



..“miracles happen”



One of the top  
26 innovative  
organizations in  
India – **CII Industrial  
Innovation  
awards 2017**

**PLUSS**® | TECHNOLOGY FOR  
A BETTER WORLD



**MiraCradle<sup>®</sup> - Neonate Cooler** is an affordable cooling device which uses the advanced saveE<sup>®</sup> Phase Change Material (PCM) technology to induce therapeutic hypothermia among newborns suffering from birth asphyxia. It has been developed by Pluss<sup>®</sup> in collaboration with CMC, Vellore. It is easy to use, safe, light weight, portable and gives the precise temperature control of 33-34°C for a period of 72 hours with minimal manual supervision and no requirement of constant electricity supply.

**PLUSS**<sup>®</sup>

**TECHNOLOGY FOR  
A BETTER WORLD**

Founded in 1994, Pluss Advanced Technologies started with R&D and manufacturing of specialized polymers. In 2007 Pluss commenced development in the field of Phase

Change Materials (PCMs) technology. In 2012, the company raised equity funds from Tata Capital Innovations Funds and expanded R&D, developed and commercialized first of its kind temperature control solutions using proprietary materials, addressed unmet need of temperature control across refrigeration, cold storage, cold-chain logistics, HVAC, and healthcare sectors. The company today has a global presence with its own subsidiary in Netherlands. Pluss has received several awards and recognitions, including the CII Innovation award twice, in 2014 and 2017. It has also received the Massachusetts Institute of Technology's Innovators under 35 awards, in 2016 and 2017. Since 2021, Pluss is a subsidiary of Carborundum Universal Limited (CUMI), which is a Murugappa Group company.



## The MiraCradle<sup>®</sup> Advantage



### SAFE

Electricity free cooling system does not have any electrical supply near the baby



### EFFICIENT

Gives precise temperature control



### EASY TO USE

Minimal manual supervision required. PCMs can be charged in a normal refrigerator



### ECONOMICAL

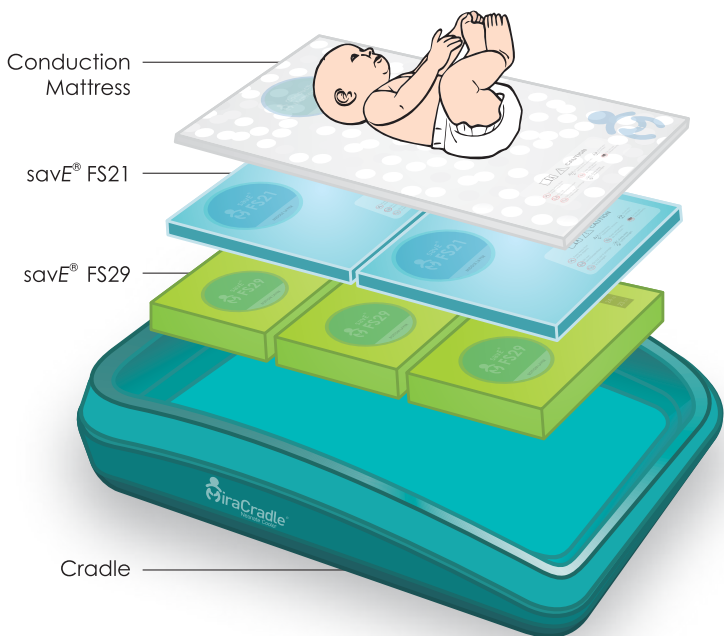
Less than 1/5th of the cost of the available electronic devices



### LONG LASTING

The PCMs are designed for repetitive use

## The MiraCradle® - Neonate Cooler

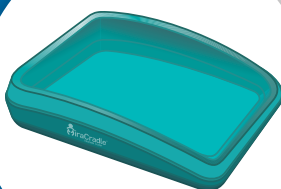


“every infant  
has a right to live”

## Components of MiraCradle<sup>®</sup> - Neonate Cooler

### Insulated Cradle

It is a rotomoulded plastics structure which serves as a framework for placing all the other components of MiraCradle<sup>®</sup> - Neonate Cooler and also provides insulation to the PCM helping it last for longer hours.



### save<sup>®</sup> FS29

This forms the bottom layer of the MiraCradle<sup>®</sup> - Neonate Cooler. Three units of save<sup>®</sup> FS29 PCM are placed at the bottom of Cradle. save<sup>®</sup> FS29 in solid state passively extracts heat from the neonate's body which is at 37°C thereby inducing and sustaining hypothermia.



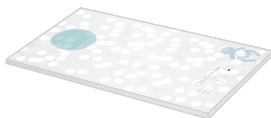
### save<sup>®</sup> FS21

This is the middle layer of the device. save<sup>®</sup> FS21 is used in conjunction with save<sup>®</sup> FS29 to quickly bring the temperature of the neonate down to 33°C. It is subsequently removed and save<sup>®</sup> FS29 takes over to sustain the temperature for longer hours.



### Conduction Mattress

The conduction mattress is a gel bed which provides a smooth surface for the baby to lie on and improves heat transfer between the baby and the PCM.



## Saving lives with MiraCradle® - Neonate Cooler



### Clinical Evidence

1. Aker et al. Therapeutic hypothermia... Arch Dis Child Fetal Neonatal Ed 2019; 0:F1–F7. doi:10.1136/fetalneonatal-2019-31731. BMJ  
Randomized Controlled Trial. 50 infants in India. Conventional MRI was available for 46 infants and demonstrated significantly less moderate/ severe abnormalities in the cooled (n=2, 9%) than in the non-cooled (n=10, 43%) infants.
2. Thomas et al. Phase Changing Material for Therapeutic Hypothermia... A Multi-centric Study. Indian Pediatrics. 2017. Epub 2017 Dec. PMID:29242417.  
103 babies at 10 different hospitals in India. The mean (SD) deviation of temperature during cooling phase was  $33.5 \pm 0.39^{\circ}\text{C}$ .
3. Saraswat et al. Therapeutic hypothermia in asphyxiated neonates...experience from South India. Indian Pediatrics. 2019. International Journal of Paediatric Research. Online ISSN: 2349-3267.  
50 babies at Bapuji Child Health Institute, KA. Concludes MiraCradle is an effective device in reducing asphyxia induced morbidity in low-resource settings.
4. Thomas et al. Phase changing material: an alternative method for cooling babies.... Neonatology. 2015;107(4):266-70. Epub 2015 Feb. PMID:25720449.  
41 babies at CMC. The mean ( $\pm$ SD) temperature during cooling phase was  $33.45 \pm 0.26^{\circ}\text{C}$ .

## Doctors' Quotes

“ **MiraCradle® - Neonate Cooler** will be a good investment for the Neonatologists and Pediatricians dealing with cases of perinatal asphyxia. It is easy to use and affordable in a resource limited setting. It goes without saying that the cooling procedure should be undertaken with close monitoring of the baby. **MiraCradle® - Neonate Cooler** is easy to use and the maintenance cost is almost nil.”

**Dr. B. Vishnu Bhat** (Professor and Head, Department of Pediatrics, Division of Neonatology, JIPMER )

“ In India, asphyxia results in approximately quarter of the neonatal deaths and is a huge burden on neonatal morbidity and neurodevelopmental sequelae. Hypothermia is the only proven intervention to improve the neurodevelopmental outcomes; but because of the high cost of the currently available machines it is not available to most babies in the developing world.

**MiraCradle® - Neonate Cooler** is a significant low cost innovation to help such babies in this part of the world. ”

**Dr. Sanjay Wazir** Consultant Neonatologist  
Cloudnine Hospital, Gurugram

“ I have been utilizing two **MiraCradle® - Neonate Coolers** in my NNF Certified NICU to induce and maintain therapeutic hypothermia in newborns. The outcomes are really good. ”

**Dr. Ravi Khanna**, Ravi Khanna Hospital, Bareilly (UP)

“ I have been using **MiraCradle®** for the last five months. It is effectively maintaining hypothermia for 72 hours and has immensely helped many babies. ”

**Dr. P. Lall**, Astha Mother and Child Care Hospital,  
Rourkela (Odisha)

## Recognition



Included in WHO Compendium of Innovative Health Technologies for low resource settings



Confederation of Indian Industry

Twice winner under the Most Innovative Company Manufacturing sector Micro and Small Enterprise category



DST-Lockheed Martin India Innovation Growth Programme 2015 (4<sup>th</sup> out of top 50 innovations)



Developed in collaboration with Christian Medical College, Vellore



Designed under NID's Design Clinic Scheme for MSME's



NRDC Award for Meritorious Invention - 2014



Winner of Healthcare Excellence Award - 2014



MIT Innovators under 35 Award - 2016, 2017



Winner of India Innovates 2020 Award in the Healthcare Category



Successfully commercializing an indigenous technology



Winner under the Innovative Medical Equipment category



Winner of Plasticon Award 2015

## Patents

### Patent Granted

- US - 10,258,500B2 • Nigeria - NG/PT/C/2015/1537
- Europe - EP3100457 • South Africa - WO 2014/203274 A3
- ARIPO - AP/P/2015/008765 • Malaysia - MY-174551-A

### FER Issued

- India - 1796/DEL/2013 • Brazil - BR 11 2015 024821 7

“Simplicity  
is the  
ultimate  
sophistication.”  
*Leonardo da Vinci*

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able to maintain the optimal rate  
or level to meet the needs of the present  
without compromising the needs of future  
generations, **the PLUS way.**



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# PLUS<sup>®</sup>

TECHNOLOGY FOR  
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[www.miracradle.com](http://www.miracradle.com)