Some impressions from IDS '96

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SOME IMPRESSIONS FROM IDS'96

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REASONS FOR DRYING

In one of his books on drying Roger Keey[1] states that *'Reasons for drying are almost as diverse as the materials that are dried'*. This statement became again true during IDS'96, being held in Kraków, Poland, from 30 July to 2 August 1996. Though drying is said to be a unit operation, it covers a rather diverse field and many configurations for drying equipment exist. The main reasons for this are the broad range of required drying times, the transportation of several types of material through the dryer and the desired product quality. Compared to other classical unit operations, this diversity in technology has been and still forms an intrinsic obstacle in the development of a scientific understanding of the drying process. The idea to hold biannual International Drying Symposia to promote exchange of knowledge and expertise on the science and technology of drying has contributed quite a lot to a better understanding of the phenomena playing decisive

[1] Drying: Principles and Practice, 1972, page 1

roles in drying processes. This series of International Drying Symposia was initiated in 1978 - and sustained over the years- by Prof. Arun S. Mujumdar from McGill University, Montreal, Canada. The successful 10th IDS in Kraków, Poland, has undoubtedly attained a honourful position in this series of symposia.

In an economical sense there is only one single good reason for drying, namely making profit. This requires that the drying process

- adds value to the product (quality, specifications)
- is performed at minimum costs (design, control, optimization, equipment, technology, energy, other resources)
- and is realized within the rules, imposed by society (safety, environmental protection, loss prevention).

These three factors are essentially the main driving forces for research and development. Nevertheless, one should not ignore the personal drives of researchers themselves, especially at universities.

THE PAPERS

It is not the intention to give here an extensive and well considered analysis of the papers, but to sketch simply some personal impressions. The number of papers published in the proceedings amounts 194. These papers are subdivided by the organizers in several categories, as can be seen in Figure 1. These categories can be rearranged according to:

Theoretical:	fundamentals, modeling and simulation	23%
Practical:	equipment, technology & automation	25%
Products:	Agricultural and Food products	29%
	Other products	23%

It is striking to see that more than half of the papers are specially devoted to the drying of some material. Nearly all these materials appear to be different! This

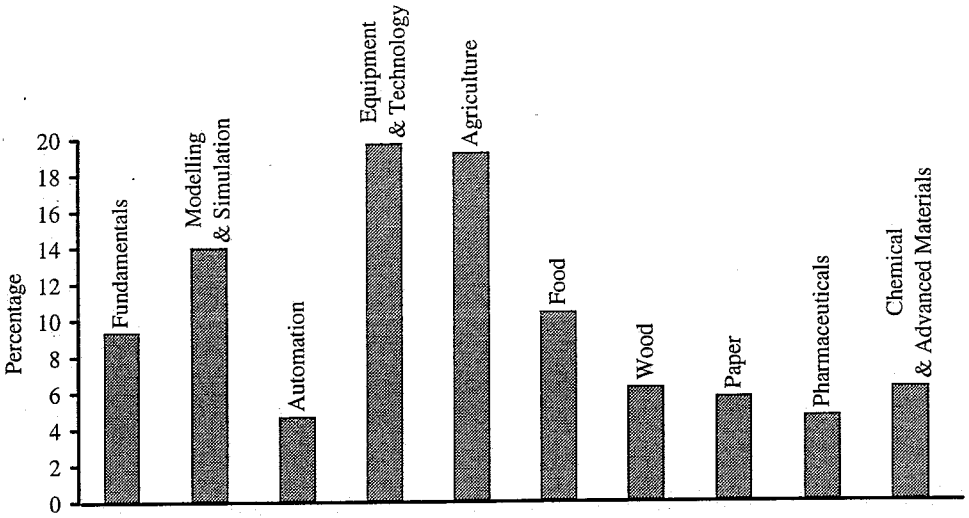

Figure 1. Papers at IDS'96 and fields of interest

may be seen as a clear indication that the relation between the drying process and the obtained product quality is a rather complicated one. Most of the materials investigated are agricultural and food products and there is only few attention paid to the drying of inorganic materials and polymers.

7% of the papers are dealing with energy savings by means of heat pump drying (wood chips, beet pulp, fish meals), or by using solar energy, or by applying partial energy recovery from exhaust air or by a better understanding of the drying process itself. It might be a little bit surprising to see this low number of contributions, because generally drying is considered as a highly energy intensive process, and because of this it is often mentioned in national and international research programs.

Drying must be a very safe and environmentally friendly process, because only 1 (keynote) paper, by Michel Roques, was dealing with this subject. Surprising? Maybe not, because safety and environmental protection are less specific for drying processes and are disciplines themselves, which can be dealt with in other types of congresses.

Sophisticated models for mass and heat transfer in drying materials are presented by Perré (porous materials) and Hasatani (shrinking materials). These rigorous models incorporate a maximum of physical relevance and are not easy to handle. Most model parameters depend on moisture content and temperature and are laborious to establish experimentally. However, these models are very important for developing a better understanding of the drying process at the microscopic scale.

An excellent way of validating models for drying kinetics is NMR-imaging and not one single paper is dealing with this subject! In most cases drying kinetics is characterized by means of drying curves, which represent an overall drying behavior of the sample and from which it is rather difficult to derive reliable intrinsic material properties.

In modeling flow patterns and particle trajectories an increased interest in using Computation Fluid Dynamics would be expected. Unfortunately only a few papers, including a keynote lecture by Tim Langrish, are dealing with this subject, despite the availability of excellent commercial software in this field. In his keynote lecture Keith Masters addresses the question of wall deposition in spray dryers and that solving these type of problems via fundamental CFD approaches might be very promising. It is without any doubt, that there are great potentials of CFD in the practical design of dryers. The combination of CFD modeling and sophisticated drying kinetics seems to be a future dream. Stable, accurate and fast computer programs for these rigorous approaches are still hard to develop and accordingly some need for simplified models will keep on in the future.

Taking into account:

- the large amount of dryer configurations and the many materials to be dried,
- the modeling at different scales, from micro (pores, molecules), meso (particle) to macro scale (incremental or total dryer),
- and the balancing between physical meaningful and practical manageable models

may explain the great diversity in theoretical approaches of drying processes, as can be seen in the papers of IDS'96. Sometimes, one feels the instigation to clean up this field in one way or the other.

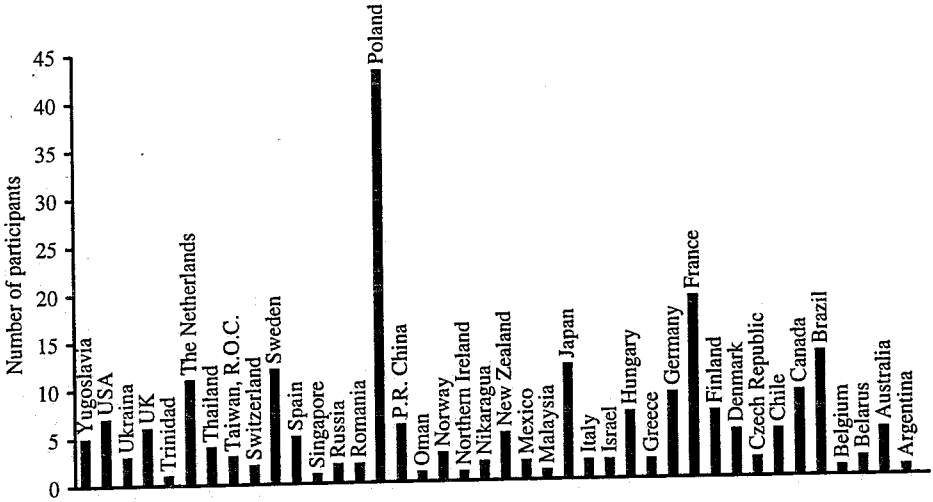

Figure 2. Participants IDS'96 and their country of origin.

With respect to new technology a very interesting idea was put forward by Prof. Schlünder in his keynote lecture, where he proposes the concept of thermo-mechanical dewatering. By heating saturated porous materials with superheated steam or via microwave energy internal evaporation of the moisture may occur. This causes pressure gradients, which lead to a mechanical displacement of the liquid solvent. This way the dewatering process takes place by a combination of thermal and mechanical dewatering, which requires less thermal energy and gives shorter drying times.

THE PARTICIPANTS

About 230 people, coming from 40 countries, attended IDS'96. In Figure 2 an overview is given. As usual the host country of the symposium is the clear winner, with 43 persons, which is 1/5 of the total attendance. Further, this chart speaks for itself.

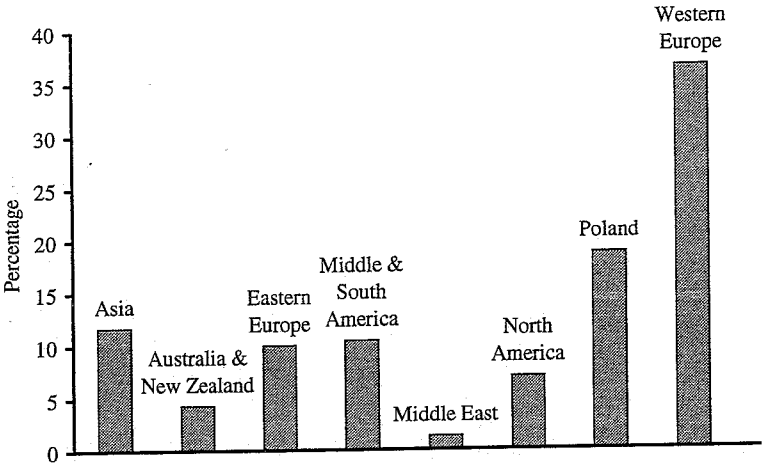

Figure 3. Participants from different regions

In Figure 3 an overview is given of the participants according to the geographical part of the world they are coming from. It is striking to see the weak representation of North America (USA and Canada). Probably the attendance from this part of the world is that low because of the Olympic Games in Atlanta and/or by the World Congress on Chemical Engineering in San Diego being held at nearly the same time. Further the participation from Middle and South America is surprisingly strong, and due to the congress location more people form Eastern European countries were able the attend IDS.

INDUSTRY, INSTITUTE AND UNIVERSITY

During the Open Forum Discussion the relation, or better said the "poor relation", between industry and academia was discussed. From the list of participants it can be derived that the ratio of attendants from Industry:Institute:University is 1:2:7. Further, only 10 participants from 6 manufacturers of drying equipment are fea-

turing on the list. These figures show a worrisome weak interest from industry. In general, transfer of knowledge from academia to industry and vice versa is said to be rather poor, and there might be something wrong on both sides.

It is felt that in industry the technology management is rather conservative. There is often a lack of qualified people with drying expertise, contrarily, drying is just one of the many tasks employees are dealing with and so this process does not have the highest priority in their work. Further, one has to admit that in many cases trial and error approaches are leading more quickly to a working solution than scientific routes. Especially for food products, enhancement of product sales can be better achieved via advertisements, commercials and attractive packages instead of improving the product quality via more risky research efforts. On the other hand, the academic world produces a great diversity of drying models, which makes it difficult to make a good choice; in general the manageability of the models is poor. Researchers are rather satisfied with accepted publications, nice reports, etc. and they do not always show a drive for putting theory into real industrial practice. A possible solution for bringing industry and acedemia more close together, should take into consideration, that there is a need for:

- reliable good software development towards industry.
- practical laboratory methods for the establishment of the relevant material properties.

Good and satisfying working solutions for drying processes can only be achieved by essential co-operation between both sides. An example of such a fruitful co-operation is shown by Soponronnarit, Prachayawarakorn and Wangji in their paper on a "Commercial fluidized bed paddy dryer". A co-operation between academia and a private enterprise has resulted in 28 commercial plants. Surely, there must exist many more of such examples, however in many cases this information will be confidential and is not published in open literature. Nevertheless, success stories are needed to convince both worlds of the potentials they have. I am not aware of situations in other parts of the world, but in the European Community it has been recognised that mystic walls exist between industry and academia,

especially small and medium sized companies are missing chances here. Therefore special research programs (e.g. CRAFT) have been set up to break down these barriers.

REASONS FOR ATTENDING IDS'96

There might be a chance that those, who attended IDS'96 do not recognize much of all the things being said here. They might even think that the author attended some different symposium. However one should realize that every participant may have his or her own field of interest and by paraphrasing Roger Keey one could say: "The reasons for attending IDS'96 may be as many as there are participants". All that the attendants have in common is that they hope to meet people and to hear things that bring them further in their work at home.

IDS has grown over the years towards a full size congress offering a welcome reception, an opening ceremony, many lectures in 3 parallel sessions, posters, congress dinner, 7 awards , open forum discussion, touristic excursion and proceedings printed in two volumes. In the periphery of the symposium business meetings were held by the EFCE-Working Party on Drying, the International Drying Symposium Secretariat (IDSS), the European Drying Network QUID and maybe other groups.

This symposium was very enjoyable, not only because of the above mentioned program, but also because of the perfect ambiance and the beautiful location in the historical city of Kraków. The efforts of Prof. Czeslaw Strumillo, dr. Zdzislaw Pakowski and all their co-workers for making IDS'96 so attractive and successful are greatly acknowledged by the international drying community.

Jan Coumans, August 1996