

The greatest challenge for the future of the refractory area

V.C. Pandolfelli, Federal University of S. Carlos, Brazil

Human evolution over time has brought us to the “Technology Era” in the XXth century. Experts believe that we are currently facing the “Imagination Era”. I myself have given various talks quoting this statement. Nevertheless, recently I have been reflecting on this subject and realized that it seems much more suitable to call the present century the “Creativity Era”. Imagination is not the same as creativity. Imagination is an internal process which could be performed without anyone noticing, whereas creativity is related to original ideas that have value. Being creative involves using the imagination to work and come up with something new, leading to new solutions for everyday problems. Creativity is applied imagination. The pressure to be innovative nowadays is pumping out of our brains, mainly because we tend to magnify the difficulties involved in technological breakthroughs. Regarding this subject, we often think about ideas transcending the surroundings as a result of a unique gifted mind (that we don’t usually have..). Nevertheless, let me emphasize that it might not be the case with an example that I came across recently. Whenever mankind faces a tragedy in remote areas, there is a global move to provide help to the less fortunate. In order to save infants, modern incubators are often donated and statistics show that after some months, most of them are not working properly. Lack of spare parts and technical expertise to fix them are the main causes. Nevertheless, a doctor observed that even small towns seemed to be able to keep their cars working. Therefore, why not make an incubator out of car parts? This was the birth of a key device that from the outside looks like modern equipment, but the inside is made of car parts, with no need for trained medical technicians to fix it or even to read the manual. This is creativity in action, frugal innovation providing simple solutions with quality. Most of these kinds of breakthroughs do not require a quantum leap of an extraterrestrial genius or even a large budget to come true. However, they certainly require us to keep our eyes wide open to see the surroundings and make the right connections. I always think about Darwin’s famous saying in order to apply it to my research and life: “It is not the strongest of the species that survives, nor the most intelligent. It is the one that is most adaptable to change”. In order to survive, we need to be creative by making simple and effective connections with our environment. Perhaps, the best innovations in the refractory area are much closer than we can imagine, because innovating while keeping the simplicity and reliability requires not only imagination, but above all creativity, based on reflections, practices and observations.

But, should we only think about innovation in the technological aspect? How about attracting young and bright people to the refractory area? Based on the present situation, why are they choosing different professional directions? General and quick

answers may arise such as: there are so many professional choices nowadays and bio or electronic ceramics are much more appealing. What does the new generation expect as a professional life in the industry or at university? Recent international surveys involving thousands of people around the world ranging from 18 to 24 years old, interviewed in pubs, parks and universities concluded that 90% of them want a job that could help the society. Besides this, only 4 out of 10 considered salary as an important factor when a new job is chosen. As a matter of fact, salary was only the seventh most important item listed. Growing fast up the hierarchy ladder and earning high wages are no longer the priority for the present generation. For them, the size and history of an organization is not a key issue when choosing a job. The main driving aspects are the values and the ability to make them dream, either carrying out a project or research. Without dreams, without a purpose, the targets are worse than unattainable – they don't make sense!! Satisfaction is the most important aspect in the job and if they are convinced by the values, they will put their heart and soul into it. Based on these surveys, almost 50% of young people change their jobs due to the lack of challenges.

But, what can we do to seduce the young generation? Antoine de Saint-Exupéry, perhaps shed some light on this issue: "If you want to build a ship, do not gather people to collect timber and don't assign them tasks and work, but rather teach them to long for the endless immensity of the sea". Previous generations need to be creative in order to convince present students. As mentioned before, creativity is applied imagination as a result of keeping our eyes wide open to see the surroundings and make the right connections. These statements are clear and valid, but don't we do and study what the new generation is seduced by? In general, the answer is yes, but if refractory does not attract as many young people, we should ask ourselves whether we are using the right methods to market the area?

Refractory is a mature field regarding importance but also in terms of the average age of professionals working in the area. Perhaps the most difficult aspect is not for the young generation to see the refractory area with our eyes, but the opposite. As mature people we are more reluctant to changes, whereas the present generation with their energy and dreams want to be convinced and to do things their way. Were we any different? Do I need to recall what happened in the sixties and seventies of the last century? The problem is not trying to understand young people, because it is clear what they want! The battle is for us to present them with the refractory area in a way that they can be attracted! For example, why not thinking and showing the challenges of refractory energy saving issues from an integrated point of view? High emissivity paints, slag foaming, advanced foaming spray insulating, novel ceramic burner designs made by 3D printing, etc, can be part of a holistic view of refractory subjects that will help the environment, the society and make us feel useful! How about the courses that are taught? Are we concerned with the importance of the

transversality of the knowledge? Philosophy, nanotechnology, sciences of nature, anthropology, etc, they must all be part of the package for the global professional. How could we understand and teach ethics in a broad sense, if our cosmos is limited to a nut shell? We have arguments and history to change the old and current “Dirty-Messy-Polluting” image of the refractory area for a “Clean-Green-Challenging” one. The problem is that we are expecting the young generation to see the importance of refractory on their own, whereas the other professionals are marketing their area better.

By the way, if you are not convinced by the statements above and still think that the present generation is unique and complicated, a quotation by Roger Allen, a contemporary American writer, can explain this issue better: “In case you’re worried about what’s going to become of the younger generation, it’s going to grow up and start worrying about the younger generation”.