OCCASION

This publication has been made available to the public on the occasion of the 50th anniversary of the United Nations Industrial Development Organisation.

DISCLAIMER

This document has been produced without formal United Nations editing. The designations employed and the presentation of the material in this document do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations Industrial Development Organization (UNIDO) concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries, or its economic system or degree of development. Designations such as “developed”, “industrialized” and “developing” are intended for statistical convenience and do not necessarily express a judgment about the stage reached by a particular country or area in the development process. Mention of firm names or commercial products does not constitute an endorsement by UNIDO.

FAIR USE POLICY

Any part of this publication may be quoted and referenced for educational and research purposes without additional permission from UNIDO. However, those who make use of quoting and referencing this publication are requested to follow the Fair Use Policy of giving due credit to UNIDO.

CONTACT

Please contact publications@unido.org for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at www.unido.org
SOMETRA SA
COPSA MICA METALLURGICAL PLANT
Visit 19.5. - 24.5.1991

Command: Dr. Reinhard Fischer
28.5.1991

Best regards, its focus
PPD/AEEA/EMGI
Report about the visit of the Copsa Mica Metallurgical Plant
from 19. 5. - 24. 5. 1991

by Dr. Reinhard Fischer

I have met

in Bukarest

Alexandru Tarana, General Direktor
Ministry of Industry, Ecological Division

Calin Popescu, Managing Director
Cornel Florea, Deputy Director
Ministry of Industry, Public Relations Division

at the plant

Ladislau A. Frumosu, State Subsecretary
Ministry of Industry, Department of Metallurgical Industry

Gheorghe Stefanescu, Director adjunct
Ministry of Industry, Department of Metallurgical Industry
Division of Ecology of Non Ferrous Metals

Nicolae Bodea, Director general
Sometra, SA

Volker Hammrich, Director tehnic
Sometra, SA

Octavian Pop, Head of Training Department
Sometra, SA

Vasile Mucundorfean
Engineer for safety, health and environmental protection
Sometra, SA

Most informations were given by Mr. Hammrich, Mr. Pop acting as interpreter.

1. Plant and process.

1939-1966

A zinc smelter was in operation using at least 12 horizontal retort furnaces, capacity each 5 t/d zinc.
Average production 5 000 t/a zinc.

1958

Erection of 1. New Jersey zinc refining column.
1962
Project to install the I.S.P. technology for production of zinc, lead and sulfuric acid.

1966
Commissioning of the plant No. I, built by British companies.
Reasons for building the plant here: Nearly same distance to several mines. Natural gas, water, working force.

1974
Erection of lead electrolysis, Italian made, 38 000 t/a lead.

1975
Treatment plant for slurry of electrolysis.

1978
Furnace for antimony production.

1984
Erection of I.S.P. plant No. II, Rumanian made.

1985
Erection of 250 m stack and connecting pipes.

1.1. Process.
The Imperial Smelting Process has been developed in England and is in use since the 60 th in several countries in the world.

The process is able to treat bulk zinc-lead-concentrates to recover simultaneously zinc and lead metal, also copper and precious metals.

The concentrates are roasted and agglomerated on a sinter machine. The sulfur contained is burnt to SO₂ which is treated after dedusting in a contact plant to produce sulfuric acid.

The sinter is smelted with coke in a blast furnace, the zinc volatized is condensed to liquid metal, the liquid lead and the slag is tapped from the bottom of the furnace.

The lead contains the copper and the precious metals.

Zinc is refined to 99,99 % in New Jersey distillation columns. Lead is refined to 99,99 % by electrolysis.

Anode slurry from the electrolysis is smelted in short rotary furnaces to produce Doré metal (containing silver and gold), antimony and bismuth slags.

Doré metal is further enriched by cupellation.
Antimony- and Bismuth-slags are treated by reduction to produce metal.

The Wälz kiln is used to treat zinc containing residues evaporating zinc and producing zincoxyde.
By chemical methods, using solutions, zinc- and cadmiumsulfat are produced.

Pyrite is roasted in a fluosolid roaster to produce sulfuric acid and to help to increase the SO₂ level of the off-gases of the sinterplant. For pyrite cinder is no use, it is dumped.

1.2. Equipment.
The metallurgical plant comprises:

Covered storages for concentrates and coke

2 I.S.P. plants consisting of
- Sinter plant
- Sulfuric acid plant
- Blast furnace
- Decopperizing plant

4 New Jersey zinc refining systems
2 lead electrolysis
2 Wälz kilns, 1 wrecked
Fluosolid roaster for pyrite
4 short rotary furnaces, 3 in operation for anode slurry treatment
1 cupellation furnace for Doré metal
1 furnace for antimony production
Plants for production of zinc- and cadmiumsulfat

Plant for production of zinc dust
2 effluent water treatment plants
Laboratory
Repair shops
Social buildings (change house etc.)

2. Present situation.
2.1. General
The plant is in a very bad condition, not only concerning un repaired, partly wrecked equipment but also cleanliness and order is missing.
The plant management mentioned the following reasons:

In the past:
Priority of metal production, no care for environmental problems.
Lack of spare parts, especially those which are not produced in Rumania.
Isolation from the development of zinc and lead metallurgy and the means for environmental protection outside Rumania.
Since 1978 interruption of the exchange of experience with the other ISP users in the world.

At present:
Lack of spare parts.
Shortness in electricity.
Shortness in skilled labor.

After the revolution 30% of the workers retired at the age of 50. Many good workers left for western countries.
Unplanned break downs of parts of the plant because of the bad conditions of the equipment.

Mr. Hammrich and Mr. Pop have visited recently the ISP plant in Britain, Germany and Poland.

2.2. Present situation of operation.
By order of the Ministry of Industry the production of the plant was reduced to 50% of the capacity of one ISP line because of heavy pollution of the environment.
The No. I ISP line were working but is due to be stopped at the end of May for a 90 days repair. Then the No. I shall start again, because the overall working conditions are said to be better than the No. II.
The No. II was repaired and prepared for starting, which I could see during the visit.

In operation were also
1 Wälz kiln
1 lead electrolysis with 132 cells, producing ca. 60 t/d lead
Slurry treatment plant with 3 short rotary furnaces.
Zinc- and cadmiumsulfat- and zincedust-plant, zinc distillation
No. 3 + 4, which I have not visited.

The production and consumption figures for 1984, 1986, 1989 and 1990 are given in table 1 to 4.
3. Health regulations.

Every 6 month medical examination for each worker by doctor of the plant.

Urine analysis: Coproporphyrine, ALA

If necessary lead in urine, lead in blood.

The following table shows the scheme of the threshold values

<table>
<thead>
<tr>
<th></th>
<th>normal</th>
<th>acceptable</th>
<th>excessive</th>
<th>dangerous</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead in blood</td>
<td>- 40</td>
<td>40-80</td>
<td>80-120</td>
<td>+ 120</td>
</tr>
<tr>
<td>Lead in urine</td>
<td>- 80</td>
<td>80-150</td>
<td>150-250</td>
<td>+ 250</td>
</tr>
<tr>
<td>Coproporphyrine</td>
<td>- 150</td>
<td>150-500</td>
<td>500-1500</td>
<td>+ 1500</td>
</tr>
<tr>
<td>ALA</td>
<td>- 6</td>
<td>6-20</td>
<td>20-40</td>
<td>+ 40</td>
</tr>
</tbody>
</table>

Cases of industrial diseases in 1990

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cases of professional saturnism</td>
<td>102</td>
</tr>
<tr>
<td>Cases of saturnistic colics (pains)</td>
<td>27</td>
</tr>
</tbody>
</table>

Monthly instruction about accidents and health.

Most workers have dust masks, but there exists a shortage in masks.

But no central cleaning of masks.

No smoking regulations in the plant, but not regarded after revolution.

Rules for employment of minors exists, but no prohibition for women employment.

Working clothes are furnished and washed by the plant.

Concentration of lead in the air of the working places is measured monthly.

Table 5 shows average figure of 1990. Column 3 shows the threshold values.

It is remarkable that also in those parts of the plant where normally low concentrations occur, as zinsulfat-, sulfuric acid- plant etc., the threshold values are surpassed. Diffuse emissions inside the plant could be the cause.


Working 6 h/d, 5 days a week.

Lunch and 1 ltr. of milk daily free.

Payment:

Fixed, depending on the working place. Ministry fund of about 1-2% of wages for special bonus for workers, now superintended by the trade union.

No incentive payment for example for reduction of break downs or good performance of work.

The main subject of bonus was the fulfilment of the plan of production.
The number of plant staff is given in table 6.

5. Responsibility and decisions.
In the past the Ministry of Industry owned the plant, set the standards for health and environment, made the plan for the production, fixed the prices for raw material and products and determined the amount of money to be spent for wages, spare parts, repairs.

In 1978 the standards were:

<table>
<thead>
<tr>
<th>Environment</th>
<th>mg/m³/24 h (?)</th>
<th>SO₂</th>
<th>0,250</th>
</tr>
</thead>
<tbody>
<tr>
<td>H₂SO₄</td>
<td></td>
<td>0,100</td>
<td></td>
</tr>
<tr>
<td>Lead</td>
<td></td>
<td>0,001</td>
<td></td>
</tr>
<tr>
<td>Dust</td>
<td></td>
<td>0,35</td>
<td></td>
</tr>
<tr>
<td>Working place</td>
<td>mg/m³</td>
<td>Pb 0,2</td>
<td>ZnO 10,0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CdO 0,2</td>
<td>SO₂ 15,0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>H₂As 0,3</td>
<td>Sb 0,5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bi 10</td>
<td>Cu 0,15</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HF 2</td>
<td>CO 50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>H₂SO₄ 1,5</td>
<td>Dust 15</td>
</tr>
</tbody>
</table>

A standard for the contents of the effluent gases should have been existing, as Mr. Hammrich told me, but I could not get the figure.

All these standards will be revised now.

Now the Ministry of Environment set the standards.
The Sibiu-Institut which measured around the plant belongs to the Ministry of Environment.

The Ecological Department of the Ministry of Industry has to supervise the realisation of the standards by the plant management and also to furnish the money to build the necessary equipment.
Plant manager have very few rights to decide.

6. Remarks about the working conditions of the plant.
Most equipment needs extensive repairs.
In a comparatively better state are
ISP blast furnaces
one lead electrolysis
decopperizing plants
treatment plant for anode slurry
antimony and bismuth plant
cupellation furnace
Wälz kiln

Extensive repairs are necessary for
sinterplants
sinterplant off-gas cleaning
sulfuric acid plants
zinc refining plant
dedusting systems off different plants
The question is which equipment can be repaired or must be replaced. Parts of the sulfuric acids plants e.g. are wrecked.

6. Yards and roads.
Yards and roads are covered up to 10 cm with metal bearing, fine material. Loads of scrap laying everywhere. During my visit most of this material were slurry because of the weather. But in summertime it becomes dry.
The dump for slags and pyrite cinder is also covered with scrap.

7. Pollution
There are two sources of pollution:
From point sources of emission.
From diffuse sources of emission.

7.1. Point sources of emission.
They are numbered at the map, enclosure 1.
No. 1 + 2
Off gases of the blast furnaces. They are washed in a Theissen washer and burnt to preheat coke and blast air.
They normally and also here contain very few dust.
No. 3 + 4
Off-Gas of sintermachines. It contains 3-5 % SO$_2$ and up to 10 g/m$^3$ dust, containing zinc, lead and cadmium.

Normally these gases are dedusted and the SO$_2$ content is converted to SO$_3$ with about 98 % conversion efficiency, the SO$_3$ is absorbed by sulfuric acid with an absorption efficiency of 99 %. The dedusting has to be done very efficiently to avoid contamination of the contact mass of the converter.

In the past and at present very often unplanned break downs in the gas cleaning system and in the sulfuric acid plant occured. Not to stop sinter- and blast furnace-production gases were let off thru short stacks before dedusting or after dedusting, so that dust and SO$_2$ were emitted.

Also conversion and absorption efficiency did drop down, because contaminated catalysts were not replaced and absorption tower not maintained. From these sources most of the pollution has been and is still originated.

In a normal ISP plant the factor of sulfuric acid produced to intake of sulfur into the plant is ca. 2.8. Looking at table 1-4 to production of sulfuric acid and sulfur intake the calculation shows factors between 0,79 and 1,34. That means, that

<table>
<thead>
<tr>
<th>Year</th>
<th>Sulfuric Acid (t/a)</th>
<th>Sulfur Intake (t/a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1984</td>
<td>42 000</td>
<td></td>
</tr>
<tr>
<td>1986</td>
<td>45 000</td>
<td></td>
</tr>
<tr>
<td>1989</td>
<td>79 000</td>
<td></td>
</tr>
<tr>
<td>1990</td>
<td>12 000</td>
<td></td>
</tr>
</tbody>
</table>

of SO$_2$ have been emitted to the air.

No. 5 is the Wälz kiln
No. 6 is the anode slurry treatment plant
No. 7 + 8 are the zinc distillation plants
No. 9 + 10 are the decopperizing plants.

Number 5 to 10 contribute to pollution mainly dust in a minor quantity compared with the sinter plants.

The laboratory of the plant is not equipped for determination of emitted gas quantities and dust contents. It only has an electric pump and washing bottles, by which gas contents, f.e. SO$_2$, can be determined. This equipment is not suitable to determine the dust content.
7.2. Diffuse sources of emission
The roads and yards, the open air concentrate and byproduct storage and the
dump are producing severe pollution by zinc, lead and cadmium containing dust
in the dry season. This pollution will mostly occur in the vicinity of the plant.
But with higher velocity of wind this dust can be carried several kilometers.

My estimation is that during dry periods the quantity of this dust pollution
is in the same range as the quantity of dust coming from the point sources
of pollution.

7.3. Effluent water.
Water of the plant goes into the Tirnava Mare river only trough one outlet.
Most of the water was treated in the water treatment plant of ISP plant No. I.
only by adding lime. The chlorination for destroying CN-compounds in the
washing water of the Theissen washer was not in operation.

8. Recommendations
8.1.
During repair of ISP line No. I in the next 90 days a connection should be made
of sinter gas outlet before dedusting plant, behind dedusting plant (venturi)
and behind absorber to the 1,600 mm Ø flue leading to the 250 m stack.
The stack is lined with acid resistant bricks. The steel pipe of the flue is
only covered with an acid resistant thin layer. Therefor the pipe should be lined
inside with a better acid resistant material to avoid quick corrosion. If not
available in Rumania buying from abroad.
The ventilator before the stack should have an acid resistant rotor which is
not sensitive for sticking of dust onto the blades which would cause unbalance.
If no experience in Rumania with that type of rotor buying abroad.

This measure would allow to run the sinter plant also in case of break down
of the gas cleaning or sulfuric acid plant.
The 250 m stack will dilute the SO₂ and dust concentration to such an extent
that the threshold values for SO₂ and dust in air and for dust deposit not
will be surpassed.
8.2.
Repair of dedusting equipment of point sources of emission No. 5 to 10 and repair of hoods and exhaust piping.
This can be done by fitters of the plant, some spare parts, f.e. filter bags, should be bought from abroad.

8.3.
Immediate cleaning of the plant site from metal bearing material by carrying it onto big heaps. Depending on the metal contents controlled by analysis it is advisable to make different heaps. Later on can be made the decision about the use of that material.
These heaps and also the open air stacks of concentrates and the dump should be sprayed with lime milk (solution of Ca(OH)$_2$ in water) which forms a thin solid layer on the surface of the material avoiding erosion by wind.
Mr. Hammrich has already started a team to clean the dump of scrap on a basis that the profit from selling the scrap should be split between the team and Sometra. The same system should be applicable to clean the plant.
When these undertakings are finished I recommend to run one ISP line on full capacity of the sulfuric acid plant.
The present half capacity means either smaller gas quantity or smaller SO$_2$ content in gas or more interruptions.
All this is not good for a sulfuric acid plant which should be operated at high gas quantity and SO$_2$ content.

Theses recommended measures diminish pollution and give time for a comprehensive study about the future of the plant. This study should be made by foreign experts together with Rumanian Institutes.

8.4.
The study should comprise:
1.
Is a zinc-lead smelter advisable in Rumania because of availability of concentrates from the country and because of consumption of zinc and lead in the country?
2.
Is Copsa Mica the right place concerning transportation, natural gas, water, working force and hazards to the environment?
If both questions are answered positively further studies should comprise:

3. An obligatory offer from international companies for the repair of the existent equipment.

4. An obligatory offer from international companies for the replacement of worn out equipment and repair of the remaining.

For the replacement more modern equipment should be considered.

For example sulfuric acid plant with double catalysis and replacement of the two condensers at the blast furnace by one.

5. An obligatory offer from international companies for a more modern plant using other technologies than ISP.

Possible companies for offers 3 and 4 is Lurgi in Germany, for offer 5 KHD Humboldt Wedag in Germany.

I would estimate the necessary time for

study 1 + 2 = 6 month

offer 3, 4 + 5 = 12 month

That means that the Romanian Government can make the decision about the future of the Copsa Mica plant at the end of 1992.

The rehabilitation of the plant will then take about 3 years.

8.5.

Concerning general regulations to minimize emissions I propose to employ the German schemes for protection of the environment and of the workers.

The German regulations provide an engineer who belongs to plant staff having direct access to the general management and taking care of emission problems (Immissionsschutz-Beauftragter).

A governmental inspector being permanently in the plant would take over the responsibility for running the plant. This responsibility should better remain with the management.

Only in cases of very severe danger to the public by emissions of a plant the German authorities have the right to stop the plant.
8.6.
Concerning the problems of the use of vegetables etc. by the population around
the plant I attach a copy of recommendations which were given by German
authorities in a similar case.

Aachen, 28.5.91

[Signature]
|                | Fico | Zn  | Pb  | Cu  | Au  | Ag  | $\delta$
|----------------|------|-----|-----|-----|-----|-----|------
| zinc metallurgic| 38.170.0 |     |     |     |     |     |      
| Plumb electrolyte| 29.430.0 |     |     |     |     |     |      
| acid sulfuric | 59.700 |     |     |     |     |     |      

**Consum**

|                | Fico | Zn  | Pb  | Cu  | Au  | Ag  | $\delta$
|----------------|------|-----|-----|-----|-----|-----|------
| conc. zincos    | 49.976 | 26.078 | 813 | 574 | 85 | 5152 | 17.189 |
| conc. plumbos    | 23.975 | 2.952 | 12.143 | 885 | 114 | 22.97 | 8.151 |
| conc. colecitiv | 50.340 | 17.354 | 9.573 | 1.731 | 4.84 | 18.728 | 17.411 |
| prod. oxidice    | 1720 | 163 | 1.079 | 10 | 12 | 1.317 | 8.152 |
| Total            | 126.011 | 46.547 | 23.608 | 3.200 | 6.95 | 47.494 | 50.903 |
| %                | 37.0 | 19.0 | 2.6 | 0.56 | 3.8 | 40.72 |

984 

96 Boia More 13.673 13.179 10.24 41.863

Table 1. Production and consumption 1984
<table>
<thead>
<tr>
<th></th>
<th>Fizic</th>
<th>Zn</th>
<th>Pb</th>
<th>Cu</th>
<th>Mg</th>
<th>Si</th>
</tr>
</thead>
<tbody>
<tr>
<td>1986</td>
<td>11.430</td>
<td>10.927</td>
<td>564</td>
<td>36.848</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table 2. Production and consumption 1986.**

- Zine metalurgic: 46.418,0
- Plumb electrolitic: 34.400,0
- Acid sulfuric: 63.090,0

**Consumption**

<table>
<thead>
<tr>
<th>Conc. Zinicos</th>
<th>10.395</th>
<th>42.70</th>
<th>186</th>
<th>70</th>
<th>13</th>
<th>904</th>
<th>3.534</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conc. Plumbos</td>
<td>9.961</td>
<td>1.041</td>
<td>5185</td>
<td>124</td>
<td>20</td>
<td>8,517</td>
<td>2.191</td>
</tr>
<tr>
<td>Conc. Colectiv</td>
<td>149.572</td>
<td>50.488</td>
<td>26.635</td>
<td>2302</td>
<td>670</td>
<td>44.347</td>
<td>40.154</td>
</tr>
<tr>
<td>Prod Oxidice</td>
<td>2.700</td>
<td>189</td>
<td>2211</td>
<td>43</td>
<td>71</td>
<td>27.793</td>
<td>1.093</td>
</tr>
<tr>
<td>Total</td>
<td>158.272</td>
<td>55.988</td>
<td>34.217</td>
<td>2.536</td>
<td>7.4</td>
<td>81.561</td>
<td>46.973</td>
</tr>
</tbody>
</table>

% Baia-Mare

- 32.0
- 22.6
- 1.4
- 4.9%
- 46.59%
- 26.8
<table>
<thead>
<tr>
<th>Year</th>
<th>Pb</th>
<th>Zn</th>
<th>Cu</th>
<th>Sb</th>
<th>Mo</th>
<th>Ni</th>
</tr>
</thead>
<tbody>
<tr>
<td>1989</td>
<td>11,463</td>
<td>3,849</td>
<td>1,254</td>
<td>700</td>
<td>1,434</td>
<td>4,349</td>
</tr>
</tbody>
</table>

Consumption:
- Concentrated Zn: 279.7 t, 134.5 t, 59 t, 37 t, 199 t, 868 t
- Concentrated Sn: 5.02 t, 1.83 t, 3.11 t, 154 t, 590 t, 697 t
- Concentrated Sb: 150; 002 t, 53,150 t, 29,186 t, 2,600 t, 1,176 t, 55,760 t, 45,988 t
- Production Oxidine: 42.828 t, 9.027 t, 9.382 t, 11.5 t, 17.7 t, 66,507 t, 80,788 t
- Total: 187.630 t, 63.705 t, 42,251 t, 2,906 t, 1,353 t, 123.086 t, 550,311 t
- Pb: 10.549 t, 10.075 t, 656 t, 34.724 t
<table>
<thead>
<tr>
<th></th>
<th>U/H</th>
<th>Fine</th>
<th>Zn</th>
<th>Pb</th>
<th>Cu</th>
<th>Hg</th>
<th>M</th>
<th>M.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zinc metalurgic to</td>
<td>11463 583</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plumb electrode to</td>
<td>12548 600</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acid mulfuric to</td>
<td>17443 0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Copper**

<table>
<thead>
<tr>
<th>Cone mines Eukonvent</th>
<th>2124</th>
<th>914</th>
<th>56</th>
<th>25</th>
<th>0.5</th>
<th>0.53</th>
<th>9.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conc. plumbor Blikonvent</td>
<td>164</td>
<td>21</td>
<td>103</td>
<td>5</td>
<td>1.5</td>
<td>54</td>
<td>55</td>
</tr>
<tr>
<td>Conc. coelectro-Wich Konvent</td>
<td>304746</td>
<td>10718</td>
<td>10716</td>
<td>8569</td>
<td>83</td>
<td>12346</td>
<td>11072</td>
</tr>
<tr>
<td>Produce oxicide</td>
<td>10652</td>
<td>3237</td>
<td>6991</td>
<td>138</td>
<td>147</td>
<td>10163</td>
<td>2130</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>43686</td>
<td>13980</td>
<td>17926</td>
<td>8734</td>
<td>262</td>
<td>22716</td>
<td>13979</td>
</tr>
<tr>
<td>%</td>
<td>32</td>
<td>41</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Pb. Baja Mare 5924 5718 119 13610
<table>
<thead>
<tr>
<th>Nr.</th>
<th>Sectia</th>
<th>Noxa</th>
<th>CMA</th>
<th>Concentratia medie</th>
<th>Lat var</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>mg/mc</td>
<td>mg/mc</td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Furnal I</td>
<td>Pb</td>
<td>0,2</td>
<td>1,11</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>ZnO</td>
<td>10,0</td>
<td>10,95</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CdO</td>
<td>0,2</td>
<td>0,06</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>SO₂</td>
<td>15,0</td>
<td>7,3</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Furnal II</td>
<td>Pb</td>
<td>0,2</td>
<td>1,38</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>ZnO</td>
<td>10,0</td>
<td>4,9</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CdO</td>
<td>0,2</td>
<td>0,0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>SO₂</td>
<td>15,0</td>
<td>1,5</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Aglomerare II ISP</td>
<td>Pb</td>
<td>0,2</td>
<td>2,18</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sinterplant II</td>
<td>ZnO</td>
<td>10,0</td>
<td>7,84</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CdO</td>
<td>0,2</td>
<td>0,0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>SO₂</td>
<td>15,0</td>
<td>14,96</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Ralinar Zn</td>
<td>Pb</td>
<td>0,2</td>
<td>0,48</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>ZnO</td>
<td>10,0</td>
<td>9,4</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CdO</td>
<td>0,2</td>
<td>0,47</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>SO₂</td>
<td>15,0</td>
<td>1,58</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Sulfat Zn</td>
<td>Pb</td>
<td>0,2</td>
<td>1,14</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>ZnO</td>
<td>10,0</td>
<td>11,4</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CdO</td>
<td>0,2</td>
<td>0,16</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>SO₂</td>
<td>15,0</td>
<td>4,3</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Electroizare Pb</td>
<td>Pb</td>
<td>0,2</td>
<td>1,06</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>ZnO</td>
<td>10,0</td>
<td>4,97</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CdO</td>
<td>0,2</td>
<td>0,97</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>SO₂</td>
<td>15,0</td>
<td>2,36</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cu</td>
<td>1,5</td>
<td>0,97</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sb</td>
<td>0,5</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bi</td>
<td>10,0</td>
<td>0,24</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>HF</td>
<td>2,0</td>
<td>1,13</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>P.A.S.</td>
<td>Pb</td>
<td>0,2</td>
<td>1,16</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sulfuric acid plant</td>
<td>ZnO</td>
<td>10,0</td>
<td>1,58</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CdO</td>
<td>9,2</td>
<td>0,1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>SO₂</td>
<td>15,0</td>
<td>16,8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>8. Aglomerare ISP</td>
<td>Pb</td>
<td>0.2</td>
<td>1.11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sinterplant</td>
<td>ZnO</td>
<td>10.0</td>
<td>9.76</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smelting I</td>
<td>CdO</td>
<td>0.2</td>
<td>0.18</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SO₂</td>
<td>15.0</td>
<td>17.85</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Perimetrul uzinal</td>
<td>Pb</td>
<td>0.2</td>
<td>0.81</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environment</td>
<td>ZnO</td>
<td>10.0</td>
<td>4.23</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CdO</td>
<td>0.2</td>
<td>0.04</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SO₂</td>
<td>15.0</td>
<td>6.72</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6 Par. (outside)
<table>
<thead>
<tr>
<th>No.</th>
<th>Work</th>
<th>Foreman</th>
<th>Office</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tophe I</td>
<td>667</td>
<td>39</td>
<td>723</td>
</tr>
<tr>
<td>2</td>
<td>Tophe II</td>
<td>317</td>
<td>15</td>
<td>347</td>
</tr>
<tr>
<td>3</td>
<td>chimie</td>
<td>229</td>
<td>12</td>
<td>245</td>
</tr>
<tr>
<td>4</td>
<td>Refiner</td>
<td>178</td>
<td>11</td>
<td>192</td>
</tr>
<tr>
<td>5</td>
<td>Wälz</td>
<td>62</td>
<td>1</td>
<td>64</td>
</tr>
<tr>
<td>6</td>
<td>Electrolysis</td>
<td>260</td>
<td>10</td>
<td>276</td>
</tr>
<tr>
<td>7</td>
<td>At mane</td>
<td>350</td>
<td>10</td>
<td>367</td>
</tr>
<tr>
<td>8</td>
<td>At energy</td>
<td>299</td>
<td>11</td>
<td>321</td>
</tr>
<tr>
<td>9</td>
<td>Truck auto</td>
<td>226</td>
<td>1</td>
<td>230</td>
</tr>
<tr>
<td>10</td>
<td>Tr. Ferovia</td>
<td>55</td>
<td>1</td>
<td>56</td>
</tr>
<tr>
<td>11</td>
<td>Vagoane</td>
<td>75</td>
<td>-</td>
<td>75</td>
</tr>
<tr>
<td>12</td>
<td>CTC+Lab</td>
<td>148</td>
<td>-</td>
<td>158</td>
</tr>
<tr>
<td>13</td>
<td>Depoizite</td>
<td>70</td>
<td>-</td>
<td>70</td>
</tr>
<tr>
<td>14</td>
<td>Nerbach</td>
<td>202</td>
<td>-</td>
<td>202</td>
</tr>
<tr>
<td>15</td>
<td>of. calcul</td>
<td>9</td>
<td>-</td>
<td>9</td>
</tr>
<tr>
<td>16</td>
<td>Ventilat</td>
<td>17</td>
<td>-</td>
<td>18</td>
</tr>
<tr>
<td>17</td>
<td>TESA</td>
<td>100</td>
<td>145</td>
<td>146</td>
</tr>
</tbody>
</table>

ISP line No. 1
ISP line No. II
Pyrite roaster + zinsulfat
New Jersey distillation
Wälz kiln
Lead electrolysis
Mechanical workshop
Electrical workshop
Truck transport
Railway transport
Wagon loading
Laboratory
Concentrate and material storage
Canteen and Industrial water
Calculation office
Ventilators
Office
250 m stack in operation

To the right emission of sinterplant

Short stack of absorption tower sulfuric acid plant
Timava Mare valley
view to Copsa Mica

SOMETRA
Metallurgical plant

CARBOSIN
Carbon black plant
Anode slurry treatment plant

Decopperizing

Hoods at blast furnace tap hole
Plant water discharge

Upstream river pollution