QUALITÉS TECHNIQUES**

Les qualités que nous avons pu apprécier ont été les suivantes:

Appareil solide, et bien construit en general.

Composantes faciles d'accès.

Bonne qualité générale du montage mécanique.

Bonne qualité des accessoires fournis.

### **LIMITES**

Comme tout appareil, la chambre à vide Watkins a ses limites au niveau de la grosseur des pièces rigides pouvant être traitées.



A cet effet, le volume intérieur de l'appareil que nous avons, nous semble adéquat pour traiter un fort pourcentage des pièces à conviction ( plus de 70% ) sur **le plan de leur grosseur.**

## **A S P E C T S N É G A T I F S**

Malgré les grandes qualités que nous avons été à même d'apprécier, nous avons par contre identifié quelques problèmes.

Les problèmes identifiés sont les suivants:

Le compresseur contient une huile spéciale, laquelle doit être changée fréquemment (à toutes les dix ( 10 ) utilisations environ ), dû à sa contamination par les résidus de cyanoacrylate.

Cet entretien demande du temps, et représente des coûts d'opération. L'huile pour ce type de compresseur étant relativement dispendieuse ( 4,00\$ le litre ).

En retablissant la pression à l'intérieur de la chambre à vide, l'huile du compresseur sort (en très faible quantité) par le boyau en matière plastique raccordé au compresseur, ce qui est désagréable surtout dans un laboratoire où la propreté est de rigueur.

Il faut aussi disposer de l'huile contaminée, ce qui constitue un autre problème.

La pression négative ( vacuum ) à l'intérieur de la chambre à vide n'est pas constante il semble aussi qu'il y ait un problème d'étanchéité de la porte et de d'autres composantes.

Cette constatation est faite en consultant les indications apparaissant sur le cadran de l'appareil.

Le sensor n'est pas place à un endroit pratique, ce qui **pour**-rait faire en sorte que des debris accumulés sur la coupelle rouge dans le cabinet puissent fausser la lecture du cadran ( voir le schema-02 ).

Le concept de charnières fait en sorte que la porte ne se ferme pas toujours à la même position, ce qui est susceptible ( possiblement ) de causer des fuites.

Le dispositif de verrouillage de la porte ne nous apparaît pas aller de pair avec l'apparence du reste de l'appareil. Ce dispositif fait plutôt... " bon marché ".

L'appareil est pourvu de deux ( 2 ) roulettes fixes et deux ( 2 ) roulettes pivotantes, ce qui rend difficile son déplacement dans des espaces exigus.

La majorité des points "négatifs" pourraient possiblement être éliminés, ou du moins, leurs consequences sensiblement diminuées.

## **RECOMMANDATIONS**

Suivie aux expériences réalisées avec la chambre à vide, nous formulons les recommandations suivantes:

### **LE COMPRESSEUR**

Installer un compresseur sans huile, afin d'éliminer les problèmes de contamination, de manipulation et d'entretien.

### **LE SENSOR**

Installer le sensor au niveau de la valve servant à rétablir la pression dans l'appareil.

L'installation du sensor à cet endroit aurait pour conséquence de donner une lecture beaucoup plus juste sur le cadran (**voir** le schema-03 ).

### **LA PORTE**

Installer un dispositif permettant de toujours refermer la porte dans la même position.

Ce dispositif pourrait ressembler à celui illustré sur le schema-04, ou être équivalent.

L'installation de ce "dispositif" pourrait possiblement éviter les fuites dans l'appareil

## LES ROULETTES

Nous recommandons l'installation de quatre (4) roulettes **pivotantes, de** façon à faciliter grandement le déplacement de l'appareil dans les endroits restreints.

**L'expérience future** nous amènera certes à apprécier encore plus les qualités de la chambre à vide, et à pouvoir en tirer le meilleur parti possible en matière de rélation d'empreintes digitales latentes.

*SCHÉMAS*

*DE LA*

*CHAMBRE A VIDE*

**SCHÉMA-01**

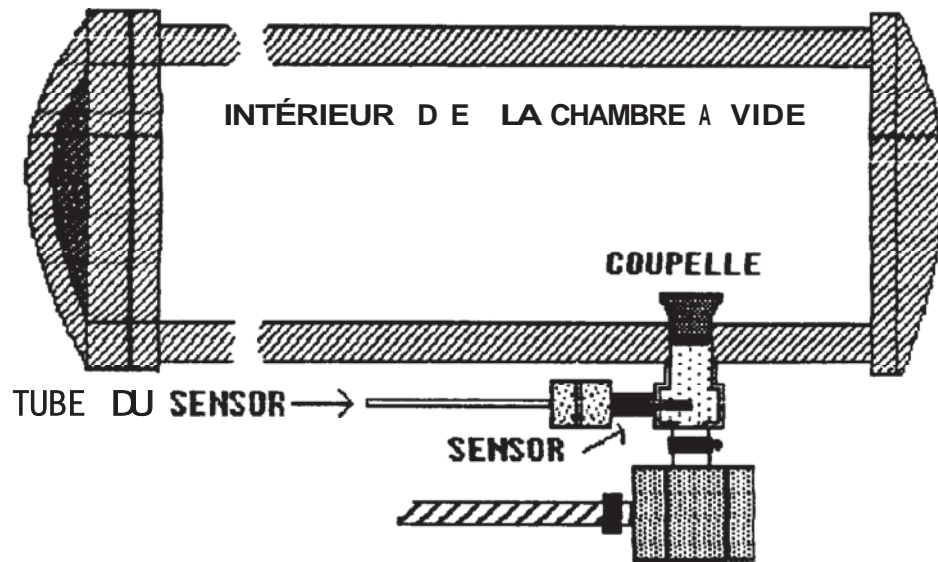


SCHÉMA-02

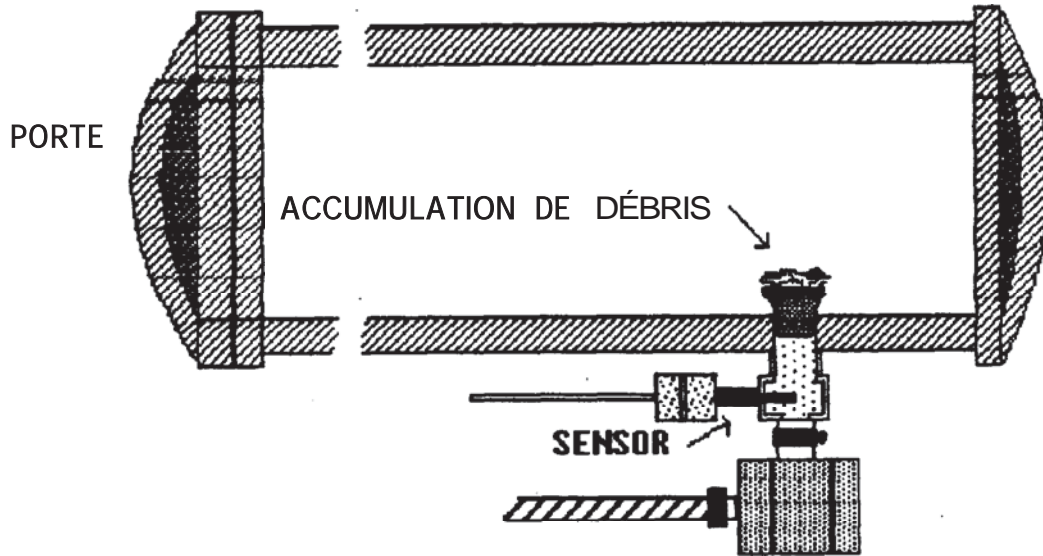
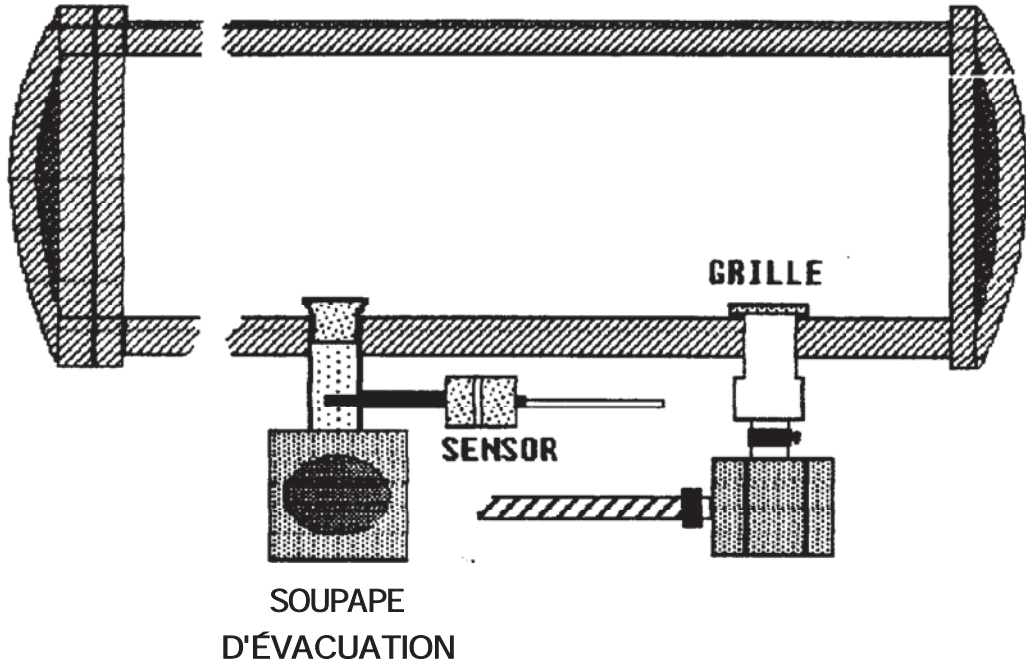


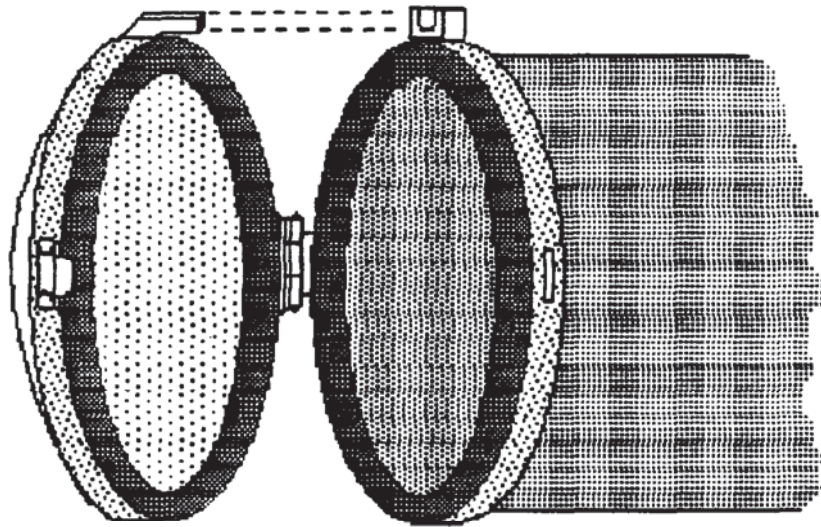
SCHÉMA-03





## SCHÉMA-04

### DISPOSITIF D'ALIGNEMENT DE LA PORTE



## *CONCLUSION*

Les points énoncés dans ce document ont pour but de porter à l'attention des personnes impliquées dans la fabrication de la chambre à vide, les qualités de l'appareil et certains problèmes de conception mécanique.

L'objectif que nous poursuivons par ce rapport, est d'apporter notre contribution qui fera en sorte que les futurs modèles de chambre à vide pourraient être améliorés.

**WATKIN VACUUM FINGERPRINT EVALUATION  
VANCOUVER POLICE DEPARTMENT**



JUN 7 1993

W.T. Marshall  
Chief Constable

June 1, 1993.

Mr. John Arnold, Chief Scientist  
Canadian Police Research Centre  
Ottawa, Ontario  
KIA OR6

Dear John,

This is in response to your request for an evaluation of the Watkin Vacuum Fingerprint Chamber. After considerable delay we now have a properly functioning vacuum chamber.

The initial chamber had a faulty vacuum gauge which was changed over when ETM Industries sent us a new control panel and vacuum gauge. This, however, did not alleviate the problem as we were unable to develop enough vacuum in the chamber to vaporize the glue. After changing the oil and several phone calls to Dave Richard of ETM Industries, it was decided that there was a problem with the pump and motor assembly. The pump and motor were crated and couriered to ETM.

Dave Richard contacted us and informed us that the pump and the motor were functioning perfectly and that the problem could be an improper solenoid installed in the replacement gauge panel. This was found to be the case and was exchanged with the old panel. The pump and motor, upon arrival back in Vancouver, was reinstalled and operated properly.

The vacuum chamber has effectively only been in operation since April 15/93 and as such, is only beginning to be properly evaluated. We have just received budget approval to purchase a Polilight and have had little opportunity to use any of the dyes. We are also getting some Tec dye and will begin using and experimenting with these enhancers.

The bottom line is that we are now happy with the operation of the vacuum chamber, however, we are just beginning to realize the full value of the chamber with the acquisition of the Polilight and the various enhancing dyes.

Dave Tyler, Cpl. #521  
Forensic Identification Squad.

**WATKIN VACUUM FINGERPRINT EVALUATION**  
**WINNIPEG POLICE DEPARTMENT**



# Winnipeg Police Department

## Police de Winnipeg

P.O. BOX/ B.P. 1680 • WINNIPEG • MANITOBA • R3C 2Z7  
TELEPHONE (204) 986-6037  
FAX: (204) 944-8468

Address all correspondence  
to Chief of Police

Adresser toute correspondance  
au Chef de police



93-03-13

Attention: John ARNOLD,  
Chief Scientist,  
Canadian Police Research Centre,  
Ottawa, Ontario,  
K1A OR6

Dear Sir:

RE: Vacuum Fingerprint Chamber Evaluation

In general, the vacuum chamber has been used to the satisfaction of our members and the results have been very successful in comparison to the heat and humidity method when examining exhibits with cyanoacrylate. Fingerprints developed in the vacuum chamber have been enhanced for viewing using Ardrox and U.V. lighting. Limited testing to date using Thenoyl Europium Chelate by our department has demonstrated the possible potential for further enhancement over the ardrox method.

The following are recommendations to correct the problems that we have encountered with the vacuum chamber:

- 1) - Documentation for the unit is very good in so far as the initial start up procedures and general use of the unit, but falls short in the area of maintenance. In particular, information is required on:
  - a) - servicing and changing the "O" rings,
  - b) - how the build up of cyanoacrylate in the Speedi-valve and Vacuum Sentry valve affects the operation of the chamber.
  - c) - how and at what intervals should the Speedi-valve and Vacuum Sentry valve be serviced.
- 2) - The present mounting system for the vacuum gauge creates vibration which besides being loud and annoying, appears to be the cause for the recent malfunction of the new "Piranni" vacuum gauge installed on our unit. It is recommended that a vibration free mount be designed to isolate the gauge or gauge panel from vibration.

continued.....

**WINNIPEG**  
ONE GREAT CITY!

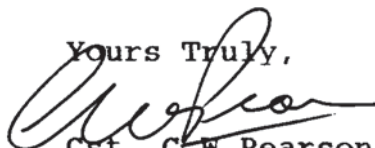
(2)

- 3) - During the operation of the pump an oil mist is discharged from the unit until a specific vacuum is reached. It is recommended that an oil mist filter be included as standard equipment.
- 4) - The six plastic feet that attach to the bottom of the exhibit tray to eliminate scratching to the interior of the chamber are not well secured. During normal operation of the unit, the rivets used to secure the feet have constantly broken off. It is recommended that these feet be secured in a better manner.
- 5) - To ensure proper servicing and top performance of the unit it is recommended that service kits be made up consisting of oil, new "O" rings, grease for the "O" rings such as "M" grease manufactured by Apiezon Products Ltd. of 4 York Rd., S.E.1, London, England. A minimum of 2 such kits should be supplied with the delivered unit.

The vacuum chamber. unit has been well received by our department. It is portable enough so that it can be placed out of the way when not in use and the table top is a very practical design. In addition to fingerprints being developed, some very excellent footwear impressions have been developed on plastic bags.

I hope the above information has been of benefit to you in evaluating the vacuum chamber. If you have any questions please contact me.

Yours Truly,



Cst. C.W. Pearson  
Winnipeg Police Department  
Identification Unit

**WATKIN VACUUM FINGERPRINT EVALUATION**

**YORK REGIONAL POLICE**





17360 Yonge Street  
 Newmarket, Ontario  
 Canada L3Y 4W5  
 (416) 895-1221 Fax (416) 853-5810

Address all correspondence to:



Bryan Cousioeau  
 Chief of Police

Reference:

June 16, 1993

John Arnold, Chief Scientist  
 Canadian Police Research Centre  
 National Research Council  
 Ottawa, Ontario  
 K1A 0R6

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Dear Mr. Arnold:

Attached, please find a report submitted by Detective Brad Powell #187 in relation to the use of a Vacuum Chamber.

Should you have any questions or require further information regarding this matter, please feel free to contact Inspector A. Thompson, Officer in charge of our Forensic Identification Bureau, or Detective Powell at (416) 895-1221, extension 225.

Please be assured of our continued co-operation in all matters of mutual concern.

Yours truly,

Eugene Kerrigan  
 Inspector #327  
 Investigative Services

EK:aw  
 enclosure(s)

C.C. Inspector A. Thompson  
 Ident

DEEDS SPEAK

June 4, 1993

John Arnold  
Chief Scientist  
Canadian Police Research Centre

REF: WATKIN VACUUM FINGERPRINT CHAMBER EVALUATION

Dear Mr Arnold

I must apologize for not having sent this evaluation sooner, however I wanted feed back from all the Forensic Identification Technicians that are involved in the use of the vacuum chamber.

I was tasked with the set up and testing of the vacuum chamber. I found the documentation to be adequate for this purpose. The only area that I found it lacking was in relation to preventive maintenance ie.oil change intervals .

When the chamber was first tested there was no problem in obtaining a pressure of 200 millitorr, in fact this was reached in 3 minutes 40 seconds. Since then I have not been able to get the pressure that low. The chamber routinely reaches 500 millitorr however the running of the pump beyond this point serves little purpose. I realize this pressure is sufficient to obtain the desired results, however one must wonder as to the reason why there is an inability to reach the 200 millitorr mark.

The noise level of the pump seems to be a common complaint. This can be reduced significantly by eliminating the vibrations that are being transmitted from the pump to the control panel. This could be accomplished by installing some type of rubber or spring mounts for the pump and/or the stiffening of the control panel and the frame work to which it is mounted. The vibration at the control panel is very evident by viewing the needle fluctuations. A little experimentation showed that a slight hand pressure on the control panel dampened out the vibration and reduced the noise level. This vibration also necessitates the tightening of the clamps on the o-rings on a regular basis.

The documentation that was supplied with the 'Pirrani" vacuum gauge was straight forward and the change was effected without problem. We did however encounter some difficulty in determining the operating range. This was clarified by ETM Industries.

The Watkin vacuum Chamber appears to me to be the method of choice when glue fuming is required. I have had better results with this method than the original heat and moisture method, particularly so when dealing with garbage and the zip lock type bags. This opinion is not shared by all the members of the unit.

I would be interested in any new applications or methods for using the vacuum chamber. Further information by means of publication , or seminars on the use of chemical enhancement would be beneficial.

Yours Truly,

A handwritten signature in cursive script, appearing to read "Brad Powell".

Detective Brad Powell 4187  
York Regional Police  
Forensic Identification Bureau

cc Inspector Alvin Thompson