

# "Sustainability is being seen as intrinsic to good construction practice"

**Q:** Professor Dhir, you are an internationally acclaimed expert on concrete technology; what in your opinion are the broad trends in the area of cement and concrete in Europe?

**A:** This is a difficult question to answer, as out there in Europe, and to a varying extent worldwide, design, specification and testing of concrete is being reviewed and the norms are changing. Notwithstanding this, as I see it, there are three basic principles that are helping to reshape European concrete construction practice:

- specification of concrete by performance.
- adoption of multi-cement combinations.
- acceptance of sustainability as central to concrete construction.

I must confess, I have advocated these approaches long and hard, as I believe that this will allow concrete to remain competitive and retain the centre place as the "Number 1" construction material.

**Q:** We understand that the concept of "sustainable construction" is picking up in Europe. What is the current status in this regard?

**A:** Very encouraging indeed, although a lot remains to be done. The good news is that the construction industry is realising that it is the major player in the overall European sustainability equation. Thus, sustainability is being seen as intrinsic to good construction practice through all its elements, from materials, production, design, construction to operation.

**Q:** We understand that the share of blended cements in the to-

tal cements is as high as 65 percent in Europe. Learning from your experience in Europe, what steps are needed in India to achieve higher level of blended cement consumption?

**A:** I would address this question differently. Admittedly, the majority of cements used in making concrete within Europe are not Portland clinker alone, that is, cement combinations or blended cements (as you prefer to name them) are commonly used.

However, I would not take this to mean, as this can prove dangerous, that cement combinations can replace Portland clinker cements regardless. I believe that the correct way forward for India would be first to understand the function of cement combinations within the Indian climate and then to address how to maximise their use to optimise concrete performance. This will not be easy, I can tell you now, but it is necessary if India were to avoid making mistakes of the kind that others have made.

## Professor R K Dhir



Professor Ravindra Kumar Dhir is the Director of Concrete Technology Unit (CTU) that he founded in 1989 and which is now an internationally acknowledged enterprise for its excellence in research (with extensive laboratory facilities) and continuing professional development courses (10,000 man hours per year) for the related sectors of the construction industry. The uniqueness of the CTU is that whilst it inspires to achieve the highest academic standard at all times, it works very closely with the construction industry, which

contributes over 50 percent of its total annual external funding budget, currently at £1.5m. This combination provides a culture where industry and academia can move together to optimise construction for cost effectiveness, whilst allowing flexibility for radical innovation and development. This has been recognised by the award of DTI Secretary of State's Prizes in 1998 and 1999 for academic/industry partnerships in research in the area of concrete technology – the only group within the civil engineering and related disciplines in the UK ever to receive this honour.

An internationally acknowledged scholar and practitioner in concrete science, technology and construction. Professor Dhir's contribution in this field has been recognised worldwide and he was awarded in 1994, an Honorary Fellowship of the Institute of Concrete Technology for services to research and education and in 1999 an Order of the British Empire (OBE) for services to Concrete Technology.

Professor Dhir has served (chaired) on numerous academic/technical committees nationally and internationally and has played a major role in the on-going development of education, training and research at various levels, namely, academic : at court, senate, faculty and departmental levels; and technical : within publishers, CIRIA, Scottish Executive, British and European Standards Institutions, American Concrete Institute, Department of the Environment, Engineering and Physical Science Research Council, Concrete Society and Concrete Industry Alliances. He has published extensively (38 books and 200 papers) and travelled widely throughout the world giving lectures and speaking at the seminars and conferences. Professor Dhir is regularly invited to give keynote papers and chair technical sessions at major international conferences and has been consulted widely by companies within the various sectors of the construction industry within the UK and overseas in India, Singapore and South Africa. Above all, he is well liked by his students.

**Q:** There is a concern in certain sections of the Indian construction industry that the use of fly ash based blended cement may make the structure susceptible to higher levels carbonation of concrete and corrosion of reinforcement. What are your observations on this issue?

This question was put to me by the audience during my lectures in Mumbai, Chennai and Bangalore, entitled "Fly Ash : An essential ingredient for the 21<sup>st</sup> Century Concrete Construction". I tried to avoid this then, as I thought it was the wrong platform to discuss such matters. I think that this interview is also not the correct forum to deal with the question. In general terms what leads to the ingress of CO<sub>2</sub> into concrete and the formation of HCO<sub>3</sub> is the permeation property and moisture content of concrete. These issues need to be considered before dealing with the question of carbonation. As you can see, the answer is already becoming complex and why I say that this question needs to be discussed in detail in a technical forum. Moreover, it would be necessary to involve all pozzolanic materials in such a discussion.

**Q:** The use of construction waste has not really been popularised. What can be done to implement its increased usage?

**A:** I could have said the same about the UK, about 10 years ago. However, the situation has been improving rapidly. This change has been brought about by, for example, intense promotional work by the government, Professional institutions and environment regulatory organizations, plus pressure groups such as "Friends of the earth" and the green party. To further encourage the use of construction demolition waste (CDW) the government has also been introducing penalties in the form of landfill taxes for discarding waste (£3 per tonne) and levy on the extraction and use of naturally-occurring aggregates (£2 per tonne). Education, training and dissemination of newly found knowledge from R & D and demonstration projects are also helping the agenda for developing the use of CDW. For example, any R & D project funded with the public money in this area in the UK must have a clearly stated dissemination policy within the proposal also indicating who the likely beneficiaries may be and how the

project outcomes may help in the use of CDW. So you can see a lot of effort is required to bring this kind of desired change.

**Q:** You have often talked about innovative and exciting applications, such as self-cure concrete and controlled permeability formwork. When will this actually be used in the industry in a pervasive manner?

This is an interesting question and as to be expected, as an editor, you have done your homework well and are familiar with the CTU research. Indeed, to a varying degree, both the self-cure concrete and controlled permeability formwork are being used in the construction industry. However, the level of use depends on many factors, including cost and more importantly how the cost is calculated (initial cost or whole life cycle cost) and how a particular construction project is conceived. Here, it would be worth reminding ourselves the way the concrete construction industry is structured, and that it can be painfully conservative, and therefore determined efforts are needed to bring about changes, albeit very slowly.

**Q:** Do you think that research in concrete technology is poised for still further growth?

**A:** I am unsure what is meant by still further growth in research in the area of concrete technology? Indeed, given that concrete is second only to water volume consumption, insignificant funds are invested for research and development in this area. This explains why the concrete construction industry is primitive in relation to the advances made in other sectors of industry. Furthermore, I fear that governments worldwide tend not to regard concrete research as a priority area, perhaps they never will. This is regrettable as the emergence of sustainable construction developments can only be brought about by sound, dependable innovative research.

**Q:** As an academic, do you agree that fewer students are viewing civil engineering as a career option? What can be done to change their view point?

**A:** I am afraid, and it is regrettable, that this is happening. I think, in this regard it is the civil engineering profession to blame, as it has not evolved

with time as it should have done, both in terms of creative skills and financial rewards, from the formulation of materials to design of structures. I also think that it is going to be difficult to turn the tide in the near future.

**Q:** You have successfully conducted international conferences in the field of concrete technology. Are you planning any such conference in the near future?

**A:** Two things need to be stressed first.

- (i) It is the Concrete Technology Unit (CTU) at the University of Dundee and not I that organizes these highly successful international conferences. I happen to have the privilege of being its founding Director since 1989.
- (ii) It is important to recognise that the CTU organises these conferences in partnership with industry and in doing so, provides a platform to discuss new developments and how best concrete can meet the challenges that lie ahead.

Thus, there is a clearly defined mission and focus for these conferences, which draws delegates in large numbers (up to 650) from all over the world (up to 70 countries) to Dundee. In addition, the CTU invest a great deal in these events and does its utmost to provide excellent value for money. Indeed, our next two sets of conferences are planned for September 2003.

- (i) Celebrating Concrete : People and Practice (September 3-4, 2003) at which we will be honouring Professors Fred Glasser (Scotland), Surendra P Shah (USA) and Jiri Strasky (Czech Republic) for their outstanding contributions to concrete technology.
- (ii) Advances in Waste Management and Recycling (September 9-11, 2003).

Thereafter, we plan to hold our triennial congress in 2005, which I believe would be my last.

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