# International Mineral Processing and Comminution

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## 1 — International Mineral Processing Activities

As in many other fields, experts in mineral processing are in closer and closer relations on an international level and those relations through technical newspapers and meetings have started, about thirty years ago, to be organized under the form of :

### International Mineral Processing Congresses

I shall not make a complete historical review of these congresses but table—I indicates and summarizes how they developed. They can be commented by answering two questions :

### Why International Congresses ?

To answer this question we have to make some historical references : regarding minerals processing, Europe was in a bad situation, as well as for many other respects, after the second world war. If, indeed, specialists of minerals processing ( as well as for mining and metallurgy ) were used to meet in North America, specially with AIME and CIM, similar orgnizations in Europe were somewhat weak; furthermore they were based on national societies such as Societe de l' Industrie Minerale in France.

In United Kingdom, the scope of the institution of Mining and Metallurgy was somewhat larger, due to the Commonwealth but, anyhow, in Europe there was the need of co-operation.

As far as I remember, it was started by a working group of OECD* ( w.g. No. 3 ) and, more or less, in the same time, further demonstrated by the congress in London called "Recent Developments in Mineral Dressing" : it was, to be precise, between September 23rd and 25th, 1952 that around 330 people mainly from U.K, and the Commonwealth but also a good number from Western Europe assembled in London under this theme. So it was the starting point.

Following year, a more or less similar meeting was organized in France and the system started. As you know and as you can see on table—I, the specialists of this science and of this technology of Mineral Processing met on a more or less regular basis and this will bring us to the creation of the International Scientific Committee.

We have another interest point to mention in that, more or less in the same time, the profession was becoming internationally minded. The supply of ore came, indeed, more and more, from distant places and mineral processing could be made, and, even, should be made in various places around the world. In other words, these European Congresses became from their beginning International congresses.

### Why an International Scientific Committee ?

As mentioned before, the first congresses have been decided and made by national organizations such as IMM and Societe de l' Industrie Minerale. But it appeared quickly that some co-ordination had to be made to insure continuity of such congresses.

What means continuity ? in my opinion, there are three points of view :

1) Continuity of meetings :

It appears easy, when you begin to meet, you meet again ! It is a standing joke, valid I think everywhere when two people meet, the first they say "Hello ! when do we meet ?

* Or EOCD in English

** *Chairman, International Scientific Committee of International Mineral Processing Congress.*

However this is more difficult in that, at least for us, it means to find a place, a date and, more important a suitable organization to handle the next congress.

2) Continuity in the technical and scientific level of the congresses

The second point is probably more delicate in that we want, all of us, to keep up with the sceintific standards of these congresses. So we need communications and discussions of the highest scientific level including, of course, the fundamental aspects of all our processes and techniques.

On the other hand, we cannot neglect the technical, technological and, should I say, practical aspects of Mineral Processing. So we have to keep a balance.

3) Continuity in the international aspects of such congress

There, in fact, I should say not continuity but development and expansion.

As I mentionned earlier such congresses were Europeans mostly for West—Europeans where the need of such meetings was so acute. So, we had the first meetings in London, Paris, Goslar, Stockholm, London again and Cannes.

But, as could have been anticipated, there was a growing participation not only from Europe but, may I say, from the East and from the West. I mean :

USSR and Eastern European Countries, on one side, USA and Canada, on the other.

In a logical way, this led to the meetings in New York in 1964 and in Leningrad in 1968 . . . but in a not so logical way, in our difficult world this led to a number of difficulties and, for the records, it was at that time that we created in a more formal way this I. S. C. which was badly needed to solve a number of problems.

Now, we had to improve our scope in another direction, I mean North—South and after alternating meetings in Western and Eastern Europe, Cagliari, London again and Prague, we moved in 1977 to Brazil. My feeling, as well as for many of you, I guess, is that we have to develop further in that direction in order to have our meetings better known in Asia, Africa and Latin America. We are, indeed, very pleased by more and more delegations from these areas but, however, we intend to develop more and more our efforts in that direction and have more and more meetings in these areas.

## II — MINERAL PROCESSING AND COMMINUTION

As the program of your national seminar on mineral processing indicates, Comminution is an essential unit operation, not only in Mineral Processing but in many other activities, industrial and, even agricultural and commercial. As a matter of fact, our program for the XVth IMPC (June 2nd - 9th 1985 in Cannes, France) included a number of contributions about comminution and it gives the opportunity to emphasize, in this address how comminution is now regarded, specially of course, from the point of view of mineral processing. We think there are three different points of view :

Technology of Comminution :

This is, in fact, the first point of view, I mean from operators of crushing and grinding plants as well as designers of these equipments. A lot of work has been made in this field of research and, specially, development but more work is going on and, in my opinion, specially in fields of :

- the materials of the crushing and grinding equipment, specially the linings and the grinding materials (balls, rods, etc . . .)
- the conception of these equipments and the drive systems
- automation and use of more sophisticated sensor and control devices associated with computers
- and, of course, the link between the comminution equipment and the sizing units : screens, classifiers, cyclones etc. . .

Theory of Comminution :

From practical and technological aspects, we are now coming to fundamentals and theory or, should I say, various theories of Comminution and liberation of the minerals in a given ore. It must be appreciated that many research program are progressing around the world to understand how comminution is made.

As recent examples, among the contributions, scheduled for our XVth IMPC in Cannes I have noted several papers in this field. I do not want, of course, to comment them but only mention the various lines of approach in this important field.

— the *fracture mechanism,* (specially YASHIMA, KANDA, SANO and HASHIMOTO from Japan; they have made an evaluation of the final fineness of ground products achieved by ultrafine grinding from this point of view )

— *the stress conditions of the particles,* or to be precise, of a bed of particles in the various grinding systems by prof. H. SCHUBERT and D. Ing. HANISCH from Bergakademie Frelberg (DDR)

— the role of fine grinding on the *surface properties* of quartz particles by prof. J. M. CASES and Ing. DOERLER and FRANCOIS from the Nancy ENSG and BRGM center (France)

— and a theoretical approach of *surface and solid state properties modification* during grinding from LIN and NADIV from Haifa (Israel).

New Technology :

This is the third part of this approach where, using better and better knowledge of the fundamental and theoretical aspects of comminution, on one side, practical and technological possibilities, on the other, new processes and new technologies can be developped.

As an example we can remind the development of autogenous and semi-autogenous grinding which is going on; just a few months ago, a large new iron ore concentration plant has been started in Mauretania with a dry flow sheet: medium intensity magnetic separator and two very large semi autogenous mills, each

34.5 diameter X 6.75 ft. length

6000 HP ( 2 motors )and

1500 t/h ( 7 milloin ton crude ore per year for each mill )

From theoretical studies, new technologies could and, probably, will be devised in the future to achieve what is the aim of comminution in mineral processing i. e. the liberation of the various minerals which will be further separated by appropriate equipment.

**CONCLUSION :**

As a conclusion, may I say that your seminar will certainly be very interesting and I wished to be with you at that time; unfortunately, I was not able to come again in India.

To include, I wish you a very fruitful and pleasant meeting which is, may be, somewhat a "rehearsal" of a future international mineral processing congress in India.

**TABLE — 1 : INTERNATIONAL MINERAL PROCESSING CONGRESSES**

| | Place | Number of contributions | Number of delegates |
|---|---|---|---|
| 1 | Londres — 1952 | 39 | 332 |
| 2 | Paris — 1953 | 28 | 302 |
| 3 | Goslar — 1955 | 20 | 490 |
| 4 | Stockholm — 1957 | 34 | 523 |
| 5 | Londres — 1960 | 52 | 644 |
| 6 | Cannes — 1963 | 50 | 752 |
| 7 | New-York — 1964 | 55 | 1200 |
| 8 | Leningrad — 1968 | 69 | 900 |
| 9 | Prague — 1970 | 55 | 700 |
| 10 | Londres — 1973 | 48 | 700 |
| 11 | Cagliari — 1975 | 53<br>+ 24 * imprimes<br>+ 22 ** en tables rondes | 787 |
| 12 | Sao Paulo — 1977 | 87<br>+ 18 *<br>+ 23 en tables rondes | 562 |
| 13 | Varsovie — 1979 | 61<br>+ 6 conference pleniere<br>+ 31 en tables rondes | 717 |
| 14 | Toronto — 1982 | 110 | 600 |
| 15 | Cannes — 1985 | Around 150 ? | ? |
| 16 | Stockholm — 1988 | | |

* printed in the proceedings but not open for discussion

** In specialized sessions ( round tables )