RECOVERY OF MACHINERY AND EQUIPMENT FOLLOWING DISASTER INCIDENTS

FOR EQUIPMENT OWNERS AND USERS

BELFOR

The occurrence of a disaster is a devastating experience for any organisation, especially for the shareholders and employees.

The first consideration of senior personnel, after ensuring the safety of the employees, is usually "how do we reinstate business operations with the minimum of delay?"

Commonly, senior personnel are inundated with tasks requiring their urgent attention, and information and advice received from various parties involved or wishing to become involved. The task of determining the optimum course of reinstatement for the organisation is often very difficult. If, however, all decisions regarding reinstatement are based upon economics, including the cost of business interruption, then reinstatement in the most effective manner will almost always be achieved. Resuming business operations, within the shortest period of time, should be the underlying basis for all decisions made.

Unfortunately, progress being made by persons tasked with the reinstatement process is too often inhibited by conflicting opinions presented by equipment suppliers, advisors and equipment recovery specialists. Having frequently witnessed such situations over the past years, the technical team at BELFOR pooled their ideas, and produced this simple guide, in order to assist persons tasked with the reinstatement process, in quickly understanding the key issues.

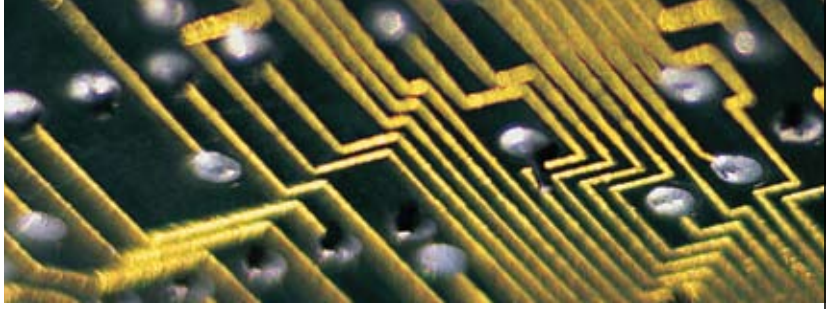
This guide covers critical considerations, such as:

- The effect of contamination incidents upon equipment
- Essential first measures necessary to stabilise the condition of equipment
- Assessment of the condition of equipment, and the basis for determining the most effective reinstatement option
- The recovery process
- Selecting appropriate service providers
- Costs of recovery versus replacement
- Warranty considerations

Brian Whitmore
Managing Director
BELFOR (Asia) Pte Ltd

CONTENTS

1.0	**INTRODUCTION**	2
2.0	**CONTAMINATION/DAMAGE TO EQUIPMENT**	4
2.1	Fire contamination	4
2.2	Water contamination	6
2.3	Impact damage	7
3.0	**STABILISATION OF EQUIPMENT CONDITION**	8
4.0	**ASSESSMENT OF CONTAMINATED EQUIPMENT**	12
5.0	**RECOVERY OF MACHINERY AND EQUIPMENT**	14
6.0	**WHO IS BEST PLACED TO RESPOND TO DISASTER INCIDENTS?**	17
7.0	**COST OF RECOVERY VERSUS REPLACEMENT**	20
8.0	**RECOVERY OF INSURED EQUIPMENT**	21
9.0	**WARRANTY/MAINTENANCE CONTRACT ISSUES**	22
	QUESTIONS AND ANSWERS	24



1.0 INTRODUCTION

In cases of disaster incidents caused by fire, water, or other chemical residues, or in cases of impact damage to machinery and equipment, **significant savings** which might have been made in respect to:

- Minimisation of business interruption costs
- Capital cost of replacement equipment
- Preservation of client base

Significant savings are often lost, due to the manner in which the initial reaction to the disaster incident is handled.

are often lost, due to the manner in which the initial reaction to the disaster incident is handled. Persons involved in a contamination/damage incident for the first time are often unaware that sophisticated technical equipment can be successfully recovered and recommissioned, in a relatively brief period of time, if processed by a professional engineering recovery specialist.

Many equipment users regard the original equipment manufacturer (OEM) as being the authority in regard to all matters concerning technical equipment. It is acknowledged that the OEM has many skills. The OEM initially designed, manufactured, and supplied the item in question, and has usually installed, commissioned and since serviced the equipment.

Recovery involves utilisation of the skills of a recovery specialist. Such skills are not normally possessed by the OEM.

Recovery of technical equipment, following the occurrence of disasters, however, not only involves utilisation of several of the above competencies, but principally requires additional skills which are not normally available from the OEM. Tasks such as total dismantling remote from the OEM facility, treatment of all components for the removal of contaminants/corrosion and reassembly, all carried out on an urgent 24 hour around the clock basis, are tasks which the OEM is almost never equipped or sufficiently skilled to carry out.

Consequently the OEM, when questioned concerning the feasibility of carrying out recovery of contaminated/damaged equipment, will tend to advance the opinion

that recovery of the affected equipment is “technically not feasible”. This opinion may be correct in respect to the skills of the OEM, but is not correct in terms of the wider range of services available worldwide.

The OEM will invariably advance the opinion that recovery is “technically not feasible”.

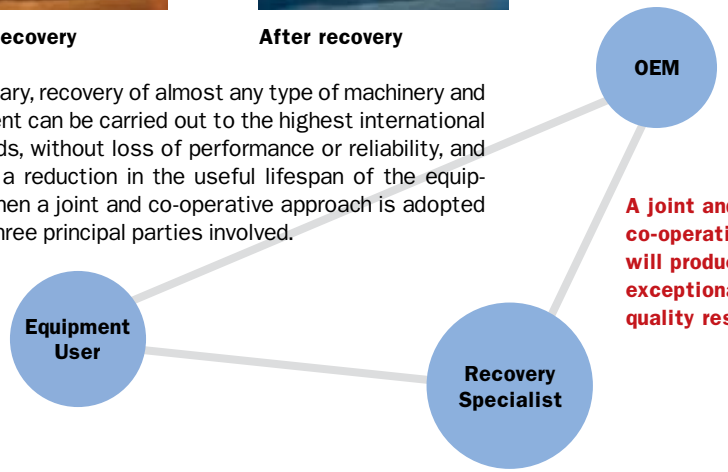
There are professional recovery specialists available who have the skills required, in order to carry out the critical decontamination phase of the recovery project, enabling the OEM to complete the project by carrying out recommissioning and repair activities (where required).

Before recovery

After recovery

Almost any type of contaminated technical equipment can be successfully recovered.

In summary, recovery of almost any type of machinery and equipment can be carried out to the highest international standards, without loss of performance or reliability, and without a reduction in the useful lifespan of the equipment, when a joint and co-operative approach is adopted by the three principal parties involved.



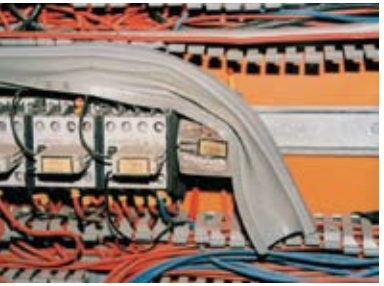
A joint and co-operative approach will produce an exceptionally high quality result.

2.0 CONTAMINATION / DAMAGE TO EQUIPMENT

Contamination /damage to machinery and equipment is most commonly caused by incidents involving exposure to fire, water or impact. Each situation affects the equipment in a different manner, and therefore requires a different recovery approach.

2.1 Fire Contamination

A fire incident can lead to equipment becoming exposed to high temperatures, potentially corrosive contamination in gaseous form, and electrically conductive contamination in the form of soot.



Equipment located at the seat of the fire, has usually suffered thermal damage, and cannot be recovered.

Equipment located some distance from the seat of the fire may not have been exposed to damaging high temperatures, and can often be recovered

- **Damage Caused by High Temperatures**

  All components have a designed maximum rated temperature. Once this maximum temperature rating has been exceeded, permanent damage will usually occur. Once damaged, individual components of equipment must be replaced with new components.

  Equipment located at the seat of the fire often experiences permanent damage to a substantial number of components. Recovery, in such instances, often becomes uneconomical to carry out in respect to these items, due to the large number of components which require replacement (with spare parts).

  Equipment located further from the seat of the fire may well have not been exposed to damaging temperatures at all. Such equipment can usually be economically recovered.

- **Contamination**

  In a typical fire situation, a chaotic reaction occurs, with numerous materials and compounds being consumed by fire. The ensuing gas and smoke contains a multitude of chemical elements, due to the chemical reactions which occur. Furthermore, in many fire situations, a significant quantity of PVC materials is consumed.

  PVC, when consumed by fire, will produce chloride. When combined with high ambient humidity levels, hydrochloric acid corrosion cells are initiated on exposed metallic surfaces. These corrosion cells will continue indefinitely, unless thorough decontamination measures are undertaken, as a matter of urgency.

  The important point to note is that initially following a fire, soot and other fire products can be classified as surface **contamination** only, and this **contamination** can be removed. At this point in time, **damage** has not normally occurred. If, however, **contamination** is not immediately removed from metallic surfaces, or stabilisation (corrosion inhibiting) measures are not implemented, corrosion may occur, leading to **damage**. It is important to understand the difference between **contamination** and **damage**.

- **Electrical Damage**

  Very often, electrical equipment remains energised, at least during the initial stages of a fire incident. As soot deposits (which are conductive) build up between electrical conductors (on printed circuit boards, wiring connectors etc.) an increasing risk arises of short circuits occurring. Short circuits can cause damage to occur to the components involved.

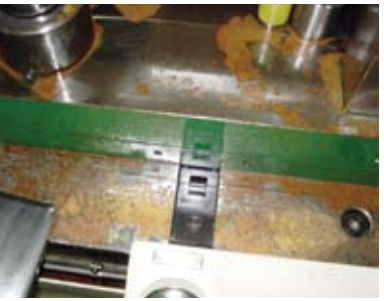
The burning of PVC often produces hydrochloric acid.

Immediately following a fire incident, equipment is usually contaminated only, not damaged. Contamination can be removed successfully.

Electrical failure can occur when equipment remains energised.

2.0 CONTAMINATION / DAMAGE TO EQUIPMENT

Flood or fire extinguishing water usually contains corrosive contaminants.



Electrical failure can occur when equipment remains energised.

2.2 Water Contamination

A situation where water ingress to machinery and equipment occurs (either by dripping, spraying or flooding) can lead to equipment becoming exposed to potentially corrosive contamination, and electrically conductive contamination.

- **Contamination**

  Pure water in itself is generally not harmful to components of equipment. In fact de-ionised water is widely utilised in the precision cleaning of electronic and other sensitive components.

  Water which enters equipment in an accident or uncontrolled situation is seldom pure, and usually contains potentially corrosive contaminants.

  Drying procedures will evaporate and effectively remove water, however, water borne contaminants which entered the equipment will remain on component surfaces. As with fire contamination, provided that professional recovery techniques are employed, this contamination can be effectively removed.

- **Electrical Damage**

  As with fire contamination, electrical damage can occur to electrical and electronic equipment, during water ingress, when the equipment remains energised. Moisture can cause short circuits to occur, leading to damage to components.

  Once individual components have been damaged, such components must be replaced with new components, as part of the recovery process.

2.3 Impact Damage

Impact damage to equipment (which most frequently occurs during transportation operations), often results in permanent damage occurring to a number of components in the vicinity of the impact.

Frequently, all other components of the machine or equipment are totally unaffected.

Recovery of such equipment simply involves removal of damaged components, and the fitting of new replacement components (spare parts), followed by recommissioning. It seldom occurs that such work cannot be carried out in the field.

Reinstatement of impact damaged equipment simply involves removal of the damaged components, and replacement with new components.

3.0 STABILISATION OF EQUIPMENT CONDITION

Specific action must be undertaken, in order to halt or control ongoing corrosion.

Once the condition of the equipment has been stabilised, there is usually sufficient time available to accurately assess the situation, and make informed decisions.

Essential Equipment Stabilisation Measures

In the majority of instances, corrosion, precipitated by fire, soot, smoke, water or a combination of these, progressively attacks componentry. Deterioration will continue unless specific action is undertaken in the form of stabilisation measures, in order to halt or control ongoing corrosion. In order for recovery to remain a viable option following a contamination occurrence, it is essential that the equipment is protected from further deterioration as quickly as possible. A delay of only a few days, or in some instances a few hours, in stabilising the condition of equipment can make the difference between recovery remaining economically viable, or becoming an uneconomical proposition.

As soon as a contamination incident has occurred, an experienced recovery specialist should be contacted, in order to implement detailed stabilisation measures to protect equipment from further deterioration.

Such Procedures Provide Substantial Benefits

- Retains the opportunity to recover equipment (in technical terms), while the viability of the various reinstatement options are evaluated.
- Enhances the potential salvage value (should replacement eventually be proven to be the more viable reinstatement option).

The costs of implementing detailed stabilisation measures seldom exceed 2% of the cost of new replacement equipment. When full professional stabilisation measures have been implemented, a salvage value of 10-15% of the replacement price of the equipment can usually be secured. On this basis, stabilisation measures provide substantial benefits, irrespective of whether the eventual solution involves recovery of existing equipment, or replacement with new equipment, and therefore ***such measures should be implemented in all disaster situations, as a matter of course.***

In order to preserve equipment from further deterioration, follow the specific advice forwarded by the recovery specialist.

Following the implementation of stabilisation measures, there is then usually sufficient time available to carry out detailed engineering assessments of the condition of equipment, in order to determine whether the most economically viable option involves professional recovery of existing equipment, or replacement of existing equipment with new equipment.

Actions which should be undertaken as a matter of urgency following a contamination incident:

Fire

- Disconnect equipment from all electrical power sources, including backup batteries and uninterruptible power supplies (UPS systems). At power distribution cubicles, remove fuses and secure circuit breakers in the “off” position.
- Open windows and doors and use fans, in order to remove smoke from the premises.
- Remove portable equipment to a clean, dry area.

3.0 STABILISATION OF EQUIPMENT CONDITION

In order to preserve equipment from further deterioration, follow the specific advice forwarded by the recovery specialist.

Stabilisation measures should be implemented without delay.

- Where building repairs have commenced, protect all equipment with waterproof sheeting.
- Enclose contaminated electrical/electronic equipment in waterproof sheeting. Install portable dehumidifiers, in order to reduce ambient humidity to less than 40% Relative Humidity (RH).
- Preserve exposed metallic surfaces and other corrosion prone surfaces of mechanical equipment with a suitable preservative.
- Control access to affected areas, in order to prevent further spread of smoke, soot and/or water contamination from the fire source, to areas containing equipment, which may yet be uncontaminated.

Water

- Immediately disconnect equipment from all electrical power sources, including backup batteries and UPS systems. At power distribution cubicles, remove fuses and secure circuit breakers in the “off” position.
- If water entered through the ceiling, protect the equipment with plastic sheeting.
- Remove excess water from walls, floors, sub-floors, heating ducts, etc. by vacuum extraction and wiping.
- Remove all wet furniture, packaging materials, filters, etc.
- Turn on heating systems, in order to aid the drying process.
- Enclose contaminated equipment in plastic sheeting. Install portable dehumidifiers, in order to reduce ambient humidity to less than 40% RH.
- Preserve exposed metallic surfaces and other corrosion prone surfaces of mechanical equipment with a suitable preservative.

Industrial Dust and Fire-Extinguishing Powder

- Disconnect all dust-sensitive equipment from power sources.
- Do not operate dust-contaminated equipment.
- Seal off the area from further dust infiltration and eliminate the dust source.
- Change the air filters on equipment which is required to continue to operate, before recovery is carried out.
- Keep equipment as dry as possible wherever fire-extinguishing powder is present.

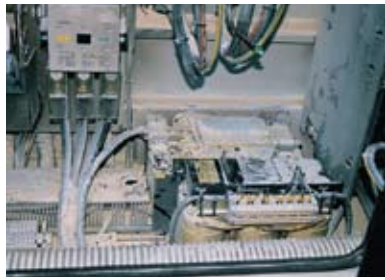
Important Note:

The stabilisation (corrosion prevention) measures outlined above will only minimise the rate of deterioration of the equipment. These measures will never fully halt the progression of corrosion.

Accordingly, during the period prior to commencement of recovery work, the condition of the equipment should be frequently re-assessed. Where it is evident that deterioration is occurring at an unacceptable rate, additional stabilisation measures should be implemented.

Where it is necessary to move equipment from the affected area, treat all equipment, regardless of apparent condition, as if the equipment was new undamaged equipment, during all handling and storage operations.

During the period prior to commencement of recovery work, additional stabilisation measures may be found to be required.



4.0 ASSESSMENT OF CONTAMINATED EQUIPMENT

Objective assessments should be carried out by skilled engineers.

Following stabilisation of contaminated/damaged equipment, it is recommended that an objective assessment of the condition of all affected equipment be carried out by engineers fully trained and experienced in carrying out such assessments. It is also necessary, in certain circumstances, that the OEM is involved, in order to provide information concerning the availability of replacement spare parts.

The OEM, meanwhile, should also concentrate on assembling information concerning the availability and price of new replacement equipment.

The objective of both the recovery specialist and the OEM should be to provide to the equipment owner, within the shortest period of time, all information necessary, in order to allow them to make an informed decision, based upon economics, concerning the most viable course of action to follow (i.e. recovery of existing equipment versus replacement of existing equipment, with new equipment).

In order to make an informed decision, the equipment owner requires to know the following information.

Key information concerning both the recovery option and the replacement option should be compiled.

1. Recovery of Existing Equipment (Recovery Specialist)

- Recovery cost, including the supply of spare parts and recommissioning.
- Realistic estimation of the time required, in order to complete all recovery activities.

2. Replacement with New Equipment (OEM)

- Cost of purchase, delivery, installation, upgrading of services (if required), commissioning, retraining of staff, inventory of spare parts etc. associated with the supply of new equipment.
- Realistic estimation of the time required, to complete all of the above activities, which are required, in order to replace the existing equipment, with new equipment.

3. Business Interruption Cost (Equipment Owner)

- The daily cost of business interruption incurred, as a result of non operation of the equipment involved.

With the above information available, the relative viability of the two options can be assessed:

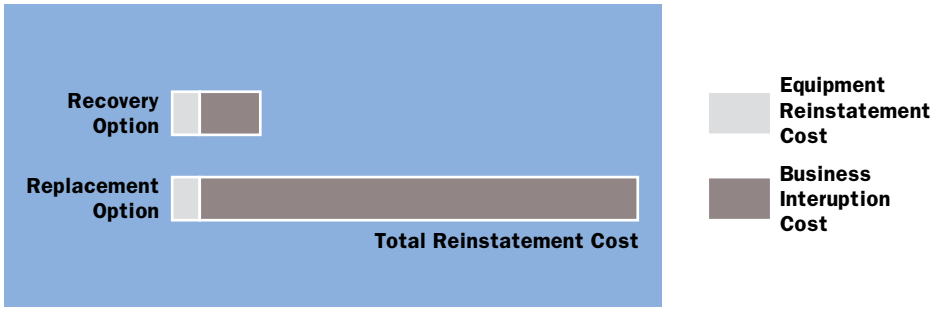
Recovery Option Cost =
Recovery price + (Days of business interruption x daily cost of business interruption)

Replacement Option Cost =
Replacement price + (Days of business interruption x daily cost of business interruption)

The viability of both options, in engineering terms, is well proven.

The viability of options, in financial terms, should now be compared.

With the above information in hand, the decision concerning whether to recover existing equipment, or replace existing equipment with new equipment is usually a straight forward matter.



5.0 RECOVERY OF MACHINERY AND EQUIPMENT

Once it has been determined that recovery of equipment which has been affected by fire or flooding incidents will take place, there are 3 distinct phases of the process which are usually required:

Phase 1
Decontamination

Phase 2
Recommissioning/Repair

Phase 3
Warranty/Maintenance Contract Reinstatement

The recovery process is a 3 phase operation.

The objective of the recovery process is always to achieve the following result:

1. Removal of all contamination introduced by the contamination incident in question, such that the equipment meets, upon completion of the work, predetermined international standards of cleanliness, appropriate to the technology in question. The recovery specialist should be required to guarantee that appropriate standards of cleanliness are met in all instances, and support this claim by providing at least a one year warranty.

Equipment will be returned to service, free of contamination, and performing to OEM specifications, without loss of reliability or lifespan.

2. Reinstatement of the functional capability of the equipment, in compliance with the original manufacturer's specifications, or alternative specifications agreed with the client, prior to commencement of work.

3. The return of the equipment to normal service, without loss of reliability, or lifespan.

Phase 1
Decontamination

As described previously, contamination introduced by fire or flooding incidents usually permeates throughout equipment subassemblies, contaminating difficult to access crevices and interstices, the surfaces of which often perform functions critical to the reliable operation of the equipment (inside electrical plugs and sockets are a good example of such situations).

Fire or flooding incidents cause contamination of all internal components to occur.

In order to achieve complete removal of contamination, which is required in order to produce a certifiable and warrantable result, it is necessary to dismantle the equipment, to the degree that every surface becomes accessible to the recovery technician during the precision cleaning process. In most situations total dismantling is required, in order to achieve this.

Due to the degree of dismantling and subsequent reassembly required, the recovery process requires a relatively high degree of involvement of highly skilled engineers and technicians, which accounts for levels of costs arising, as outlined within section 7.0.

Such contamination necessitates full dismantling of the equipment, followed by an aqueous based precision cleaning process.

Following dismantling, a detailed precision cleaning process is carried out, utilising aqueous based cleaning agents. This precision cleaning process includes the following main steps:

- Pre-cleaning
- Main cleaning including, corrosion removal (employing high pressure spraying techniques)
- Rinsing (including medium pressure rinsing utilising de-ionised water)

5.0 RECOVERY OF MACHINERY AND EQUIPMENT

Following decontamination, testing and recommissioning is required.

On occasions, defective components are identified during the recommissioning phase, requiring that repair work be carried out.

- Drying (including high volume warm air, and vacuum drying techniques)

Following the precision cleaning process, the equipment must of course be reassembled.

Phase 2
Recommissioning/Repair (if required)

Once the decontamination process has been completed, the reassembled equipment requires to be recommissioned, in a similar manner to the way in which the equipment was commissioned, by the original manufacturer, when initially installed.

The process of recommissioning will ensure that the equipment recommences operation smoothly and safely. The recommissioning engineer will identify and carry out minor adjustments which are found to be necessary, and ensure that all functions which the equipment has been designed to perform, are available and operational.

From time to time a small number of defective components are identified, requiring that repair work be undertaken. This repair work should be undertaken, in the same manner as repair work is undertaken following a normal “in service” failure.

Trained and competent technicians or engineers are required to carry out fault diagnosis work, in order to determine which component has failed. Once a faulty component has been identified, this component is usually required to be replaced, with a new component.

Phase 3
Warranty/Maintenance Contract Reinstatement

Please refer to section 9.0 for further details.

Professional disaster response/recovery requires implementation of the various activities covered within sections 3.0 to 5.0. These activities can be grouped as shown below:

Initial Incident Response Process

- Stabilisation
- Inspection
- Assessment
- Defining options

Recovery Process

- Decontamination
- Recommissioning/repair
- Warranty (maintenance contract)

Many equipment users regard the original equipment manufacturer (OEM) as being the authority in regard to all matters concerning technical equipment. It is acknowledged that the OEM has many skills. The OEM initially designed, manufactured and supplied the item in question, and has usually installed, commissioned and since serviced the equipment.

Recovery of technical equipment, following the occurrence of disasters, however, not only involves utilisation of several of the above competencies, but principally requires additional skills which are not normally available from the OEM. Tasks such as total dismantling remote from the OEM facility, treatment of all components for the removal of contaminants/corrosion and reassembly, all carried out on an urgent 24 hour around the clock basis, are tasks which the OEM is almost never equipped or sufficiently skilled to carry out.

6.0 WHO IS BEST PLACED TO RESPOND TO DISASTER INCIDENTS?

Recovery of technical equipment, following contamination incidents involves skills, not normally available from the OEM.

6.0 WHO IS BEST PLACED TO RESPOND TO DISASTER INCIDENTS?

Consequently, the OEM, being not aware of the expertise of recovery specialists, will often advance the opinion that recovery is "technically not feasible."

Consequently the OEM, when questioned concerning the feasibility of carrying out recovery of contaminated/damaged equipment, will tend to advance the opinion that recovery of the affected equipment is "technically not feasible". This opinion may be correct in respect to the skills of the OEM, but is not correct in terms of the wider range of services available worldwide.

The following table compares the range of services provided by professional recovery specialists with those provided by equipment manufacturers.

Range of Skills of Recovery Specialist vs OEM

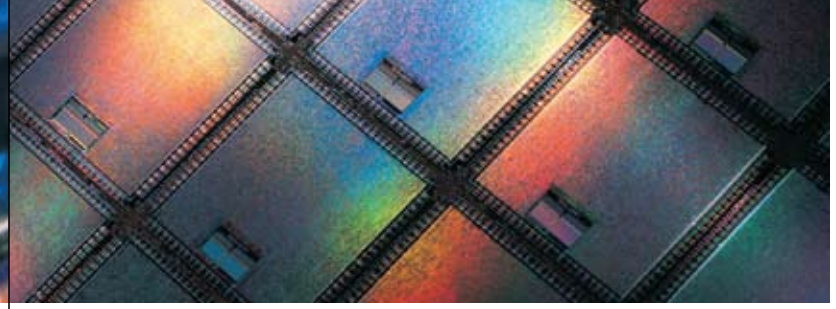
TASK	RECOVERY SPECIALIST	EQUIPMENT MANUFACTURER
Initial Incident Response Process		
Stabilisation, Assessment, Defining Options	Yes	No Experience
Recovery Process		
Decontamination	Yes	No Experience
Recommissioning/ Repair	Yes (refer to note)	Yes
Warranty (Maintenance Contract)	Yes	Yes

Note: Capability may depend upon availability of technical information.

In general, equipment manufacturers have no experience in carrying out the decontamination phase of the recovery process. It is due to this fact that specialist recovery organisations have evolved.

It is preferable that the recommissioning and repair phase of the project be carried out by the equipment manufacturer. If however, the equipment manufacturer fails to perform these services, the recovery specialist can often provide such services directly or via a third party service provider, skilled in the recommissioning and repair of the equipment in question.

In general, equipment manufacturers have no experience in carrying out the decontamination phase of the recovery process.



7.0 COST OF RECOVERY VERSUS REPLACEMENT

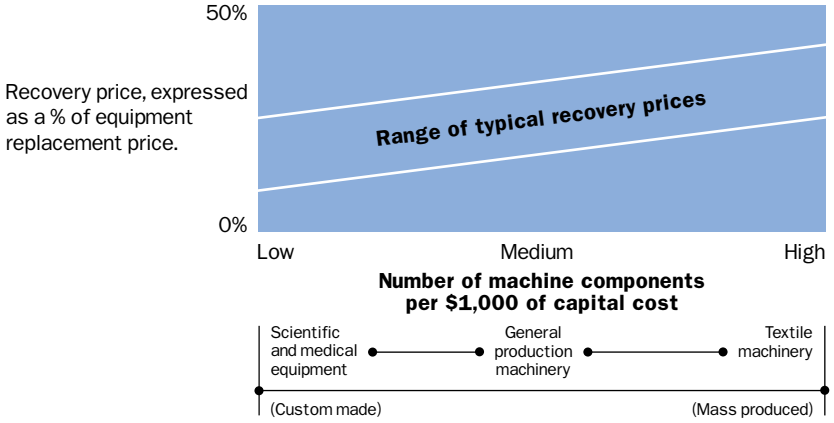
In general, the total cost of recovery of machinery and equipment usually falls within the range of 5-40% of the replacement cost of equipment.

The recovery price submitted by the recovery specialist depends upon the combination of at least the following factors:

- Complexity of the equipment
- Quantity of components
- Degree of contamination
- Facilities available in which to carry out the work
- Location
- Time frame within which recovery is required to be completed
- Replacement spare parts required
- Cleanliness standard required

In general, the total cost of recovery of machinery and equipment usually falls within the range of 5-40% of the replacement cost of equipment.

As the cost of carrying out recovery work depends largely upon the quantity of components which are required to be dismantled, precision cleaned and reassembled, the recovery cost, expressed as a percentage of the new replacement cost of the equipment, tends to vary according to industry type (refer to the graph below).



Contamination incidents involving machinery and equipment are very often the subject of an insurance claim. Personnel representing the recovery organisation are usually not trained in insurance matters. There are, however, several principles which appear to apply to most insurance contracts, which an insured party should be aware of, concerning actions required in order to mitigate the loss (stabilisation), and the issues surrounding entitlement to indemnification of repair costs versus replacement costs.

In all cases, the insured party should seek further clarification of obligations and entitlements under the terms of existing insurance contracts, from their insurance advisers.

8.0 RECOVERY OF INSURED EQUIPMENT

Recovery specialist personnel are not trained in insurance matters.

There are usually various insurance contract compliance issues which equipment owners should be aware of.

Consult your insurance advisers, in respect to all insurance related matters.

9.0 WARRANTY / MAINTENANCE CONTRACT ISSUES

The OEM will usually declare existing warranties "null and void", following a contamination incident.

The recovery specialist will provide a warranty covering the work carried out.

Equipment Covered by Original Manufacturer's Warranty

New machinery and equipment is normally supplied with a manufacturer's warranty, which in most instances extends for a period of 1 year from the date of purchase by the end user. Following the occurrence of significant contamination incidents, such as fire and flooding, the equipment manufacturer will normally declare the existing warranty null and void, as the equipment has been subjected to environmental conditions which were potentially damaging and outside conditions specified by the OEM for normal and reliable operation.

When a recovery specialist carries out decontamination work, a warranty should be provided which guarantees that all contamination has been removed, and that the workmanship provided was of a high standard. This warranty covers the work actually carried out by the recovery specialist.

The warranty provided by the recovery specialist may not include rectification of other faults, which may manifest themselves following recovery, which would have occurred, regardless of whether or not the disaster incident took place. Therefore, in the case of equipment still covered by the original manufacturer's warranty, at the time of the occurrence of a disaster, the basic warranty provided by the recovery specialist may not fully replace the warranty enjoyed prior to the occurrence of the incident (refer to summary).

Equipment Not Covered by Original Manufacturer's Warranty

For equipment which was not covered by a manufacturer's full functional warranty at the time of the contamination occurrence, professional recovery of the equipment to recognised international standards will effectively reinstate the equipment owner/user to pre-incident condition.

Provision of a Period of "Post-Recovery Full Service"

Regardless of OEM warranty conditions prevailing at the time of the disaster incident, if requested, a period of "Post-Recovery Full Service" (equivalent to the manufacturer's original warranty) can often be provided, following completion of recovery work.

"Post-Recovery Full Service" work can either be carried out by the recovery specialist directly, or by the OEM. "Post-Recovery Full Service" is usually provided on a monthly or annual fee basis (in a similar manner to a maintenance contract), in addition to the cost of the provision of recovery services.

If required, a period of "Post-Recovery Full Service" can be provided, on a monthly or annual fee basis.

Summary

In all instances, the provision of a period of "Post-Recovery Full Service" is simply a matter of economics.

QUESTIONS AND ANSWERS

Questions Commonly Asked Concerning Professional Recovery of Equipment

Q: How quickly can a recovery specialist recover equipment?

A: A professional recovery specialist is totally committed to providing a rapid response and can generally recover equipment within a period of days. Time frames for recovery are typically less than 25% of that required to procure new equipment.

Q: Will the functionality of equipment be impaired, or could performance specifications be compromised following professional recovery?

A: No, functionality of equipment will not be impaired or performance specifications compromised! If the recovery specialist considers that an item of equipment can not be recovered to full “pre-incident” condition, they will recommend that the item should best be replaced, with a new item of equipment.

Professional recovery specialists will only recommend professional recovery in situations where detailed technical assessments, carried out by engineers, have verified that the equipment can be returned to full pre-incident condition, in terms of full functionality, reliability and life span.

Q: Will the medium and long term reliability of equipment be compromised following inadvertent contamination and subsequent professional recovery?

A: Reliability of equipment will not be affected, provided that a specialist carries out professional recovery, in full compliance with international standards. There is a wealth of fully documented evidence available, gained over a twenty year period, which offers verification that reliability following recovery exceeds or at least equals pre-incident reliability.

Q: Can a recovery specialist professionally recover equipment without the support of the equipment manufacturer?

A: In the majority of situations, yes! In instances where the recovery specialist does not have the required expertise in-house to complete the final stages of recommissioning, and the equipment manufacturer has elected to deprive their client of such services, the recovery specialist can normally source assistance from independent third party specialists. This includes the procurement and supply of most spare parts.

Q: Can professional recovery proceed if the equipment manufacturer refuses to reinstate warranties following recovery?

A: A professional recovery specialist will provide, as standard, at least a one year comprehensive warranty on all work carried out. Over and above this standard warranty, leading recovery specialists will provide any additional and reasonable degree of warranty cover which might be requested, or maintenance support, for a minimal additional fee.

Q: Does the work carried out by professional recovery specialists conform to any recognised standards?

A: Professional recovery specialists will normally utilise international standards for levels of component cleanliness, such as the Joint Industry Standard ANSI/J-STD-001B.

It is also advisable to select a recovery specialist who constantly ensures that their processes are meeting the expected levels of quality, through ISO 9000 certification, or equivalent auditing processes.

Q: Will electronic components be damaged as a result of thermal energy from a fire?

A: The ability of modern day electronic equipment to withstand high temperatures is misunderstood and under-estimated by the majority of people, including many engineers and technicians. Most integrated circuits and electronic components are specified to be able to withstand temperatures up to 125°C and often up to 150°C or higher. Following manufacture most components are stress, or “burn in” tested, for extended periods of time, at high temperatures. Assembled printed circuit boards are usually “reflow” soldered at temperatures around 180°C to 200°C.

When a professional recovery specialist undertakes assessments of fire contaminated equipment, based upon the condition of various materials used in the manufacture of the equipment, it is possible to establish, with sufficient accuracy, the temperatures which equipment would have been subjected to during the course of the fire. If it is considered that ambient temperatures present during the fire were likely to have exceeded the maximum temperature rating of individual electronic components, recovery of that particular item of equipment would not be recommended.

Q: Will water/moisture/humidity damage sensitive electronic components?

A: Electronic equipment, whilst not electrically energised, is extremely resistant to moisture, and direct contact with water. The ability to withstand moisture is vastly under-estimated by most people, including qualified engineers and technicians.

Following fabrication, semiconductor and most other types of electronic components, are encapsulated and hermetically sealed, and thus are impervious to moisture penetration under normal atmospheric pressures. Following assembly, most printed circuit boards are subjected to an aqueous based cleaning process, usually utilising high pressure spray cleaning techniques. Electronic printed circuit boards are required, by manufacturers, to be capable of withstanding immersion in various liquids, in order to survive the manufacturing process, in excellent condition.

Ingress of moisture/water into electronic equipment, therefore, seldom causes damage to occur (unless the equipment was electrically energised at the time of the incident). Damage really only occurs later, if stabilisation measures are not implemented, and corrosion is allowed to develop.

Q: Why do decisions in regard to recovery have to be made, with a high degree of urgency?

A: Following most contamination situations, the condition of equipment will rapidly deteriorate, usually due to corrosion, to a degree that may result in professional recovery becoming an uneconomically viable proposition.

If you are unable to make a decision to proceed with recovery of equipment within 24 hours, it is strongly recommended that stabilisation of the condition of the equipment be implemented, in order to minimise ongoing deterioration, whilst awaiting a decision on whether to recover or replace the equipment.

Q: Why shouldn't the equipment manufacturer be directly engaged to recover the equipment?

A: The majority of manufacturers will admit to having little or no experience in the field of recovery of technical equipment, following contamination by fire, water, chemical spills etc. Where a manufacturer is prepared to consider undertaking recovery (the majority appear to elect to decline undertaking such work) they will usually attempt "repair" of the equipment by replacing relatively expensive major subassemblies, which could otherwise be decontaminated by a recovery specialist.

This alternative approach to recovery by the equipment manufacturer often results in significantly higher recovery costs, and risk due to residual contamination affecting those components not replaced, combined with longer periods of business interruption, than could otherwise be achieved by utilising the services of a recovery specialist.

Q: Why should we utilise the professional services of a recovery specialist, in preference to a "cleaning" company?

A: Professional equipment recovery specialists are engineering companies, specialising solely in the recovery (restoration) of technical equipment following contamination/damage.

The work which is required to be carried out involves a high degree of dismantling of the equipment, in order to inspect and adequately treat all component parts. This is the only method by which a consistent and warrantable result can be achieved. The high standard of work carried out constitutes professional recovery, and should not be confused with "general cleaning without dismantling" which is often unsuccessfully carried out by "cleaning companies".

Professional equipment recovery was first established as a viable alternative to replacement with new equipment, more than 20 years ago. To date, tens of thousands of successful recovery projects have been carried out worldwide, including examples of virtually every conceivable type of equipment ever manufactured.

QUESTIONS AND ANSWERS

BELFOR

FOR FURTHER INFORMATION PLEASE CONTACT:

Singapore (Regional Head Office)

BELFOR (Asia) Pte Ltd
Email: inquiries@sg.belfor.com

Japan

BELFOR (Japan) Co., Ltd
Email: inquiries@jp.belfor.com

China

BELFOR Recovery Services (Shanghai) Co., Ltd
Email: inquiries@cn.belfor.com

Taiwan

BELFOR (Asia) Pte Ltd - Taiwan Branch
Email: inquiries@tw.belfor.com

www.belfor.com