In 2001, Satyendra Pakhalé was invited for a residency at the European Ceramic Work Centre (EKWC) in the Netherlands. During that period, the centre encouraged professionals with hardly any prior ceramics experience, including architects and designers to join a residency in order for them to act as a catalyst for innovation. Pakhalé had already worked with ceramics on a smaller scale, experimenting with artisans at the Bhadrawati ceramic centre in India. EKWC was an opportunity for him to further develop his interest. 'I am fascinated by ceramics, an age-old, yet high-tech material,' he says.

'Not being a ceramist,' he adds, 'You cannot know the limitations, so you're willing to try out new things, which allows you to go further. I have a lot of respect for this material, perhaps one of the most magical and ancient innovations of humankind. Ceramics is a material with a long history; as long as the Earth has existed, ceramics have been around. But it is also a very high-tech material. This is the paradox I was working with.'

Pakhalé worked at EKWC on two different occasions, separated by a year. His first residency involved working with skilled artisans and EKWC's technical staff to develop test models for one singular piece - a chair; the second period was focused more on developing the technical joint between the backrest and the body of the chair to make it work at full scale. Part of his goal was always to create something that could be produced at least in limited numbers. 'The object has to be multiplied to become a valid object,' he explains. 'Only then is it a valid object in terms of producibility. As an industrial designer, my goal is serial production.'

His approach to ceramics was novel: traditionally, ceramics has never been associated with structural objects like chairs. 'When I began, I was not sure how to proceed,' Pakhalé recalls. 'I imagined creating hollow clay volumes in order to assemble a chair-like object. I wanted to create a piece of furniture as a symbolic object. Personally, I have no nostalgic or traditional values regarding ceramics.'

For pragmatic reasons, he chose to work with the hand-thrown pottery process in order to get faster results. He found artisans and assistants who had pottery-making skills, and a skilled artisan who had developed a particular method of hand-throwing using mirror reflections to achieve perfectly symmetrical forms. Pakhalé would run his studio for a good part of the day and then rush to EKWC in the evening, working late into the night drawing and visualizing the

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A Full-scale hand-thrown volume being prepared for joining in wet condition.

B The drying process was one of the critical steps to avoid cracks while making these ceramic pieces. Here the drying process being monitored by Pakhalé.

C, D The dried ceramic pieces were skillfully stacked in the EKWC's large kilns using a forklift truck.

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pieces which eventually became the Flower Offering Chair❶ and Roll Carbon Ceramic Chair❷.

'Turning a shape on the wheel is a technique that requires amazing hand to eye coordination and it is one of those skills that takes years to master,' Pakhalé explains. While making use of this process, he attempted to do something completely new: to make a chair by joining parts and pots together to achieve unexpected results. From the beginning, he was clear that this would be no traditional seat. 'It is not a chair to sit on in front of the computer for eight hours a day,' he says. 'The Flower Offering Chair is more of a ceremonial object to welcome people. Something like a universal statement, offering flowers as a friendly gesture. Design, for me, is not only functional. There are psychological and social aspects as well.'

Pakhalé began with the basics: throwing a pot. He undertook research into a wide range of materials, searching for a clay mixture that would tolerate high-temperature firing in the kiln. Unlike metal or plastic, ceramic is an unpredictable material with an element of surprise. In the firing process, anything can happen. The piece can deform, or worse still crack or break or even explode inside the kiln. During the first period, several models of various sizes were made, clays were mixed and remixed, wall thicknesses were adjusted to allow for the natural shrinkage of the drying clay, and pieces were fired, sometimes coming out beautifully, other times cracking or becoming distorted. Then, back to the wheel and more pots were thrown based on Pakhalé's sketches, which covered the walls of the studio space at EKWC. Once all these tests were completed, the technical staff and Pakhalé moved on to full-scale prototyping. Not only did the clay composition have to be just right, but because of different thicknesses in each piece, firing had to be carefully calibrated. The joining of the back pieces to the seat was a big challenge. 'At first, we put them together and then fired them,' Pakhalé recalls. 'But this made them susceptible to cracking and exploding. So I designed a special ceramic joint.

We made the parts separately and connected them after firing with the joint and a two-component polyurethane glue. The piece was placed on a shrinkage slab to enable equal shrinkage during drying and firing in order to avoid deformation or splitting.' After several failed attempts, successful scale prototypes were eventually realized. Based on these, full-scale ceramic chair-like objects could be made. Once these full-scale pieces were successful, the new design opportunities were developed further in collaboration with industry or in a skilled workshop in which the project could be produced in a limited edition.

E Pakhalé worked with a skilled craftswoman who had developed a method of hand-throwing using mirror reflections to achieve perfectly symmetrical forms.

F Before finding the skilled artisan, Pakhalé had previously worked with an assistant who could not hand-throw objects taller than 30 cm, despite seven years of throwing practice at the local art school.

G A joint in wet clay was tried out with mixed results. These trials bore fruit in later projects.

The Process

To begin with, several tests were made to achieve the right mix of clay. Various clays (earthenware and stoneware) and grog were mixed in different proportions to obtain an open structure. This also improved the clay quality, especially during firing, by reducing the tension. Several scale models were made to test various ideas, like joining the clay and then firing it at 1200°C. After these tests, the real task of making a full-scale prototype began. Creating the large forms with joints and connecting them while still wet was a real endeavour.

The consistent drying of the relatively complex ceramic structure was essential and took 15 to 20 days. The exact drying time depends on the clay body (mixture), scale, complexity and thickness. Getting the product through the different stages of drying from plastic to dry was another hurdle.

After building the initial clay prototypes, firing the entire chair structure proved problematic as some prototypes cracked. Developing the joint created new possibilities for industrial realization. This new ceramic joint was developed as a separate parts and fired independently to be connected afterwards with two-component PU glue.

Experimenting with the material presented the opportunity to produce the ceramic chair on an industrial level. With this technical development it was possible to produce the chair with the help of moulds for slip casting, similar to the moulds used in the bathroom industry. For this relatively new production method, currently used exclusively for the production of ceramic bathtubs, the form and size of the ceramic chair needed to be adapted. Adding materials such as vitreous china – perfect for large ceramic objects and with the possibility of connecting separate parts after firing – fuelled new design opportunities. These needed to be developed further in collaboration with an industrial workshop. Pakhalé launched a search for such a ceramic workshop and after visiting a few he settled for the family-owned ceramic manufacturer, based in the north of Venice, Italy.

The next phase, critical to the chair's ultimate viability, was to find a way to produce the piece in some non-handmade quantity. Pakhalé: 'It took quite some time to find a ceramic workshop that could make the special moulds for the seat and the backrest with a special metal fixture to turn them during the slip casting process.'

While Pakhalé would never expect to make thousands of these chairs, being able to make and use dozens is important to him. He wants an object that, while ceremonial, still lives in the real world.

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H–J Scale models of ceramic audio speakers. Pakhalé experimented and played with the idea of developing ceramic speakers in the early phase of his EKWC residency.

K Experimental piece during the first phase of the residency.

K

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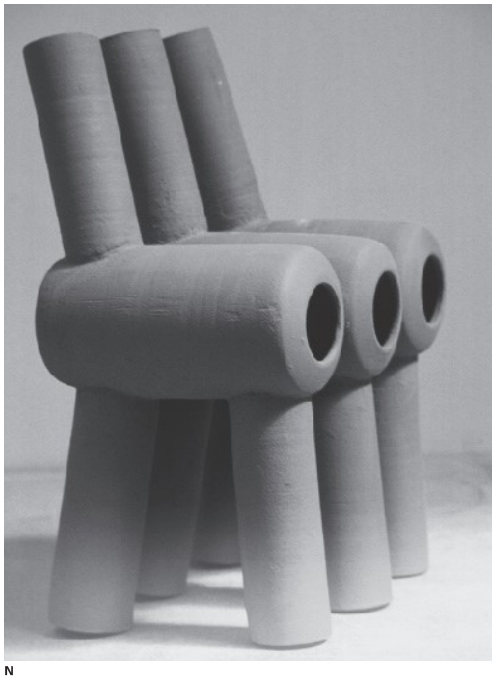

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Therefore, he points out. The Flower Offering Chair is therefore extremely sturdy and can also be used both indoors and outdoors.

Although Pakhalé pushed the boundaries of ceramics and traditional processes into untested and innovative areas, the clay resisted, asserting its natural properties. 'The ceramic material itself is very surprising and fascinating. It's very hard to control,' Pakhalé explains. 'A person like me, a control freak, needs to control every single detail of the project. I have a very clear picture in my mind, and with every industrial design project, I know how it all fits together. When you have a concrete idea, you can get it made immediately in 3D CAD, or as a precisely crafted model, exactly as you want. With ceramic, you can't do that.' As satisfying as the final product is, with all its whimsical, symbolic, ancient, contemporary, high-tech, low-tech, and tactile associations mixed together, Pakhalé wanted to take what he had learned from it into new applications, materials and new products. The intensely productive period at EKWC led to many other design works with a similar, ceramics-like finish (although they are not made in ceramics) such as the Add-On Radiator ❸ and Kangeri Nomadic Radiator ❹.

L Fruit bowl with Ananda Totem engraved with glaze ❺.

M A successful wet clay structural study with a joint.

N A scale model study with a joint in wet clay tried out during the early phase of the residency.

❸ 314–321 ❹ 154–159 ❺ 422, 425