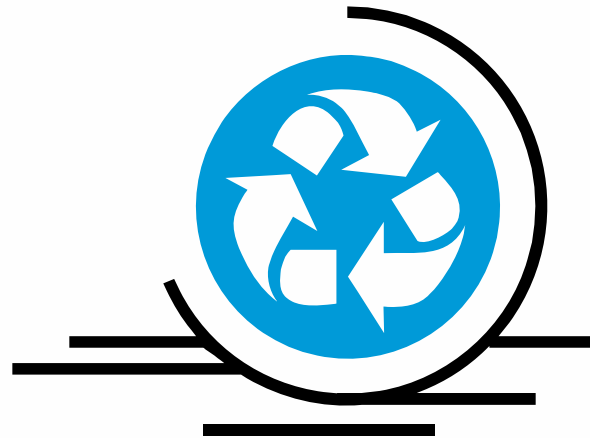


MRT System AB



ENVIRONMENTAL CALL
FOR HIGH-TECH SOLUTION
**MERCURY RECOVERY
TECHNOLOGY**





Introduction

MRT System AB

INTRODUCTION : MRT SYSTEM AB

- MRT System AB is a Swedish company founded in 1979.
- Mercury Recovery Technology : A Swedish Innovation
- The MRT mission and goals
- Mercury : Properties and Function in Lamps and other Electrical Products

THE SWEDISH INVENSION

EPA requested recycling of heavy metals instead of disposal. The Swedish Lamp Producer had to follow, resulting in the first development of a distiller 1975 and the first patent was issued 1978.

THE MRT MISSION AND OBJECTIVES

- To provide environmentally safe and advanced technology for recycling of mercurial waste including the recovery of the mercury
- To provide the most suitable and economical recycling system in accordance with the customers need and the market requirements

GOALS

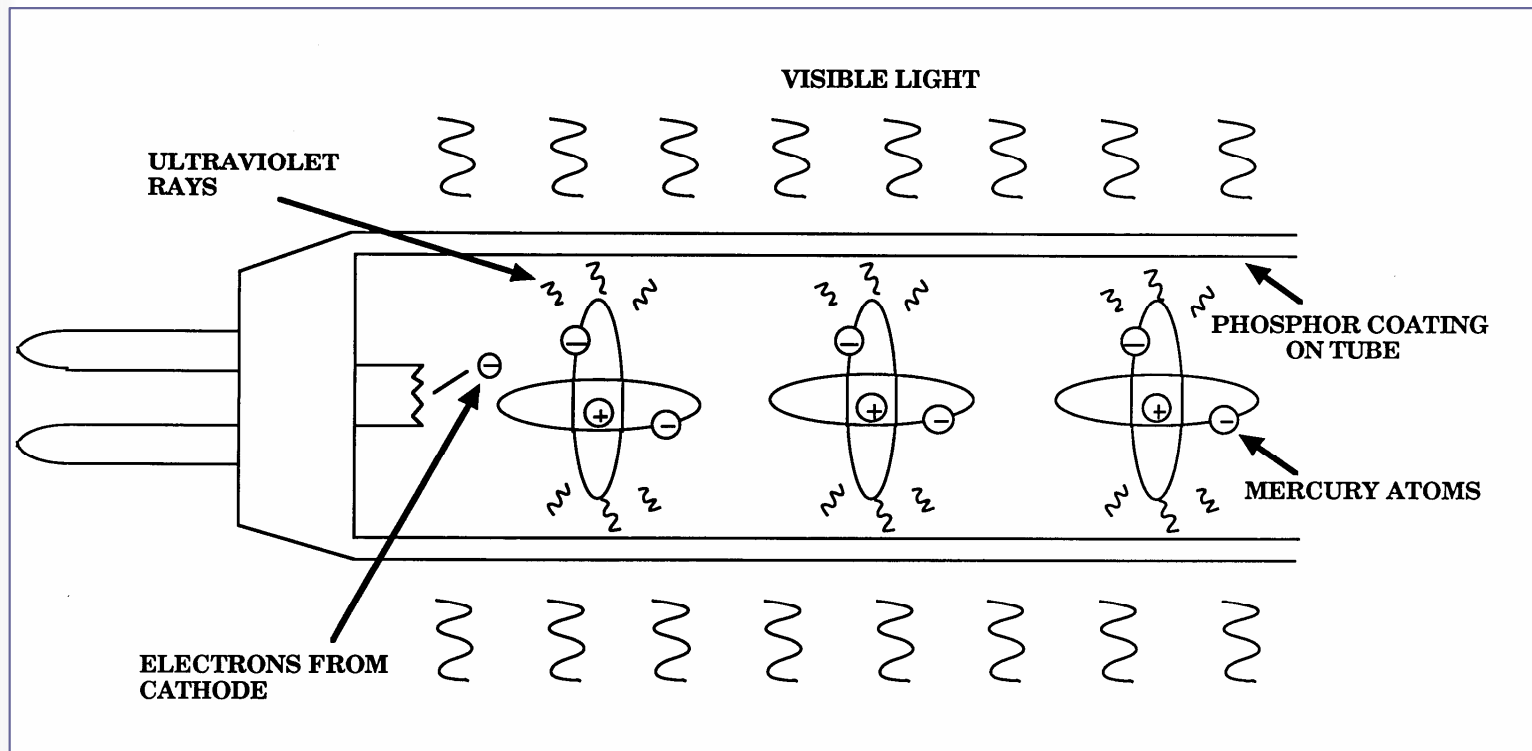
- A. Saving the environment from mercury pollution by minimizing the waste volume from entering into landfills or incineration.**
- B. Utilizing the materials for reuse and thereby reduce the existing mercury volumes in our surrounding.**
- C. Establishing new businesses which creates job opportunities.**
- D. The goals can be achieved by the implementation of more strict regulations for mercurial waste products and the introduction of collection systems and well proven recycling technologies.**

MERCURY : PROPERTIES AND FUNCTIONS IN LAMPS, ETC

Mercury (Hg) is a inorganic silvery-white metal with distinctive properties, such as :

- heavy liquid (specific gravity 13,59)
- melting point $-38,9^{\circ}$ C;
- boiling point 357° C;
- has a high surface tension and low viscosity;
- vaporises at room temperature (vapour pressure 0,012 mm Hg at 20° C);
- insoluble in water;

MERCURY : PROPERTIES AND FUNCTIONS IN LAMPS, ETC



WORLD MARKET OF FLUORESCENT TUBES

Market	No. of million tubes (approx. figures)
European Community	700
USA Canada Mexico	1000
Japan	450
China	600
Brazil	45
Total in the world	Appr. 4 Billion tubes consumed per year.



Environmental Call for High Tech Solution



**Progress on Environmental Awareness and
recycling law implementation
in Countries all around the Globe**

ENVIRONMENTAL LAWS - MERCURY RECOVERY

BASEL CONVENTION (International Members)

USA
Universal Waste Rule

JAPAN
Waste Disposal and
Cleaning Law

EUROPE
Waste Electronic and Electrical
Equipment (WEEE)

ENVIRONMENTAL LAWS - MERCURY RECOVERY



- ↩ The European Waste Electrical and Electronic Equipment (WEEE) Directive will set collection, recycling, and recovery targets for electronic and electrical equipment when it comes into effect. ↗

TARGET IMPLEMENTATION : WEEE DIRECTIVES

The European Commission has laid out a timetable for implementation:

- December 2002 - Directives adopted by European Council and Parliament
- March 2003 - Publication of the directives and entry into force in European law
- September 2004 - Deadline for member states to implement directives into domestic law
- September 2005 - Collection systems must be operational, treatment and financing systems in place and obligations enter into force

MRT offers complete solutions for solving the mercury waste problem in order to meet the WEEE requirements, which includes the Producers Responsibility

Recycling Technology

↪ First Stage

↪ End Cut Technology

↪ Crush and Separation Technology

↪ Second Stage

↪ Distillation

MRT Video Viewing -
Unchain the Future

REFERENCE LISTS OF MRT SYSTEM PER COUNTRY

Country	Standard Distiller	Superior Distiller	Special Distiller	End Cut Machine	Crusher	Crush and Sieving Plant	Compact Crush And Separation	Combination Plant
Sweden	4				12	1		
Germany	8	3	1	5	4			
Czech Rep.	1				1			
Poland	7				1	1	2	
Finland	2			1	1			
Denmark				1	1			
France		1		2	1			
Switzerland	1			1	1			
Netherlands	1			1	2			
USA	7	2		1	5	2	4	
Hungary	4					1	1	
Korea	1					1		
Italy	2				3		2	
Spain	3	1		3	3			
Portugal	1				1		1	
Belgium			1	1				
UK	2	1			2	1	2	
Russia		1					1	
Japan	4	1		4	3		1	
Taiwan	1		2	1				2
China	1						1	
India	1						1	
Indonesia	1						1	
Australia	1						1	
Nigeria	1				1			
Brasil							1	
Mexico	1						1	
Total:	55	10	4	21	42	7	20	2

TAKE ADVANDACE OF THE OPPORTUNITY

MRT Business Concept, and Opportunities



Producers Responsibility and Landfill Restrictions
calls
for High Tech and Economical Solution which are
creating a Great Business Opportunity for the
Recycling Business

GLOBAL RECYCLING OPPORTUNITIES

Sweden achieves (80%) of recycling end-of-life fluorescent tubes!

- ↪ El-Kretsen AB is a service company created by the Electrical and Electronic Trade Association in Sweden to practically fulfil the producer responsibility for WEEE.

(Please visit for reference - <http://www.el-kretsen.se>)



MRT PROJECT FEASIBILITY: Compact Crush Separation Plant

	EURO	EURO	EURO
Equipment cost			
Compact Crush and Separation Plant	300 000	300 000	300 000
Transport and installation	20 000	20 000	20 000
Total:	320 000	320 000	320 000
Annual volume of fluorescent tubes:	2 000 000	3 000 000	4 000 000
Charge per tube (excluding collection fee)	0,25	0,25	0,25
Revenue	500 000	750 000	1 000 000
Costs:			
Depreciation 5 years	64 000	64 000	64 000
Interest rate 7%	22 400	22 400	22 400
Operation cost (two-four workers € 25.000:- each)	50 000	50 000	50 000
Energy and media cost (in Europe) (€ 0,1/kWh = cost in Europe)	500	1 000	1 500
Facility (real estate cost) (€ 2.000:-/month)	2 000	2 000	2 000
Other costs such as test analyses, spare parts etc	8 000	10 000	12 000
Total costs	146 900	149 400	151 900
Profit (excluding cost for collection, transport, admin, marketing, etc)	353 100	600 600	848 100
Break even price per tube	0,07	0,05	0,04
Break even volume	587 600	597 600	607 600



RESULT OF RECYCLING AND TREATMENT

USING MRT TECHNOLOGY SYSTEM

yields exceptionally clean by-products...

- ✓ Glass
- ✓ Metal (Aluminium)
- ✓ Ferro metals
- ✓ Mercury (99.99%)
- ✓ Phosphor powder



MRT CD ROM Viewing – MRT HID LAMP PROCESSOR

ENVIRONMENT CALL FOR HIGH TECH SOLUTION

Performance of the Standard Distiller

Type of material	Capacity litre/batch	Process time	Average residue value mg/kg	* Degree of recovery %	** Purity of the recovered mercury	Max residue value mg/kg
Button cell batteries	120 litre	20-24 hours	35	Normally above 99,5%	Approx 99,9%	100
Glass scrap and metal parts from lamps	120 litre	10-12 hours	3	See enclosed examples	Approx 99,9%	10
Fluorescent powder	120 litre	14-16 hours	5	Approx 99,5%	Approx 99,9%	15

ENVIRONMENTAL LAWS - MERCURY RECOVERY

(Basel Convention: 31 September 2002, Technical Guidelines on the Environmental Sound Recycling/Reclamation of Metals and Metal Compounds, page 12 of 43, Articles 56-58.)

56. **Mercury** is an oddity of nature, the only metal liquid at room temperature. As a result of this unique property, including its uniform volumetric thermal expansion and good electric conductivity, x x x. Most mercury is used for the manufacture of industrial chemicals and for electrical and electronic applications, including a new use in flat-screen computers. It is found in fluorescent light tubes. x x x .

Caution: Mercury vapors are a health hazard. Containers should be securely covered and all operations involving mercury metal should be carried out in a well-ventilated area or in a closed system to prevent accumulation of mercury vapor in the workplace. This is of utmost importance if the operation involves heating mercury above room temperature. There are also broader hazards to public health.

(For further details/update refer, please visit - <http://www.basel.int/>)



ENVIRONMENTAL LAWS - MERCURY RECOVERY

(Basel Convention: 31 September 2002, Technical Guidelines on the Environmental Sound Recycling/Reclamation of Metals and Metal Compounds, page 12 of 43, Articles 56-58.)

58. Mercury metal is easily recycled in special facilities (vacuum distillation). Recycling is an important source of mercury, representing essentially all of the domestic mercury produced in United States in 2000. Recycling is important because there is no adequate method for final disposal.

EXAMPLES: Degree of Mercury Recovery

Material: Button cells

Hg: 25% by weight

1 kg of button cells contain 250.000 mg mercury.

Hg residue value: 35 mg/kg

Degree of recovery: $100 \times 35/250000 = 99,99\%$

Material: Fluorescent powder

Hg: 800 – 1200 mg/kg in this example we use 1000mg/kg

Hg residue value: 5 mg/kg

Degree of recovery: $100 \times 5/1000 = 99,5\%$

EXAMPLES: Degree of Mercury Recovery

Material: Glass scrap
Hg: 100 mg/kg
Hg residue value: 3 mg/kg
Degree of recovery: $100 \times 3/100 = 97\%$

Material: Glass scrap
Hg: 300 mg/kg
Hg residue value: 3 mg/kg
Degree of recovery: $100 \times 3/300 = 99\%$

Material: Glass scrap
Hg: 600 mg/kg
Hg residue value: 3 mg/kg
Degree of recovery: $100 \times 3/600 = 99,5\%$



- F. MRT Business Concept, its Prospects and Opportunities**
- G. MRT Video Viewing - MRT Drum Top Crusher**

MRT PROJECT FEASIBILITY : Standard Distiller

	EURO	EURO	EURO
Equipment cost			
Standard Distiller	200,000	200,000	200,000
Transport and installation	20,000	20,000	20,000
Total:	220,000	220,000	220,000
Annual volume of fluorescent tubes:	2,000,000	3,000,000	4,000,000
Charge per tube (excluding collection fee)	0.25	0.25	0.25
Revenue	500,000	750,000	1,000,000
Costs:			
Depreciation 5 years	44,000	44,000	44,000
Interest rate 7%	15,400	15,400	15,400
Operation cost (two-four workers € 25.000:- each)	50,000	50,000	50,000
Energy and media cost (in Europe) (€ 20/kWh+O ₂ , Propane etc)	4,000	6,000	8,000
Facility (real estate cost) (€ 2.000:-/month)	2,000	2,000	2,000
Other costs such as test analyses, spare parts etc	8,000	10,000	12,000
Total costs	123,400	127,400	131,400
Profit (excluding cost for collection, transport, admin, marketing, etc)	376,600	622,600	868,600
Break even price per tube	0.06	0.04	0.03
Break even volume	493,600	509,600	525,600

MRT BUSINESS MODEL : WASTE TREATMENT

MARKET REFERENCE PRICE (BELGIUM)					
Annual Collection	Rate per tonne	Number of Tubes Collected	Treatment (including collection and recycling)	Market Selling Price per Tonne	Collection and Recycling Fee per Tube
Fluorescent Tubes (end-of-life)		12 000 000			
Glass				€ 32,23	
Metal				€ 100,00	
Glass with mixture				€ 10,00	
Mercury Waste Treatment					
Good Margin (per tonne)			€ 320,00		
High margin (per tonne)			€ 420,00		
Small volume	€ 2 177,00	5 000			€ 0,44
Big volume	€ 2 177,00	10 000			€ 0,22

MRT BUSINESS MODEL : WASTE TREATMENT

Belgium (Glass-Fluorescent Tubes)

Class	EUR/tonne
Class A	518,6
Class B	518,6
Class C	867,63
Class D (SOX)	867,63
Broken Lamps*	669,44

**Update Technical Guidelines on the
Environmental Sound Recycling**

MARKET UPDATE : REFERENCE PRICING

Sweden (Waste Service Collection Fee)

MARKET REFERENCE PRICE (SWEDEN)		
(valid 1 January 2003)		Price per Unit
COLLECTION (including Recycling and Treatment Costs)		
Clocks and Watches		
601A	Electrical or clocks and watches, clocks and watches containing batteries	0,20 SEK
602A	Clocks used for controlling equipment, (not permanently installed for controlling heating, refrigerating or air conditioning), analogous and digital time switches, timers, and timers for stoves, car-heaters, etc.	0,50 SEK
Light sources and fittings for light sources		
801A	Fittings for light sources for professional use, over 2 kg	10,00 SEK
802A	Fittings for light sources for professional use, under 2 kg	2,00 SEK
803A	Fittings for light sources for home use, % of sales value	0,30%
810A	Straight fluorescent tubes	2,60 SEK
811A	Fluorescent light bulbs	2,60 SEK
812A	Light bulbs	0,08 SEK

MARKET UPDATE : METAL PRICING (UK)

Metals prices

Friday, 31 January 2003

Metal recycling is one of the largest recycling industries within the UK. The prices shown here provide an indication of the sums that may be paid within the metals recycling industry by typically medium to large sized businesses who are receiving material from merchants and local collectors.

The **letsrecycle.com** ferrous prices are usually revised at the beginning of each month and non-ferrous prices on a weekly basis.

Within the trade the quality of material presented and the volumes may influence the prices paid.

Non-ferrous scrap metal prices: £ per tonne

	8 January 2003	15 January 2003
pure aluminium cuttings	650	660
aluminium alloy cuttings	610	620
old rolled aluminium	550	560
clean cast aluminium	560	560

[top](#)

clubrecycle

keep in touch and up-to-date

clubrecycle



MARKET UPDATE : GLASS PRICING (UK)

Glass (cullet) prices

Friday, 31 January 2003

Glass containers (delivered to a collector) £ per tonne

	December 2002	January 2003
Brown	20 - 25	20 - 25
Clear	25 - 29	25 - 30
Green	15 - 22	15 - 22
Mixed	12 - 18	12 - 18

Prices shown are for tonnages of container glass (essentially bottles and jars) delivered to a cullet collector who will clean and sort the glass ready for use, or for further checking, by a glassmaker. **letsrecycle.com** is now showing a guide price for mixed glass. This price reflects the sum that may be paid at the weighbridge by the aggregates sector and glass industry recyclers.

A variety of contractual arrangements exist with local authorities who are the main provider of glass for recycling via bottle banks which are usually owned by the local authority or leased from a glass collector or waste management company. These arrangements can see councils facing a charge of between £10-20 for collection per tonne. Councils may then have a value for the glass deducted from the charge resulting in a reduced overall charge/profit to the council if the value of the glass is deducted.

Glass collection/handling costs (average £ per tonne from bottlebanks)

December 2002	January 2003
0 - 20	0 - 20

[top](#) [Glass Specifications](#)



MARKET UPDATE : AMALGAM PRICING

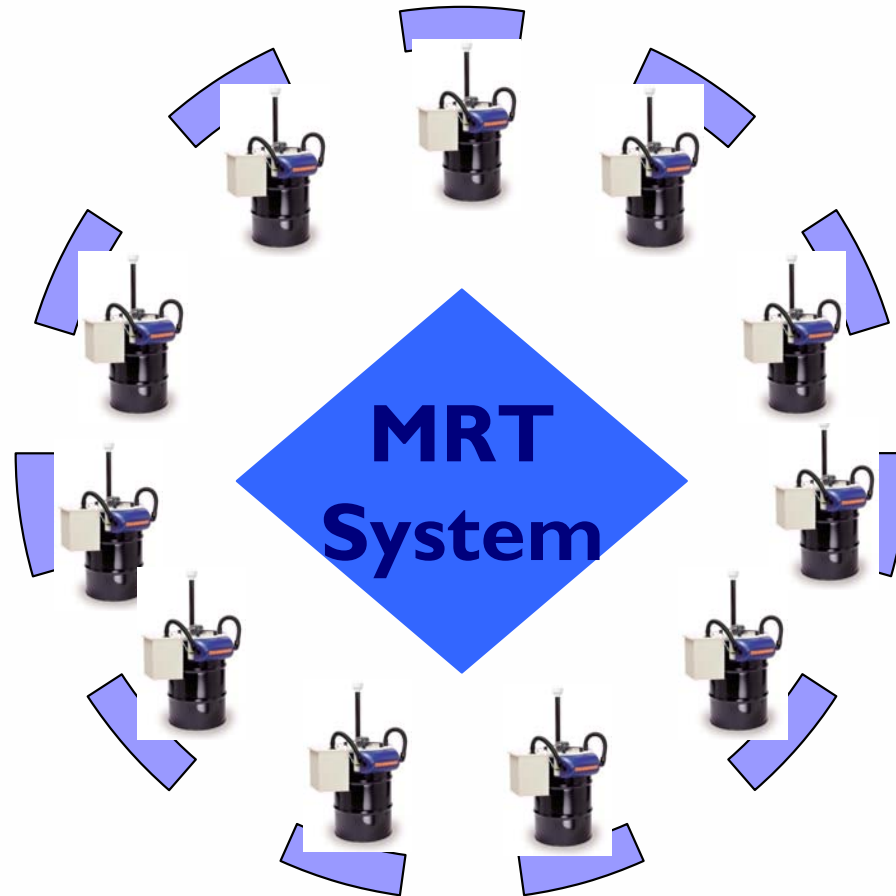


MARKET UPDATE : METAL PRICING

(Basel Convention: 31 September 2002, Technical Guidelines on the Environmental Sound Recycling/Reclamation of Metals and Metal Compounds, page 21, Articles 97.)

97. World prices can be accessed through the Metal Bulletin www.metalbulletin.co.uk or The American Metal Market. www.amm.com

STRATEGIC WASTE MANAGEMENT : Operation Recyclers





EAST ASIA & PACIFIC

↻ **China** ↻ **Malaysia** ↻ **Philippines** ↻
↻ **Indonesia** ↻ **Thailand** ↻ **Vietnam** ↻



SOUTH ASIA

↻ **Afghanistan** ↻ **India** ↻ **Pakistan** ↻
↻ **Bangladesh** ↻ **Nepal** ↻ **Sri Lanka** ↻



- H. Panel Discussion : Opportunities for Niche Markets under New Waste Management Regulations
- I. Closing Remarks

WORLD MARKET OF FLUORESCENT TUBES



Rough estimates:

South and Middle America, Middle East and Africa

500-700

China

150-200

Russia

50-100

World total approx. **2,7 – 3 billion tubes**

NOTE: Additional volume - approx. 300 million are rejected tubes.



WORLD MARKET OF FLUORESCENT TUBES

Country	Annual volume (million tubes)	Recycling volume %	million tubes	Number of systems (whereof MRT)
Hungary	20	20	4	2(2)
Czech Republic	10	20	2	1(1)
Poland	30	30	9	2(2)
Russia	60	5	3	4(1)
USA	550	20	110	20(5) approx.
Canada	50	5	2	1(0)
Brazil	40	10	4	1(0)
Japan	400	10	40	6(0)
South Korea	30	10	3	1(1)
Indonesia	20	10	2	1(1)
Average				
TOTAL	1210	14%	179	39(14)





Panel Discussions : Opportunities for Niche Markets under New Waste Management Regulations

ENVIRONMENTAL LAWS - MERCURY RECOVERY

Country	Environmental awareness	General environmental law	Legislation on mercury handling	Recycling of mercurial products	Producers responsibility
Australia	X	X	(X)	(X)	(X)
Austria	X	X	X	X	X
Canada	X	X		(X)	
Chile	X	(X)			
Cyprus		X			
Denmark	X	X	X	(X)	X
Finland	X	X	(X)	X	
France	X	X	X		(X)
Germany	X	X	X	X	X
Greece	X				
Hungary	X	X	X	X	(X)
Israel	X	X			
Korea	X	X	(X)	X	(X)
Lithuania	X	X	X		X
Malaysia	X	X	X		
Mexico	X	X	X	(X)	
Norway	X	X	X	X	X
Poland	X	X		(X)	
Portugal	X	X	X		X
Rumania	X	X	X		(X)
Spain	X	X	X	X	
Sweden	X	X	X	(X)	(X)
Switzerland	X	X	X	X	X
The Czech Republic	X	X	X	X	X
UK	X	X	(X)	X	(X)

