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Meeting of Experts on Olive Oil
Production and Electroplating Industry

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OLIVE GROWING IN ALBANIA

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OLIVE GROWING IN ALBANIA

Albanian olive growing began in the XV and XIX centuries under a Mediterranean climate. The total olive grove area represents 9% of farmland and 50% of fruit growing areas. There are almost 6 million olive trees in the south west of Albania up to Shkodra (a large city in the north of Albania). 58% of olive groves are in four or five regions in the south of Albania (Vlora, Saranda, Lushnje and Tirana).

The olive grove area in 1995 was 45,000 hectares. Annual production for the 1960-1990 period was 7,000 tons of oil and 8,000 tons of olives for consumption.

The regions of Vlora and Saranda alone do 50% of the total oil production.

Currently there are 27 oil mills in Albania. Oil extraction from olive paste is either done with the press system or with the continuous system (centrifugation)

Exploitation of by-products

1. Using the pomace

35,000 tons of olives per annum in Albania produce almost 11,550 tons of pomace. After extraction the pomace is used as cattle feed, for the production of active carbon and as fuel in companies that need to heat water for their technological processes.

Currently in our country in the transition period almost all extraction mills were destroyed and that is why only some of the pomace, with high oil content is used as cattle feed, whereas most is not used.

2. Vegetation water

Given that in one olive oil producing season almost 35,000 tons of olives are produced, the amount of vegetation water is 32,000 m3 (17000 m3 pure vegetation water and 15,000 m3 of technological water).

At the moment in our country all this vegetation water is left unused. It is poured into river and into the sea causing serious pollution problems. That is why vegetation water is an extremely serious problem for our country.

OLIVE OIL SITUATION IN REPUBLIC OF CROATIA

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In the year 1994, the total production of olive oil was 25.119 hectolitres and consumption of 29.829 hectolitres. The great part of this production belongs to small producers, which produced from 50-1000 litres olive oil per year.

The North Region of Croatia has small production of olive oil, but this oils are one of better quality in my country. The largest production of olive oil was in a South Region of Croatia. The big problem is small number of oil mills. The problem can be solved with investing in oil mills of small capacity in order to shorten the time of storage. The parallel solution is investing in the refrigerated warehouse with controlled temperature, humidity and atmosphere quality.

Olive oil is obtained by means of three principal procedures: pressing, 3-phase continuous process and in the last time we introduce the 2-phase continuous process. The greatest part of this procedure belongs to traditional pressing.

The olive oil producing industry produce highly content of waste (wastewater and oil dregs) that have been a problem for the environment. The existing oil manufacturers are in the territories without sewage system and wastewater treatment plants. The wastewater are poured out into the ground or into the karst pits. In this way, the toxic hazards are big dangerous for water current. The solid olive waste is taken to the dumping. Co-composting is carried out by open pile composting.

Two models are possible for the environment management: a) waste treatment with enzymes fermentation and b) new process which minimize the waste. In order to solve the environmental problems of this area, the Republic of Croatia have not a strategy that includes intervention by both process.

One of the oil attempts to use the pomace and solids from wastewater in the production of biocompost. This solution is the best if the cost of waste treatment processors are taken on the example and the good results of this successful experiment.

This oil mill treats on average 820 tn per year with production of 160 tn per year of olive oil. The results of wastewater will be shown in comparison to of some oil manufacturers in Istria (the north of Croatia).

After separation of solid olive waste from wastewater with membrane filter (the filter cake contains toxic hazards), solids and pomace together are treated by enzyme fermentation. The treatment time with enzymes is 60 days and obtained compost is mixtured with stable fertilizer.

The analysis of this biocompost shows no toxic substances and can be used in ecological agriculture.

Table I. *Production and consumption of olive oil in the Republic of Croatia (hectolitres)*

Year	Production	Import	Export	Consumption
1991	30.636	ND	ND	ND
1992	26.999	ND	ND	ND
1993	13.122	215	430	12.907
1994	25.119	4.968	258	29.829

ND - no data

Source: Statistical Institute of the Republic, Zagreb

Table II. *Number of trees and production of olive oil in the Republic of Croatia*

REGION Tribal state	Year	Number of trees	Production of olives (tones)	Production of olive oil (hectolitres)
Istria	1991 1992 1993 1994	153420 169440 171375 175745	1090 1415 1569 1373	1586 1771 2014 1874
Primorsko-goranska	1991 1992 1993 1994	229094 209002 185615 184370	1158 977 520 345	1845 1451 818 431
Lieko-senjska	1991 1992 1993 1994	1350 11350 19500 14500	1 23 39 22	2 33 51 30
Zadarsko-kninska	1991 1992 1993 1994	503050 483250 483480 488300	1024 848 229 1300	1732 1479 225 1547
Sibenska	1991 1992 1993 1994	419545 418244 417897 417489	1290 7426 1144 3186	1685 9077 1466 4410
Splitsko-dalmatinska	1991 1992 1993 1994	1028915 976291 934730 1021340	7318 6289 3024 7975	13541 8889 4623 13019
Dubrovaeko-neretvanska	1991 1992 1993 1994	573339 487183 575154 648200	11592 3203 3415 2541	10245 4298 3925 3808

Table 3. *Analysis of the water from olive washing*

Parameter		
pH		7,1
Suspended solids	mg/l	748,2
BOD	mg/l O_2	3977,6
COD - bichromate	mg/l O_2	14044,8
N - ammonia	mg/l N	0,3
N - organic (Kjeldahl)	mg/l N	0,3
N - total (Kjeldahl)	mg/l N	1,7
P - phosphate	mg/l P	20,5
Phosphate (total)	mg/l P	5
Grease and oils - total (IR)	mg/l	427,2
Mineral oils (IR)	mg/l	44,2
Grease - total (gravimetric)	mg/l	89,3
Total Coli - bacteria 37° C/24h	No/100 ml	2,67E + 12
Faecal Coli-bacteria 44,5° C/24h	No/100 ml	2,67E + 12
Faecal Streptococcus 37° C/48h	No/100 ml	21000000

Table 4. *Analysis of the water from olive washing*

Parameter		
pH		5,1
Suspended solids	mg/l	13 297,6
BOD	mg/l O_2	77 765,6
COD - bichromate	mg/l O_2	98 229,5
N - ammonia	mg/l N	0,4
N - organic (Kjeldahl)	mg/l N	5,2
N - total (Kjeldahl)	mg/l N	12,9
P - phosphate	mg/l P	67,4
Phosphate (total)	mg/l P	108
Grease and oils - total (IR)	mg/l	12 273,8
Mineral oils (IR)	mg/l	367,2
Grease - total (gravimetric)	mg/l	2 333,1
Total Coli - bacteria 37° C/24h	No/100 ml	2,67E + 12
Faecal Coli-bacteria 44,5° C/24h	No/100 ml	5,83E + 12
Faecal Streptococcus 37° C/48h	No/100 ml	46 800

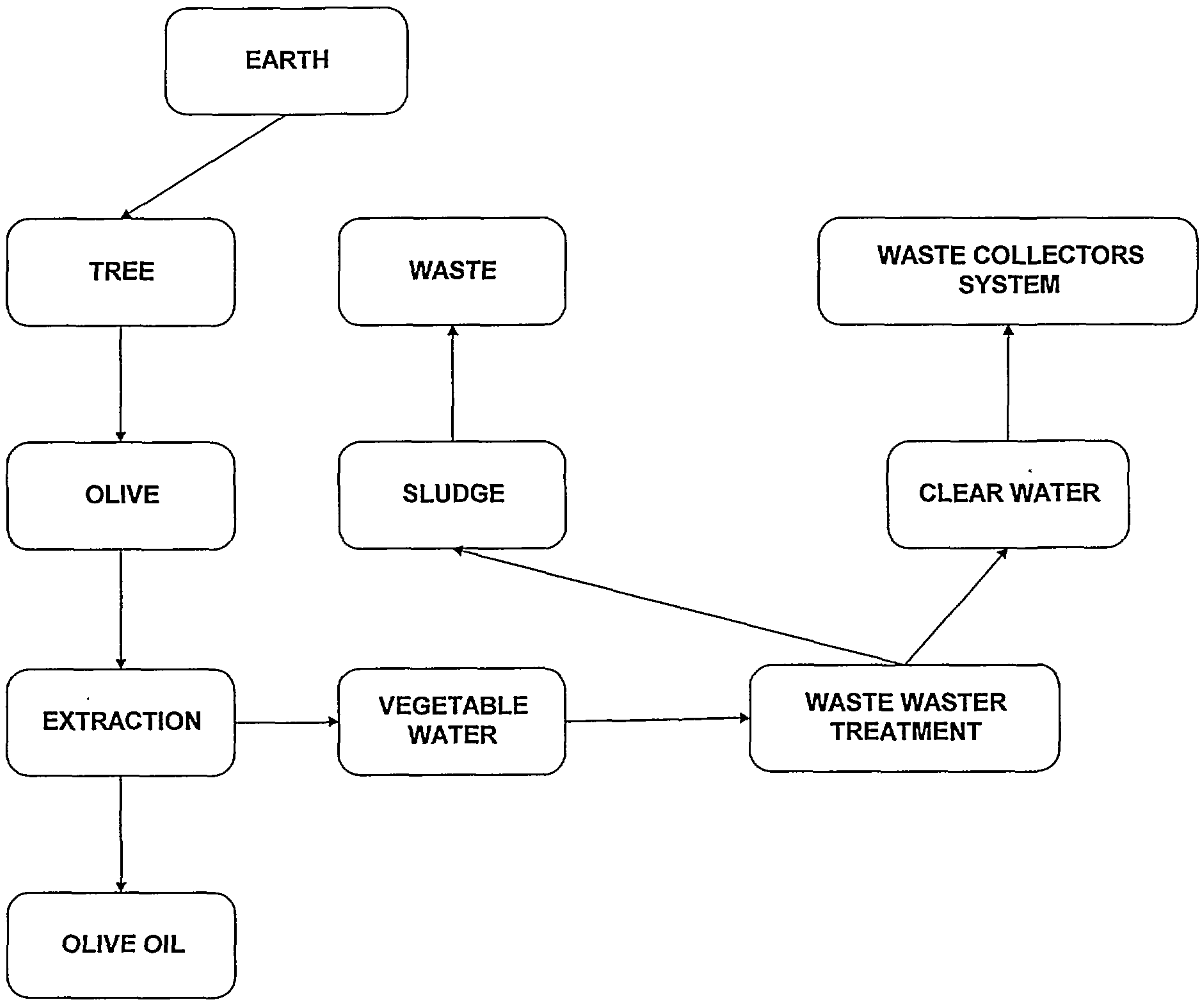

Fig. 1. Traditional cycle of the vegetable water

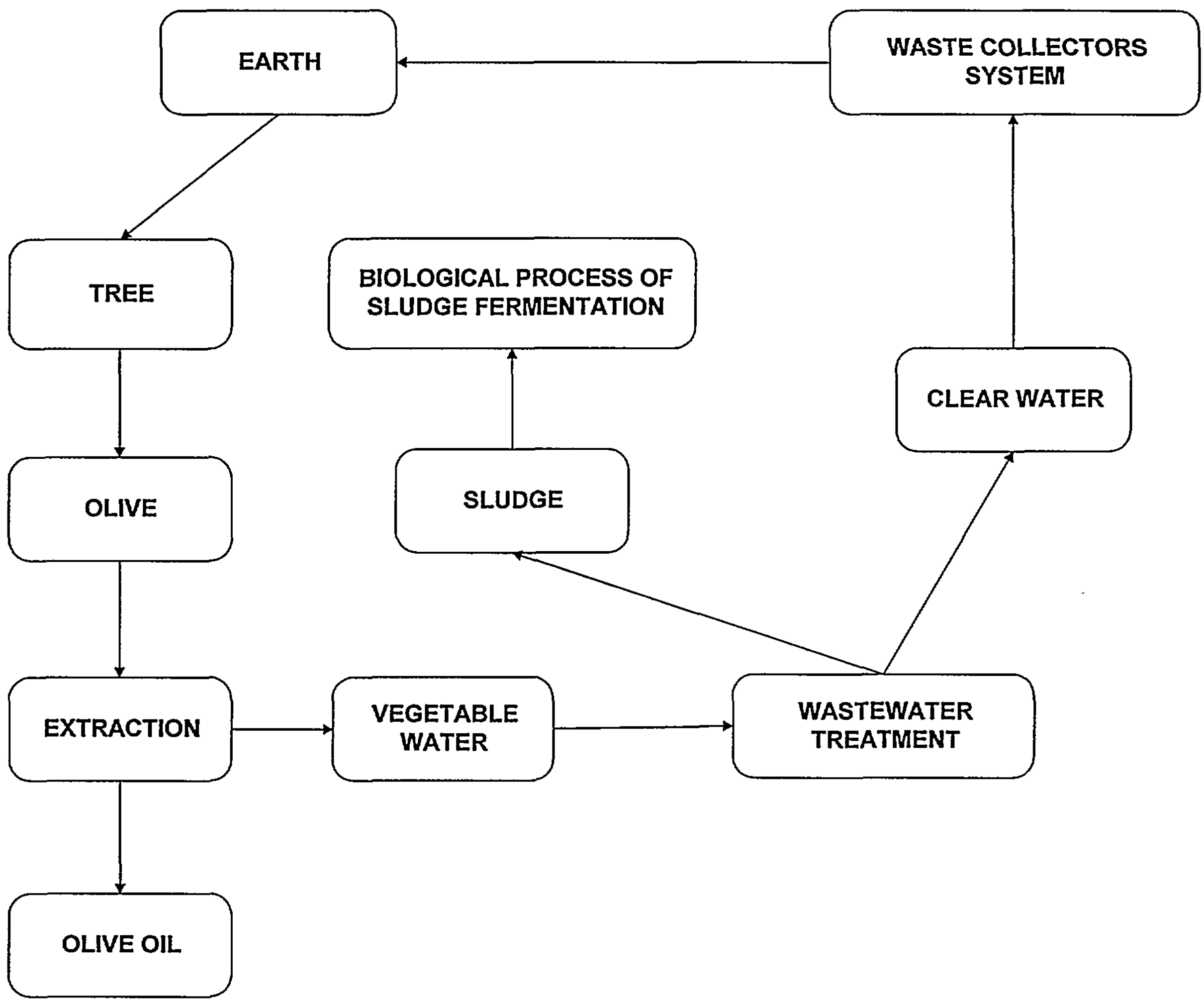

Fig. 2. Proposal cycle for recycling of the vegetation water

Table 5. *Analysis of the organic fertilizer (biocompost)*

Compost from solid olive waste

Commercial name:
SUPERVIT Biocompost

Parameter		Average
pH (10 % water eluat)		7,22
pH (1:2 v/v)		7,7
Conductivity	mS/cm	0,84
% H_2O		45,40
% Solids (105° C)		55,60
% Thermal desorption waste (550° C)		46,40
% Organic substances		52,92
% Total organic carbon		30,59
% N of moist sample		0,81
% N - total (dry sample)		1,46
% N - other forms (550° C)		1,13
% N - ammonia		0,33
Nitrate (1 : 2 v/v)	mg/l	16,4
% P_2O_5 (total on solid substance)		0,52
% K_2O (total on solid substance)		0,96
Mn	mg/kg	97,2
Zn	mg/kg	15,1
Cu	mg/kg	1,52
Fe	mg/kg	596
Pb	mg/kg	0,68
Cd	mg/kg	0,082
C/N		21

OLIVE FARMING IN CYPRUS

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In Cyprus the total area under olive farming (1996 figures) was 5.800 ha. The table below shows the changes in olive acreage.

Period	Plantings (ha)	Total area (ha)
1975	350	3.750
1975-1980	440	4.050
1980-1985	650	4.490
1985-1990	610	5.140
1990-1995	50	5.750
1996		5.800

The No. of olive trees according to age for 1996 is show in the table below.

No. and % olive trees < 5	years old	164.000	12%
No. and % olive trees 5 - 10	years old	192.000	14%
No. and % olive trees 10 - 15	years old	137.000	10%
No. and % olive trees 15 - 30	years old	274.000	20%
No. and % olive trees 30 - 50	years old	301.000	22%
No. and % olive trees > 50	years old	302.000	22%

The average density and the area under dry-farming and irrigation are presented in the table below.

Type of farming	No. olive trees/ha	Area in 1996 (ha)
Dry-farmed	200	2.320
Irrigated	300	3.480

Most of the olive trees are of dual-purpose according to table below.

	No. olive trees	Area in 1996 (ha)
Oil-olives	300.000	1.000
Table olives	150.000	500
Dual-purpose	920.000	4.300
TOTAL	1.370.000	5.800

The average total production in Cyprus is in the order of 13.500 tons per year. An amount of 3.500 tons is used as table olives and the remaining 10.000 tons are processed for olive oil production. The average olive oil production is in the order of 2.500 tons.

In Cyprus these exists 32 oil mills. Out of the 19 are of the centrifugal three phase type and remaining 13 of the old press type. After extractions of the oil the sub-products i.e. vegetation water and pomace are remained.

Pomace is not expected to represent any environmental problem because shortly a factory for the extraction of oil from pomace will put into operation. In addition the pomace is used today for the feeding of cows as well as for agricultural purposes.

The yearly average vegetation water in bare soils were carried out. A total amount of up to 162 m^3 per decare, in three doss, were applied. the results has shown the following.

- Increase of E.C. to such a level where the cultivation of semi-tolerant and tolerant crops is not hampered.

- The vegetation water can be applied homogenous using special machineries (tribble bar).

- Four to five months after the application of 162 m^3/day the soil is not toxic.

In addition the following can be considered as tendencies.

- The pH is constant.

- Organic matter and soluble salts are increased.

OLIVE OIL INDUSTRY IN ISRAEL

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1. Olive and oil production

* There are about 150.000 dunan (1 dunan = 1000 m2) planted with olive trees.

* The total olive production is approx. 25.000 tons of olives.

* The net oil production is approx.. 5.000 ton (olive-oil extraction is approx.. 30%).

* There are approx.. 105 olive oil mills in Israel.

* Approx.. 20% of them are classic olive oil mills (pressing process).

* Approx.. 80% of them are modern olive oil mills (continuous process).

* All of the modern olive oil mills are 3-phase continuous process (there are no 2-phase continuous process).

2. Pollution potential

* Production of approx.. 5.000 ton of olive oil results in production of approx.. 40.000 m3 waste water (oil dregs) and approx.. 5.000 ton of waste solids (olive marc).

2.1 Olive marc

The pollution resulting from olive marc is negligible in Israel. Generally, most of the olive marc is used for:

a. Wood stoves and traditional bakeries.
b. Smoking briquette industry (for grilling use)

2.2 Oil dregs

* Until today, all the oil dregs had been disposed as in uncontrolled areas, especially in rivers.

* The total estimated N and P pollution from oil dreg is approx.. 25 tons N and approx.. 10 ton P.

* 86 of the oil mills are distributed in the Galilee area (norther Israel), where the main source of water is concentrated. In addition, 7 of them are around the Sea of Galilee (Lake Kinneret) where they cause direct pollution to the lake.

3. Attempts for solutions (for oil dregs)

* Four years ago, we started to implement research done on irrigation from oil dregs as agricultural fertilizers and herbicides. The analysis of various physical-chemical tests of soil irrigated showed that pollution was almost zero dumping the entire period of four years. In addition, there were not any negative signs on the trees irrigated.

* The land owners resisted the above solution, because they think that oil dregs will destroy the trees totally. Implementation of this solution demands much explanation and understanding in order for the farmers to accept the proved research.

* This year we began research on a new pilot for oil dregs separation and recycling. The aims of the research are:

  a. Finding the physical-chemical-mechanical treatments needed to reduce the organic load of the oil dregs.

  b. Recycling the "organic load" for the animal food adaptation industry.

  c. Recycling the "filtered water" for rinsing the olives inside the olive oil mill, before the crushing process.

* The principal separation processes are:

  a. Coagulant treatment
  b. Centrifuge separation
  c. Micron separation
  d. Membrane separation

* Our primary results (without micron and membrane separations) showed a significant reduction in the organic load (fro example: approx.. 55% in COD, 60% in chlorides, 80% in conductivity, 80% in suspended solids and 60% in sulphates).

* If this pilot achieves its aim, it will be installed in every olive oil mill.

OLIVE OIL INDUSTRY SITUATION IN LEBANON

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OLIVES IN LEBANON

Lebanon was considered as one of the most important countries that plant olives.

This culture constitutes the principal agricultural resource for many regions including Akkar, Koura, Zgharta, Batroun, Nabatieh, Jbeil,...

36.000 hectares are planted by more than 6 million olive trees.

The olive tree is very ancient in the North of Lebanon, it is more dynamic and well treated in the south, where we see young trees.

The average of production per year is of 60.000 tons, where 12.000 tons are consumed for table, the rest is designated for olive production.

With respect to the Ministry of Agriculture, 650 presses of olives are found:

- 300 in the North of Lebanon
- 200 in the South
- 150 in the mount Lebanon and Bekaa.

The production of olive oil

Oil production is a seasonal production, it takes place between September and November.

The process is done as follows:

- Harvesting and cleansing of olives.
- Crushing of olives by stone or mechanical pestle:

  In Lebanon, the presses use two techniques,

  * the first is done by fedding the olives trees between the mills that rotate around fixed base at a speed of 10 to 14 revolutions/min and crush them to a thick paste. The paste is then transported by hand and spread evenly around mats that are rolled after into the hydraulic press.

  * the second technique is done by fedding olives between steel cylinders that turn against each other at a speed of more than 1800 revolutions/min and crush them to a thick paste.

- Separation of oil from vegetable water and this is done by clarification or centrifugation.

Utilisation and valorisation of sub-products resulting from production of olive oil

After extraction of oil contained in olives, by pressure or by centrifugation, we essentially dispose off the sub-products, vegetation water and the pomace.

1- The pomace:

Because of the oil contained in the pomace, it presents an interesting commercial value.

In Lebanon, the extraction of oil from the pomace is done by using the circulation of the hexane solvent into pomace, distillation of the mixture oil hexane and injection of vapour pressure to eliminate the hexane by condensation.

Hence, the oil obtained is used to fabricate soap and a part of distiled-pomace is used as a source of energy for the enterprise that extracts the oil, and the other part is used to fabricate fertilizers.

2- Vegetation water:

All the presses use to get rid of the vegetation water, without any treatment, in sewer tanks.

A GENERAL SURVEY OF THE OLIVE INDUSTRY IN MOROCCO

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The olive industry plays a very important role in Moroccan agriculture. Olive plantations consist of more than 47 million olive trees over an area of approximately 412,000 ha, or more than 50% of the country's total tree area.

This crop is concentrated in three main zones.

* The South zone, consisting of the Haouz, Tadla, Safi and Essaouira olive groves with an area of 129,000 ha amounting to 31% of the total.
* The North zone, consisting of the Chefchaoun, Ouazzan and Taounate olive groves with an area of 115,000 ha amounting to 28% of the total.
* The Centre zone, consisting of the Taza, Fez and Meknes olive groves with an area of 90,000 ha amounting to 22% of the total.

Average olive production between the 1988/89 and 1992/93 seasons was 480,000 T, of which 120,000 T was for table olives (25%) and 312,000 T for crushing (65%).

This production is subject to ley farming.

In Morocco the crushing of olives is done in modern, semi-modern or traditional mills. There are 170 modern or semi-modern mills of which 150 are specialised in crushing. They have a crushing capacity of about 202,000 tons of olives and 20 mixed mills produce preserve products and olive oil with a crushing capacity of approximately 85,000 tons of olives. There are about 16,000 traditional mills (Maâtras) that crush between 50% and 65% of the country's total crushed tonnage.

The extraction performance of the Maestros (13 - 14%) is still very much below that of industrial mills (18%).

Between 1988/89 and 1992/93, average olive oil production was around 45,000 T.

The region of Fez has the biggest concentration of industrial mills (42%). There are 2,879 Maestros in this region amounting to 18% of the total. The second biggest concentration is in the region of Marakech with 22.4% industrial mills and 11% Maestros followed in third place by the region of Mèknes with 16.2% industrial mills and 5% Maestros. These three regions ensure approximately 50% of the country's olive oil production.

OLIVE OIL INDUSTRY SITUATION IN TURKEY

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INTRODUCTION

There are approximately 85.000.000 olives trees in Turkey. because of the climatic conditions, the production of olives, changes from one year to another. Although the average production of an olive tree is 10 kg of olives, you can find some olive tree which produce even more than 100 kg.

OLIVE OIL YIELDS OF DIFFERENT QUALITY OF OLIVES

	TYPES OF OLIVES	OIL YIELD (%)
AEGEAN REGIONS	Ayvalik	24,72
	Çakir	23,62
	Çekistc	26,89
	Çilli	20,55
	Domat	20,57
	Erkence	25,36
	Izmir Sofralik	20,16
	Kiraz	19,76
	Memecik	24,50
	Memeli	20,20
	Uslu	21,50
MARMARA REGIONS	Çelebi	28,38
	Edincik Su	16,71
	Gemlik	29,98
	Karamürsel	18,60
	Samanli	20,77
MEDITERRANEAN REGIONS	Büyük Topak Ulak	20,20
	Sari Hasebi	24,72
	Sari Ulak	18,84
	Savrani	29,18
	Tavsan Yüregi	20,20
SOUTH REGIONS	Egri Burun	20,84
	Halhah	21,11
	Kalembezi	31,50
	Kan Çelebi	16,90
	Kilis Yaglik	31,82
	Nizip Yaglik	27,36
	Yag Çelebi	21,10

OLIVE OIL PRODUCTION PATTERN BY YEARS

YEARS	TOTAL OLIVE PRODUCTION (TONS)	OLIVE FOR DIRECT CONS. (TONS)	OLIVE FOR OIL PRODUCTION (TONS)	OLIVE OIL PRODUCTION (TONS)
87/88	600.000	173.000	427.000	60.000
88/89	920.000	250.000	670.000	90.000
89/90	495.000	195.000	300.000	39.000
90/91	845.000	235.000	610.000	80.000
91/92	640.000	181.000	459.000	60.000
92/93	750.000	231.000	519.000	70.000
93/94	550.000	200.000	350.000	50.000
94/95	1.400.000	350.000	1.050.000	150.000
95/96	515.000	206.000	309.000	42.000
96/97	1.515.000	340.000	1.175.000	200.000

OLIVE OIL EXTRACTION TECHNIQUES USED

In Turkey, there are mainly three methods of olive oil extraction.

a) Pressing. (this method is the oldest method which is separated in to two systems)

- pressing system with hot water
- pressing system with steel plates

Although, both of these, systems are being left, because of high labour costs and environmental problems, they are seldom still being used in some regions.

b) Two phases extraction system.
Because of the environmental policy, this system are new being used. In this system, vegetation water is separated being left in the pomace so that discharges kept at minimum.

c) Three phases extraction system.
This system is being widely used. Lower labour cost and high capacity are the reasons for being preferred. This system causes pollution problems compared to the two phases system.

SECOND EXTRACTION AND HEXANE EXTRACTION PLANTS.

2[nd] extraction technique is very new to olive-oil producers in Turkey. There are only three plants of this kind. Producers are not convinced to invest on 2[nd] extraction because of the problem faced with the transport of wet pomace.

For this reason oil extraction from dry pomace with hexane is preferred.

PRODUCTION AND DISPOSAL METHODS OF VEGETATION WATER

In Turkey, there is not special method of disposal of vegetation water. In some parts in large lagoon pools, vegetation water is waited in order to evaporate by the sun light. Also in some parts vegetation water is used to irrigate the olive trees. (After neutralization)

In two phases extraction system, vegetation water is left in the pomace and by that vegetation water is transported to hexane extraction plants. In hexane extraction plants, vegetation water is evaporated by burning pomace. This is the most effective method of the disposal of vegetation water.

PRODUCTION, CHARACTERISTICS OF POMACE AND METHODS OF USE

In hexane extraction plants, after the oil is recovered from the pomace is sold the industries as fuel. it is highly preferred because it is cheaper than fuel oil and it has 3.200-4.000 calories per kg energy. (It has approximately the same energy quantity with the coal).

ANALYSIS OF VEGETATION WATER BY DIFFERENT OLIVE OIL PRODUCTION METHODS

Parameters		Pressing Systems	Continue Systems
pH		4,5-5	4,7-5,2
COD	$(mgO_2/l)*1000$	120-130	40
BOD	$(mgO_2/l)*1000$	90-100	33
sugar	(%)	2-8	1
phenols	(%)	1-2,4	0.5
grease	(%)	0,03-10	0,5-2,3

CLEANER PRODUCTION IN THE ELECTROPLATING INDUSTRY IN CROATIA

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1. Legislature

a) Solid waste:

Solid waste after cleansing of waste water (sludge or filter cakes) is considered hazardous waste. This waste can be disposed only on special landfills for hazardous waste or utilised in some other industrial process.

b) Waste water:

Depending on the recipient, there are limit values for pollutants. For public sewage systems the limit values are prescribed by local authorities. For the sea, lakes and water streams as recipients, there are national regulations, nearly as strict as the Directives of European Union. The new water legislation will be completely harmonised with EU and will be issued very soon.

2. Situation in Electroplating industry

A part of electroplating facilities (rough estimation - 50% of pre-war number) is now closed for different reasons: war activities and demolition, ownership transition, economic breakdown and also non-compliance with environmental laws. Still active facilities are in the biggest industrial centres such as Zagreb, Osijek, Varazdin on the continent, and Split, Sibenik, Zadar, Rijeka on the seaside. Active are also many small handicraft workshops over the country. Machine parts, printed circuits, electric switches and installation parts, builders and plumbers fittings, kitchen appliances are mostly produced.

3. Cleaner Production

Most of cyanide electroplating procedures are eliminated and substituted with environmentally friendly procedures. Some unavoidable cyanide procedures such as silver plating for electronic devices connectors, still remains. Many producers try to work without Cr^{6+} chemicals. Most of the electroplating facilities introduced water saving procedures such as cascade rinsing, etc. None of them operates without any effluence of waste water.

Waste water cleansing procedures are based on classic chemical processes: oxidation of cyanides in basic medium, reduction of chromates in acid medium and neutralisation to pH between 8,5 and 9,5. Gravitational or forced sedimentation of sludge and press filtration follows. Only one facility users ion exchange technology in waste water cleansing.

The sludge in the form of filter cake is often utilised as ad mixture to raw materials in brick industry. Some companies still store such waste in their own storage tanks or pools waiting for a solution at the national level. In the past the common practice was to dispose this waste together with municipal waste. Such illegal practice still appears sometimes. Special landfills for hazardous waste in Croatia still do not exist.

TREATMENT OF WASTES FROM THE SURFACE TREATMENT INDUSTRY IN CYPRUS

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Cyprus being a small island of only 600.000 population and very few natural resources does not have a significant manufacturing sector. Manufacturing is mainly restricted to food processing industries and manufacturing of other products for supply of local market.

Most of these industries have been in operation for many years and the permits under which they were established did not require them to take any significant measures towards pollution abatement, apart from discharging their wastes in absorption pits within their premises. These absorption pits eventually got saturated and the wastes have been transported by private tankers and disposed into lagoons sometimes also used for the discharge of domestic septage from the non-sewered areas of towns and villages. In Nicosia and lamaca, where most of industries are located, there are about 10 surface finishing industries (galvanising, aluminium anodizing, nickel platting) which between them produce approximately 48 m3 of waste per day, of varying characteristics.

In view of the above, in December 1995, the Government decided to proceed with the construction of a Central Wastewater Treatment Plant at a location called Vathia Gonia near Nicosia, where the tankered domestic septage of Nicosia and Lamaca districts, as well as industrial wastes from about seventy industries would be treated and the final effluent used for irrigation. This plant shall receive at its full capacity 2200 m3/day (1700 m3/day domestic septage, 500 m3/day industrial wastes). Due to the high organic load of the domestic septage as well as of a number of industrial wastes, the capacity of the plant in terms of BOD5 is 55000 population equivalent.

Having carried out the necessary feasibility study and environmental impact study, the contract documents were prepared and tenders were called for the detailed design, construction, erection and five-year operation for the treatment plant. The contract was awarded for the sum of about 14 million ECU and construction begun in February 1996.

In broad terms these works comprised the following:

a) Tanker reception area of 21 discharge bays allocated as follows:

- * One for metal bearing wastes
- * Two for dairy wastes
- * One for wastes containing fats, greases and oil (FOG)
- * One for strong industrial wastes
- * One for weak industrial wastes
- * Fourteen for domestic septage.

b) Separate pre-treatment facilities for each one of the above categories of waste.

c) Common balancing of all pre-treated wastes.

d) Two oxidation ditches with final settlements tanks.

e) Sand filtration

f) Chlorination

g) Sludge thickening, aerobic digestion, mechanical dewatering.

h) Storage in a 280.000 m3 lagoon prior to reuse for irrigation.

A tanker can only enter the works provided it is licenced to do so, and carries waste from an industry which has received consent conditions for discharging at the treatment plant. A sophisticated electronic system controls and records all tanker arrivals, so that the wastes are discharged at the appropriate treatment line and that no deliberate or unintentional erroneous discharge would occur.

The metal pre-treatment stream consists of:

* Screening

* Grit removal

* Three sequentially filled 30 m3 storage tanks

* Two 15 m3 treatment tanks

* Two 15 m3 sludge storage tanks

* Two filter presses

* Conveyor belt and disposal of the dewatered sludge into an HDPE lined cell

After screening (12 mm rotating drum screen) and aerated grit removal, the waste enters the first available storage tank, which is automatically chosen according to the availability of space.

A sample of the collected waste is then collected and the appropriate analysis carried out in order to determine of the necessary chemicals that are required in order to precipitate the metals. This being determined the waste is transferred into the first available treatment tank.

In the treatment tank there are facilities for dosing the following chemicals:

* Caustic soda
* Sulfuric acid
* Anionic polyelectrolyte
* Cationic polyelectrolyte
* Sodium metabisulphite
* Sodium hypochlorite

Depending on the chemical analysis and laboratory testing that has been carried out, the appropriate quantities of the required chemicals are added and mixed with mechanical mixers. The sludge is then left to precipitate and subsequently transferred to one of the two sludge storage tanks. When adequate quantity is collected, the sludge is dewatered by the two filter presses and the cake transferred via a belt conveyor into a membrane lined cell where is landfilled. The supernatant liquor from the treatment tanks is pumped to the balance tank where all pre-treated wastes including domestic septage are mixed prior to being processed through the oxidation ditches.

Commissioning of this plant commenced beginning of January 1998 using domestic septage, and it is expected that within about a month adequate biomass shall be developed so that the industrial wastes will be gradually introduced.

WASTE MINIMIZATION IN THE METAL FINISHING INDUSTRY IN EGYPT

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Metal finishing is an integral activity of the Egyptian engineering industries (Household appliances, metallic furniture, metal profiles, etc). The number of SMEs engineering enterprises in Egypt presently exceeds 5500 with over 300 micro facilities specialized in electroplating in Cairo and Alexandria alone.

The total liquid wastes generated from metal finishing are not voluminous, but are **dangerous because of their toxic content.** The most important toxic contaminants are acids and metals, such as chromium, zinc, copper nickel, tin, and cyanide. Alkaline cleaners, grease, and oil are also found in the wastes.

There are two main sources of waste from plating operations, each one is distinctive in its volume and chemical nature: (i) batch solutions; and (ii) rinse waters, including both non-overflowing reclaimable rinses and continuous overflow rinses.

Typical pretreatment in Egyptian SMEs involves soaking the profiles in a degreasing bath which contains a weak alkaline surfactant to remove oily impurities from the surfaces of the articles. Air agitation is provided in this bath to enable effective degreasing. The degreased profiles are transferred to a rinsing process in separate tanks arranged in series. The profiles are then immersed in Nickel sulphate tank for 7 minutes to form a plating base, followed by rinsing in 3 consecutive washing tanks. Electroplating takes place in the dichromate solution for 3 minutes followed by 3-stage rinsing and final drying.

Galvanization for lighting poles and other profiles involves degreasing, rinsing, pickling in H Cl solution, flaking in NH_4Cl / Zn Cl_2 solution followed by hot dip galvanizing in mother zinc bath. Spent plating chemicals are normally collected on-site for eventual dumping in landfills; smaller quantities of spent chemicals are often dumped in the sewer system. Dross from zinc galvanization is collected and sold for refining. Wastewaters generated from rinsing, floor washing and cleaning of tanks also find its way in most instances to municipal sewerage network.

Initiatives for Waste Minimization in the Egyptian Metal Finishing Industry

Recognizing that inexpensive changes in processing and waste control methods can greatly reduce the amount of wastewater and hazardous waste generated in electroplating, several demonstration projects have been implemented to enable plating shops to avoid much of the waste generation and the subsequent treatment costs. In several instances, these techniques proved to pay for themselves in a very short period of time because they save large quantities of water and process chemicals.

The following are few examples of waste minimization initiatives in the metal finishing industry in Egypt:

1. Accumulation of contaminants in the rinsing tanks comes from the drag out of chemicals when the profiles are transferred from the treatment baths to the rinse tanks. Appreciable variations in the volume of dragouts are attributed to variable speed of withdrawal and variations in concentration and temperature of the bath. Minimizing the drag out may result in substantial reduction of wastewater and improved use of

chemicals. The following measures were implemented in few old facilities in Cairo:

* Increasing the rate of drainage by mechanical vibration or air stream stripping, in plants where such practices are not employed .

* Sufficient dripping time was controlled by performing simple chemical analysis of total carry-over to determine the optimum dripping time.

2. Since rinse water minimization is important to reduce the quantity of wastewater. cascade rinsing has been employed in one demonstration project. This avoided uncontrolled build-up of contaminants which may impair the profiles or cause frequent and unwarranted rejection of the treatment baths.

3. Continuous monitoring was successfully achieved by in one facility by installation of conductivity metres to measure the rate of build-up of dissolved contaminants. This enabled dumping frequencies to be determined on the basis of actual testing rather than the worker's judgment.

4. Rinsing is typically employed in multi-stage rinsing tanks which are totally separated. An alternative which has been investigated without major process changes is the application of the ECO-Rinse system . In this system the first rinse tank after each treatment acts as a static rinse tank in which the drain/drag out takes place. Drag out is reduced by 50 percent as the same quantity of liquid is transferred to the treatment bath (by the untreated profiles) as to the subsequent rinse tank by the treated profiles. Recovery of chemicals has been optimized using this modified technique while reducing contamination of the preceding baths. Counter-current rinsing is applied in the second rinsing tank which follows each treatment stage.

5. Liquid wastes which involve use of expensive and highly toxic chemicals are generated in small quantities in some electroplating shops located in a cluster in an industrial area in Alexandria. A centralized facility has been put in operation by the owners of these workshops for waste recovery. The facility involves distilling the effluent until it reaches the allowable concentration for reuse. The process offered favourable return on investment and eliminated a hazardous source of pollution. The recovery unit consists of double-effect evaporation where about 50 percent of the spent effluent is concentrated in the first effect using steam. The vapours from the separator of the first effect enters the second-effect reboiler and condenses to provide the energy required to reach final concentration of the plating solution. Distillate is recycled to the rinsing tanks.

6. Drain boards are not used in most plating plants. These are installed in several old facilities to collect treatment solutions that drip off the travelling rack and the profiles after they are pulled out of the treatment tanks. These solutions are collected and drained back into the treatment tanks to reduce the rate of build-up of contaminants in the rinse tanks. Since drag out is reduced, make-up chemical consumption is also reduced.

7. Blue passivation in the Galvanic industry now uses trivalent chromium instead of hexavalent chromium to allow for reuse of chemical bath, less aggressive rinse waters and lower operating costs. The conventional technology for the chromating of zinc coatings utilizes hexavalent chromium and mineral acid, which reacts with the metal. The modification involving utilizes Cr III and H_2O_2 dissolves little zinc and the bath can be replenished with concentrate and reused.

THE SITUATION OF THE SURFACE TREATMENT INDUSTRY IN FRANCE

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The surface treatment industry in France involves almost 4,500 companies employing approximately 55,000 people. Surface treatment workshops are divided into two categories: specialised ones, that are subcontracted, and integrated ones where surface treatment is one of the links in a complex manufacturing chain (motor cars, iron and steel, etc.).

Surface treatment workshops are subject to the provisions of the ministerial order of 26th September 1985, under the law of 19th July 1976 and within the environmental regulations plan.

Installations are subject to a prior authorisation procedure involving a public survey. The permits that are granted set limits for water and atmospheric emissions, give instructions for preventing the risk of accidental pollution and establish a framework for waste elimination requirements and emission surveillance modes. Since September 1986 all authorised workshops must also keep within water consumption limits of 8 litres per m^2 and rinsing function.

In 1993 there was a survey about this industrial sector based on a sample of 1,000 workshops with baths equal or above to 10 m^3.

This survey proportioned a reserved assessment of environmental performance in the surface treatment profession. The rate of non-compliance with metal emissions limits was around 10%. The rate of non-compliance reached 30% for chemical demand in oxygen, where the limit is set at 150 mg/l. The most significant difficulties are for workshops that use several types of surface treatment whilst also making use of traditional physical-chemical treatments.

It should nevertheless be stressed that these results are improving constantly with the help of regulations and new decontaminating tools that have the support of the water authorities.

However, it is difficult to obtain complete and permanent waste security within the limits set in permits for workshops with water purification plants.

For this reason, blanket or "zero waste" treatment solutions should be favoured in the future.

THE ELECTROPLATING INDUSTRY IN GREECE

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The electroplating industry in Greece consists largely of a big number of plants with a predominant characteristic their small scale, with number of employees up to 5 persons.

Few of them constitute part of big industrial plants. The majority, about 80% of the total units, placed at certain areas at the region of Athens. Due to the fact that many of the enterprises are not authorized and not even registered to their relative chambers the authorities don't have exact figures of the existing plants.

The number of electroplating plants in the region of Attika are about 150, with total number of employees about 200, according to the inventory "management of liquid toxic industrial wastes and toxic sludges in the region of Attika", assigned by the Ministry of the Environment in 1994.

In general baths of chromium at a 45%, of cyanide at a 20% and of cadmium at a 20%, are used. As an average 3 stages of rinsing are used. The total amount of wastewater is up to 3000 m^3 / day.

Concerning the wastewater produced in the electroplating process about 10% of the plants (mainly the big ones) have sufficient treatment systems. These usually consists of wastewater collection, isolation of some streams, chromium reduction (as needed), cyanide oxidation (as needed), neutralization / precipitation, clarification and sludge handling such as thickening and dewatering, that is disposed of in landfills. The rest plants, especially the small ones have either insufficient wastewater treatment systems or not at all such systems. The wastewaters are discharged into the main draining pipe that ends up to the Saronikos bay after treated in a wastewater treatment plant located at Psitalia island.

Due to the small scale, the old equipment and the restricted room for extension to the existing plants waste minimization methods such as recycling, reuse of wastewater, metal recovery, as well as treatment of wastewater at the source are not feasible.

Additionally assessments were conducted by the Ministry of the Environment at the recent past to several small electroplating enterprises which were used to develop waste minimization methods such as recycling rinse water to plating bath, increase of rinsing and using minimum concentrations of chemicals in plating baths, which will eliminate the produced wastewater about 50%.

A possible solution to the problem of hazardous wastes from this sector is the treatment of wastewater in a central unit for the removal and destruction of hazardous wastes and the safe disposal of the sludges at an approved hazardous waste disposal site. The Ministry of Environment in order to solve this issue has been working to overcome the problems encountered with local authorities and concerned population.

Also a decision has already been taken for the relocation of the small shipyards, as well as the relevant facilities such as foundries and some electroplating plants to an organized industrial area, where the individual wastewater streams will be treated in a central treatment plant.

Concerning licensing, the competent authority, which is the Ministry of Environment for the big ones and the competent prefecture for the small, through the environmental impact assessment grant the environmental permit to the enterprises.

ELECTROPLATING INDUSTRY IN LEBANON

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Electroplating industry in Lebanon is of small scale, with reference to the other industry sectors.

The purpose of this industry is for decorative reasons (Silver, Gold, Chrome and Nickel plating), and especially the gold plating enterprises are very small.

Most of electroplating plants are concentrated in the Mount Lebanon's Mohafaza (Caza).

Sidem, Siom and Crystofle plants represent the largest plants under this category.

The first plant is concerned in formation of Aluminum foils and then pre-treatment of these formed foils by complexing them with a solution of Ammonia, Fluoride, Sulphuric acid and chromium, in order to prepare them for painting.

The effluents resulting from this plant which contain ions of Fluoride, Sulphates, Hydrogen and Chromium are treated with $NaSO_3$, and the hexavelant chromium ion is reduced to Cr+3.

Then the effluent is treated with Calcium Hydroxide solution, and this gives water, Chromium Hydroxide, Calcium Fluoride and Calcium Sulphate.

The Chromium Hydroxide is transformed by ageing into Chromium Dioxide.
After precipitation and pressing, the water is separated in order to be reused and the resulting cake (Calcium Fluoride, Calcium Sulphate and Chromium oxide) is dumped.

The last 2 plants are concerned in the pre-treatment and plating of copper metal by silver, using the bath of Silver and Cyanide.

A small quantity of liquid wastes, resulting from these plants, are discharged, without treatment, into the public sewer pipes.

There is no economical benefit for the small electroplating enterprises in treating and recovering the liquid wastes resulting from them.

As most enterprises in Lebanon are very small and each one of them could not do his own treatment of his wastes, a recent study for the National Industrial Waste Management in Lebanon indicated that it is economically feasible to treat the industrial effluents for each industrial zone in one central treatment plant.

METAL FINISHING ACTIVITIES IN MALTA- A REVIEW

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Over the years, various governmental institutions have conducted surveys of industrial activities. Data collected was mainly used to define the types and quantities of various waste arising from the diverse industrial activities. Data is collected by the Department of Industry, the Department of Health through its 'Chemical Safety' programme and involvement in importation and movement of chemicals, and by the Malta Development Corporation which monitor the industrial activities supports. The Federation of Industry has also on occasions carried out surveys to establish the extent of activities concerning metal finishing.

Although data collected by these institutions has been referenced by Government appointed consultants (RH & H Consult) in order to draw up a Waste Management strategy, there is no established body that co-ordinates data collection or disseminates information to industry to create awareness or participate in a Cleaner Production programme as envisaged by UNIDO IE/PAC in 1989. Data, when collected, is guarded as if an industrial secret. This, notwithstanding that a Cleaner Technology centre was established through agreement with industrial sector. The CTC has since its inception in 1994 organised various activities to address environmental issues including a seminar on Metal Finishing. An attempt to create a Metal Finishing Sector under the auspices of the CTC was short-lived.

Industrial activities in Malta involving metal finishing are few and far between. Considering that most components are imported ready for assembly with no need for metal finishing, it is only where there is a high local manufacturing content that necessitates the support of metal finishing. Vertical integrated companies service their own metal finishing requirements. Spurned by their mother companies in Europe, environmental considerations are given maximum priority, following and in some instances exceeding European Directives and regulations. Some companies were quick to react and phase out CFCs well ahead of the timeframe stipulated by the Montreal Protocol.

An increase in the electronics and related fields has brought about a need for metal finishing support and PCB manufacture. A PCB manufacturing plant will open during 1998. Other metal finishes requested are not readily available due to the diverse requirements. Few metal finishing facilities offer more than one or two finishes.

Treatment facilities are normally present where toxic waste is discharged to the sewer although these facilities are associated with firms having a high volume of electroplating activities. Old established or very small firms have no equipment installed although batch treatment is practised. The treatments undertaken are mainly of chemical nature many involving neutralisations, cyanide oxidation, reduction of hexavalent chromium to the trivalent state and precipitation of metal hydroxides or carbonates. A few plants are under the control of semi qualified to high qualified personnel.

Metal Finishing Activities encompass the following sectors:

Sector	Process
Printing	Chrome Plating
Electronics	Electroless Nickel, Electroless Copper
Rubber Industry	Hard Chrome
Furniture/Metal	Nickel Plating, Zinc Plating, Silver Plating, Powder Coating
Cosmetics	Copper, Nickel, Chrome, Gold, Palladium, Ruthenium, Vacuum Metallizing Aluminium
General	Hard Chrome, Electroless Nickel, PVD coatings

LEGISLATIVE REQUIREMENTS & ADMINISTRATIVE PROCEDURES

The principal legislative requirements dealing with (particularly) industrial type waste are to be found in the Factories (Health Safety and Welfare) regulations of 1986.

In this legislation there is provision for the regulation of Industrial Waste Disposal. Although this regulation does not contain a definition of what constitutes 'Industrial Waste', it gives wide ranging powers to the Superintendent of Public Health to deal with this aspect of industrial activity.

Being a regulation under 'health' legislation it is not surprising that priority has been given to the health (public, occupational and environmental) aspects of Industrial Waste Disposal. No great concern has however been shown for recyclable opportunities.

The practical administrative approach to the regulation of industrial waste is primarily through the police licensing procedures. Under the Police Code of Laws the setting up of any industrial activity is subject to a license which is applied for and eventually granted by the Commissioner of Police. Before such issue the Commissioner circulates this application to various Government departments and other interested bodies, who are therefore offered an opportunity to comment and impose any conditions they deem fit in pursuance of their respective application, for the provision of any specific information, such are information on potential waste generation or discharge. All that is needed is a very short description of the activity to be undertaken.

The Department of Health has taken the fullest opportunity given by the licensing procedures to impose the required constraints in regard to toxic or problematic waste, namely:

* The discharge is not to exceed a temperature of 40 deg. C.
* The discharge is not to contain petroleum spirit or greasy material or emulsified grease shall not exceed 50mg/l.
* The discharge is not to contain any material likely to damage or block the sewer either alone or in combination with the contents of the sewer; or to interfere with the free flow of the contents of the sewer; or to effect the treatment of subsequent disposal of the contents of the sewer.

Trade effluent is to be treated before discharge to the main sewer so that it shall not include any substance or properties listed below in a concentration greater than the quoted figure.

pH	greater than 6, less than 10 at entry point to sewer
suspended solids	not to exceed 400mg/l at pH 7
B.O.D.	not to exceed 300ppm over 5 days
Oxygen Absorption	not to exceed 125ppm over 5 days

Sulphides and Compounds	not to exceed 1mg/l as S	
Toxic materials	a. cadmium	below 0,01mg/l
	b. mercury	below 0,001mg/l
	c. arsenic	below 0,05mg/l
	d. cyanide	below 10,00ppm
	e. fluoride	below 10,00ppm
	f. boron	below 2mg/l

Total concentration of soluble ions must not exceed 30ppm. This figure cannot be reached with dilution.

The stringent limits on discharges of Mercury, Cadmium and Arsenic effectively prevent any industrial activity using these materials.

There is additional legislation dealing with the disposal of wastes at sea, by virtue of the Marine Pollution (Prevention and Control) Act of 1977. To date, this has not been brought into force. Sporadic use of this method has however been made of principally in connection with the disposal of small amounts of plating sludges such as nickel and chromium hydroxide, carbonates and occasionally considerable amounts of PCBs. Dumping of chemical wastes in land fills was practised for some years with the potential danger of contaminating the water table. Although these methods are permissible according to the intentions to this act, and under the protocols pursuant to the Barcelona Convention, it had now not been resorted to for over 6 years due to public pressure.

The export of waste has also been resorted as an alternative method, mostly in connection with the disposal of P.C.B. found to be incorporated in electrical equipment.

One other matter worthy of note is the requirement (by virtue of a formal declaration to the required effect) that all sealed radioactive sources have to be returned back to the manufacturer at the termination of the useful life of the source. This condition is imposed 'by virtue of powers under the importation (control) regulations of 1969. One Company is known to send abroad filters for recovery of precious metals.

The use of CFC free aqueous propriety solutions for cleaning parts in the electronic industry has forced some companies to return the spent solution to the manufacturer.

The large majority of industrial waste is disposed of through the services of contractors specialising in the area. These remove the waste from its production site and deposit it on the Government disposal tips. This applies in particular to the medium-large industrial concerns. The smaller concerns usually dispose of their waste via the government domestic collection service.

An examination of the transportation costs does not show any relationship to the type of waste which is transported for disposal. Similar types of waste from different factories also show wide variation in the charged cost.

These discharge limits have been prepared some years ago and probably need to be revised. More stringent treatments will increase the quantities of sludges requiring disposal (unless high technology - high cost processes requiring regeneration of electrolytes or other processes will become necessary).

HEAVY METAL CONTENT IN SEWAGE

January 1986 - October 1991

Parameter mg/M3	(a) Detection level Mg/M3	(b) 90th percentile value mg/M3	(c) Maximum value mg/M3
Lead	2	20	199
Cadmium	2	6	2,8
Zinc	50	375	1018
Chromium	500	below d.l.*	
Mercury	1	1	2,76
Copper	25	160	417
Iron	100	900	2542
Nickel	100	140	268
Manganese	25	110	242
Cobalt	100	below d.l.*	

*detection level

AIR POLLUTION

A Clean Air Act is still in its embryo. A Government appointed commission has been set up in 1997 to study this issue and forward its proposals. Relative to other industries metal finishing activities do not constitute a big treat as regards contamination of the atmosphere. Companies which have the biggest activities have been proactive in conforming to new directives and regulations.

To date there is no data collection system or mechanisms that could be used to monitor air pollution or the success in meeting reduction targets. Industry specific limits to reduction potential have yet to be addressed.

The Maltese business community follows the cultural trend to wait for Government to legislate or to consequently follow EU directives. No proactive stance is taken and there is no Declaration which addresses the reduction of CO_2 emissions or their specific energy consumption. Reduction in CO_2 emissions/energy consumption through product, processes and techniques need to be integrated in a Declaration/Policy to be agreed upon with Government.

CASE HISTORY

Background

Manufacturing of goods tied up to the fashion industry requires several collections to be placed on the market at regular intervals. Designs make use of various finishes which includes plating of precious metals. Base materials used in manufacture include very light alloys which require multilayered electroplating, namely, copper and nickel as base layers and chromium, gold, platinum and other metals as finishes.

The use of cyanide based, acidic and alkaline plating solutions necessitated a fully fledged effluent treatment plant which segregated and treated rinse waters, creating a considerable volume of sludge from the metal precipitates which had to be disposed of. Sludges were dumped in the sea under the supervision of the authorities concerned.

Cleaner Production

The base metals used together with the required finishes were reviewed and the plating processes were streamlined. By introducing state of the art chemicals to activate the base metals the need for copper cyanide was eliminated. Introducing a preactivator of palladium-gold before subsequent plating with palladium, gold and ruthenium eliminated the need to have diverse effluent treatment facilities. All rinse waters are channelled through the same filtration, metal recovery system. The filters can now be sent to a company specialising in the recovery of precious metals.

Advantages

The quality of the product has been increased.

The disposal costs are virtual eliminated.

The effluent treatment plant has been downside for occasional batch treatment requirement.

There is one etching solution.

There are no hazardous chemicals to be handled.

The economic benefits gained from the need to handle hazardous chemicals, treat effluent and to dispose of subsequently created sludges far outweigh the increase in costs of the enabling technology which has been implemented. The Capital investment required was minimal and a payback period of 9 months was envisaged.

Conclusion

There is a need for statistical information on the metal finishing industry in Malta. This is lacking since there is no established association. An association would also be instrumental in discussing methods gathering data of interest, implement these methods and compile and report these results. These would also serve as a benchmarking exercise.

Specific areas of interest would include an economic outlook for metal finishers, approaches to zero discharge, the cost of compliance with environmental and safety regulations, substitutes for hazardous materials, cleaning and pre-treatment practices, finishing processes in use and industries served by finishers.

Few people in industry, government or the environmental movement are pleased with the status quo in the area of environmental regulation. End-of-pipe approach in achieving compliance results in complex, inflexible and often contradictory system of regulations, which stall business operations. The goal should be to achieve cleaner, cheaper and smarter results by implementing pollution prevention. Approaches to assisting companies in compliance issues should be explored, also to increase efficiency as well to encourage innovation and participation.

Such a programme should be sector based rather than pollutant or process based. The requirements of each sector would be actively geared toward the technology of a given industry. Companies should be grouped by level or tier of compliance. The overall goal would be to move industries to higher tiers of performance.

Tier	Attributes
1	a) constantly in compliance with requirements b) proactive c) continuous improvement beyond requirement
2	a) largest industry sector b) broadly in compliance c) proactive commitment to reach compliance
3	a) old, outdated facilities b) marginally profitable c) no funds for pollution control
4	a) out of compliance b) no attempt to improve c) avoid costs of environmental investments d) escape enforcement attention

Once a data base of existing facilities and there requirements for regulatory compliance is established, a programme would need to be implemented in order to direct the participating companies to improve their position. ISO 14000 which has emerged as a global standard may provide the required benchmarks. A study of industry requirements might show the need in sharing facilities and costs in operating waste treatment plants. Small job shops giving a service to export oriented companies can be paired with larger facilities. Small businesses may attempt to emphasise pollution prevention, but may not have access to studies indicating the technical or economic viability of a proposed process.

Metal finishing per se has never been addressed in the educational field and many companies have trained their personnel through in house training or were sent abroad for training. Foreign companies operating locally may operate on the Kaizen philosophy but may be far away from sharing improvement. They seem to adopt the same self interest in their business as the locals. Most manufacturers could see their role as making 'their' nation successful. Local service suppliers might be concentrating more on domestic dogfights. To share experiences with competitors such that more companies improve relative to the global market makes sense.

ELECTROPLATING INDUSTRY SITUATION IN TURKEY

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The surface finishing industry in Turkey covers the areas listed below:

- Hot tip galvanising

- Painting

    - wet painting
    - powder painting

- Conversion coatings

    - anodising
    - phosphatising
    - chromating
    - sulphuric acid anodising
        architectural
        hard anodising

- Electrolytic metal plating

    - tin
    -copper-nickel-chromium
    - zinc
    -brass

- Electroless plating
    -copper
    -nickel

Among these the electroplating industry, about 1.500 companies, holds an important part, with a great number of small companies and many well equipped bigger ones. Although most of these companies are sited in the western part of Turkey near Istanbul, Bursa, Izmit, Izmir, Manisa there are also companies in cities Kayseri, Kona, Gaziatep, Eskisehir which are in the middle or southeastern parts of Turkey. There is also an increasing demand for plating in the areas where the machines and automotive industry develops rapidly.

There are many garrage type small electroplating shops situated in the urban areas. in 1980's a project had been started to unite all these small and big companies in a electroplating industry zone of 80.000 m^2 closed area, organize a common waste treatment and refining system. Actually such a big project brings many problems with itself and unfortunately it does not seen to be a success at this moment.

Although aluminium anodizes have an organization and galvanisers are at the last steps of forming one, electroplaters do not have any.

The big scale companies after refining the waste water according to the regulations "Water and Canalization Administration" discharge to the canalization system. Only a few recycle the water and the small ones, because most of them are not registered officially, transfer the waste to the canalization system without refining. The sludge is collected by the municipals and buried in solid waste centres in a depth of 7 metres.

In the last years, strict regulations and controls by the ministry press this sector as well as the others to be aware of environmental factors. Companies those have ISO standards and the ones trying to get, built their own waste treatment systems and force also the small shops they are working with to refine and to minimise their wastes.