

MIRACRADLE™

NEONATE COOLER

Recently awarded by the President of India for successful commercialization of indigenous technology. A simple and functional rotational moulded product.

by Satish Gokhale, Design Directions® Pvt. Ltd.



DESIGN DIRECTIONS®
Managing Innovations

Birth asphyxia is the second largest cause of new-born deaths globally, accounting for more than 600,000 new-born lives. India alone accounts for more than 125,000 deaths from this source annually. Neonatal cooling or therapeutic hypothermia (THT) is the standard of care for birth asphyxia treatment. Babies who are born with this condition and aren't taken care of as soon as possible risk dying or living with brain damage besides many other complications.



Globally there is a need to bring these numbers down and keep more children alive. Among the causes of death, birth asphyxia is responsible for almost 10% of all infants dying after birth.

Recently, on the 11th of May, 2017 (National Technology Day), an Indian company, Pluss Advanced Technologies Pvt. Ltd., was awarded by the President of India for successfully commercializing an innovative and indigenous product to treat birth asphyxia. The product was manufactured in collaboration with Christian Medical College of Vellore, India. The product is called the MiraCradle™ Neonate Cooler, and it saves the lives of babies who are born with birth asphyxia. MiraCradle™ was designed by Design Directions Pvt. Ltd, an award-winning product and communications design company co-founded by Satish and Falguni Gokhale in 1988. Both are alumni of the National Institute of Design, a premier design institute in India.

They have won several national and international awards for medical devices, GUI, industrial equipment, electronic devices, consumer products, and many more. Incidentally, Satish was introduced to rotational moulding in 2006 by Mr. Ravi Mehra, who does not require any introduction if you are a reader of *RotoWorld*® magazine. That's when Satish's interest and foray into rotational moulding started. He has designed over 25 products for rotomoulding since then. Currently Satish is serving on the board of StAR (Society of Asian Rotational Molders).

MiraCradle™ Neonate Cooler uses the advanced saveE® phase-changing materials (PCM) that were developed by Pluss Advanced Technologies Pvt. Ltd. Form-stable PCMs are special thermal energy storage materials that store and release heat at a particular temperature. The thermal energy transfer occurs when the material change phases from solid to liquid or liquid to solid.

Purpose

The MiraCradle™ Neonate Cooler is designed to save babies who suffer brain damage and/or die from birth asphyxia. Birth asphyxia occurs when a new-born infant is deprived of oxygen long enough to cause physical harm, usually to the brain. This condition can damage the infant's organs, too. Though most babies recover, they end up with developmental delay, intellectual disability, or even spasticity.

Function

The MiraCradle™ Neonate Cooler induces therapeutic hypothermia. This means keeping the temperature of the baby below normal body temperature. For it to be a success the baby must be cooled to around 33°C (91.4°F) for 72 hours with minimal manual supervision and no requirement of electricity supply. Developing countries are particularly affected because every other machine to induce therapeutic hypothermia costs over USD 30,000 whereas the MiraCradle™ Neonate Cooler costs 1/8th of that.

Design considerations

At Design Directions we believe design should be simple, functional, safe, easy to understand and use, easy to clean and maintain, delightful, and desirable.

We firmly believe good design is an interaction among form, function, engineering, aesthetics, technology, and also business viability.

In line with the above points

The outer plastic cradle is made using the rotational moulding process. By the sheer virtue that we can produce seamless hollow parts with rotational moulding, it was a major winner over all other plastic molding processes. During the design stage we had to take care that there are no sharp corners and edges and no big, visible parting lines, which will act as unwanted crevices and possibly attract bacterial growth. We also had to keep in mind that polyurethane foaming would be necessary to create thermal insulation.

The cradle's form is simple and functional. It has a smooth surface on all sides. That makes it easy to clean and disinfect before and after use. The cradle has a well-designed visual and physical balance.

The parting line is intelligently worked out such that it blends with the form. It has been placed in the transitional area between the vertical walls and the top chamber, which is practically unnoticeable.

The material used for the rotational molded part is LLDPE, manufactured by Reliance Industries of India. The mould is CNC machined from an aluminum block and Teflon-coated. The tooling and production is done by K.K. Nag Pvt. Ltd. of Pune, a premier custom rotomoulder in India.

As in any product development process, a lot of iterations occurred in the design-thinking phase which culminated in a "WOW – simple and nice design". For example, most of the inset handles were eliminated in the subsequent designs to avoid any break in the surface and invite bacterial growth. We also extensively studied the human interaction with the cradle as the target user may not be a qualified doctor. The final chosen design was prototyped using extruded polyethylene sheets to see if the design matched the functional requirements laid out by our client. These functional and usability trials met the desired requirements, and the next step was to tool up the cradle.

The MiraCradle™ is CE-certified and approved by the World Health Organization (WHO).

MiraCradle™ consists of three major components. First, there is a rotational moulded cradle which houses 2 units made from savE®FS-29 and savE®FS-21 PCM, and

then a conduction mattress (a gel bed) as the main top layer. Next a soft baby-friendly and hygienic cloth is placed on top of the conduction mattress for the baby to rest on. The conduction mattress helps to create good surface contact with the baby's body contour and thereby increase its efficiency.

MiraCradle™ has been successfully commercialized. It is already present in more than 130 hospitals across India. It is already being exported to South Africa, Kenya, and Turkey. Exports shall soon start to Sri Lanka, Bangladesh, Pakistan, Uganda, Zambia, Indonesia, Philippines, Malaysia, Vietnam, and Thailand.

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Awards

- The President's Award for Successful Commercialization of Indigenous Technology, 2017
- Winner at the Innovators' Competition for DST-Lockheed Martin India Innovation Growth Program, 2015
- Included in the WHO Compendium of Innovative Health Technologies for Low Resource Setting
- Winner of CII Industrial Innovation Award, 2014. Winner of India Innovates: 2020 Award by ASSOCHAM
- Winner of Plasticon Awards, 2015 - India
- Winner of Kirloskar Technology Awards, 2015
- Winner of Healthcare Excellence Award at Indo-Global Healthcare Summit & Expo' 2014
- Good Design Mark awarded by the India Design Council, 2017.
- Any many more...