



ReCuring Diaper Recycling System



"Integrating technology to aid in the recycling of senior diapers in hospitals and nursing homes."

Service Design of ReCuring

ReCuring is a diaper recycling system designed for long-term care agency. It has a back-end logistics management system in place to ensure that waste diapers arrive at the recycling plant on time.

ReCuring's solution enhances waste's benefits for Taiwan's healthcare system, making diapers a valuable future economic resource for recycling.

About Disposable Diapers

Compared with cloth diapers, disposable diapers are more convenient, but they are not biodegradable. In many countries where there is a rapidly aging society, more diapers are used by older, incontinent people than by babies.



The technology and equipment exist today for some companies to recover and recycle diapers, thus solving many diaper waste problems.

Current Problems

Despite the availability of diaper recycling technology in Taiwan, there are some resistance factors at hospitals and nursing homes.



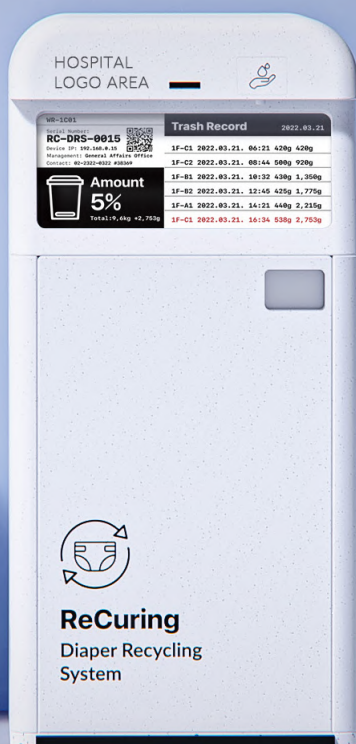
Non-diaper waste (e.g., food scraps or bags from patients' families) placed in recycling bins can interfere with the decomposition process of diaper recycling plants.



Most diapers **mixed with other industrial/commercial** waste are sorted at end-of-life.



Medical facilities will **pay more to remove** diapers as industrial/commercial waste.



Research and Insights



Head Nurse

Nurse

Interviews and observations of the stakeholders (caregiver, patients' families, external cleaning staff... etc.) on their behavior patterns. When hospitals do not have mandatory recycling regulations, they dispose of diapers or other general garbage randomly for their personal convenience, disregarding the original sorting requirements of the waste room in hospital.



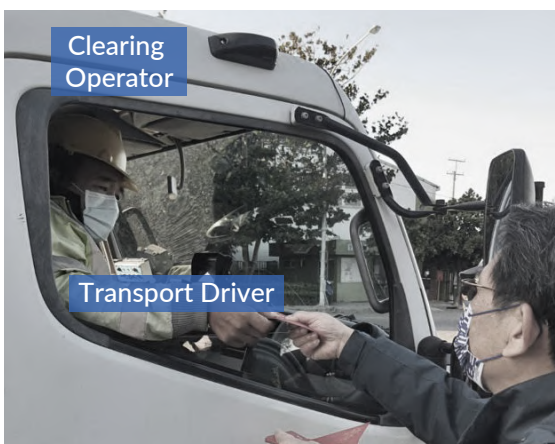
Caregiver

The ratio of caregivers to bedridden patients in the hospital is 1:15. This is a very stressful job for the caregivers. On the one hand, they have to change the patients' diapers frequently, and at the same time, they have to record the amount of urine of the patients, and they are afraid of cross-infection from the diapers.



Cleaning Staff

There are dedicated cleaning staff on each floor of the ward who are responsible for cleaning the environment as well as picking up the garbage in the dirt room. When collecting the diaper bins, they often see that the bins are full of other non-diaper garbage, and they are so frustrated that they have to re-sort the garbage inside.



Clearing Operator

Transport Driver

Diaper recycling plant have their own logistics fleets, but the amount of discarded diapers successfully collected each time is inconsistent and the cost of a single trip is high. They need to do remote logistics management system from the source to the final collection and return to the recycling plant.



Main Points Summary



- Inadequate management of diaper collection in hospitals or nursing homes.



- The recycling plants are unable to accurately grasp the amount of waste diapers, which extends many unnecessary removal costs for both parties.

Co-Creation Workshop

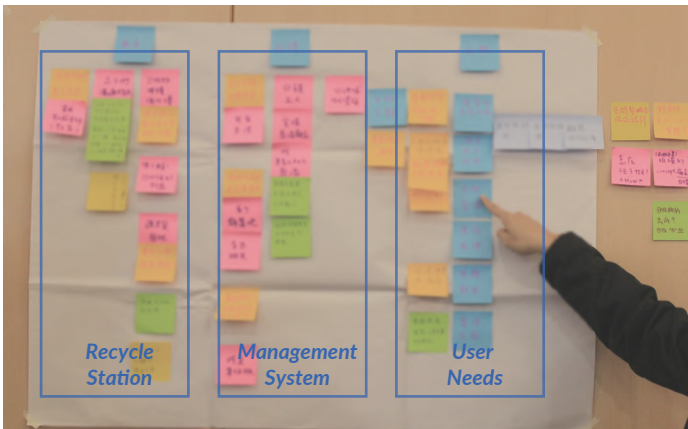
We held a design workshop with diaper recycling plant and invited stakeholders, hospital facility managers, IoT vendors, EPA officials and waste recycling experts to brainstorm:

How Might We integrating technology to aid in the recycling of senior diapers in hospitals and nursing homes ?

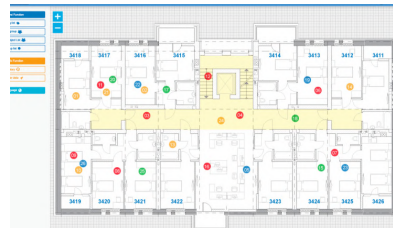
2021/10 Solution Planning Workshop



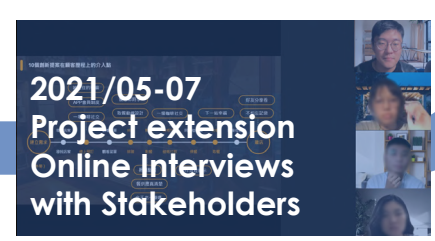
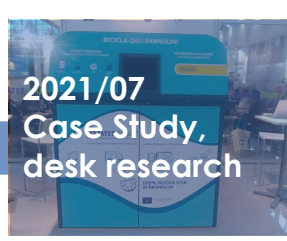
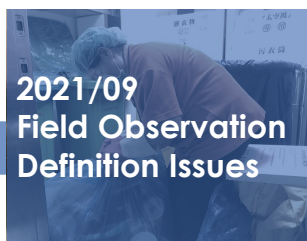
2021/11 Service and System Planning Workshop



- IoT vendors have e-paper-related R&D products that help caregivers calculate diaper weights and display information interfaces for diaper recycling. And with their RTLS, GPS technology, they can help hospitals and diaper recycling plants manage and track diapers.

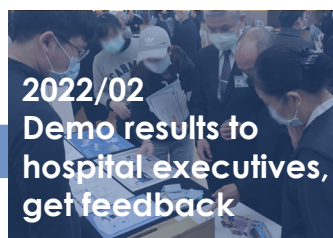


Planning Process



#Epidemic Slowdown

#COVID19 Outbreak



Our Solution

① Collecting diapers



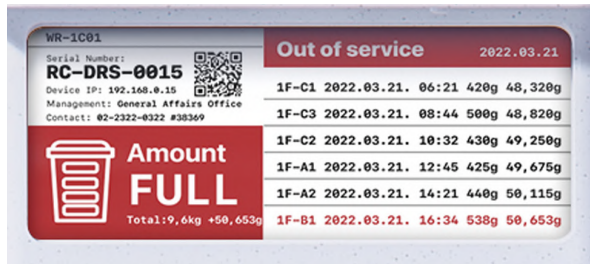
Caregiver collect patients' diapers in recycled plastic PE bins.

② Scanning recycling bin



With the QR code at the recycling bin, you can open the input port of the recycling station and collect diapers.

④ Full amount warning



If the internal diaper recycling bin is full, the facility suspends the recycling service and notifies the cleaning staff.

③ Record diaper weight



Diaper weight recording is an essential medical service. Using an optimized weighing scale, the caregiver can keep track of urine volume via an e-paper that displays data.

⑤ Diaper Removal and Logistics

All waste diapers are collected at the site and delivered to the diaper recycling plant by ReCuring's cleaning operators.



Core Value of ReCuring



For Caregiver

- Easy to check the weight of discarded diapers
- Reduces cross-infection



For Cleaning Staff

- Reduce labor and time costs
- Ensure single output of recycled resources



For diaper recycling plant

- Ensure stable quality of recycling system
- Facilitate the follow-up of waste recycling status

ReCuring Diaper Recycle Station

Helping hospitals and nursing homes collect wasted diapers more safely and efficiently.

1. Smart Identification Lens

It recognizes the QR code on the small recycling bins, ensuring that only discarded diapers are placed in the bin. QR codes alhelp track diaper collection by area as well.



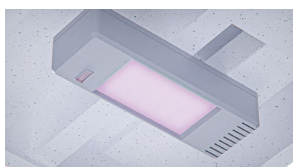
2. Sterilized alcohol storage port

Apart from disinfecting hands, aromatic alcohol disinfection can also be used for internal deodorizing.



3. UV sterilizer

UV germicidal lamps can kill bacteria inside waste diapers and deodorize them with aromatic alcohol.



4. RFID door lock

Locks prevent diaper theft or people from putting garbage from outside in the recycling bins



WR-1C01

Serial Number:
RC-DRS-0015

Device IP: 192.168.0.15

Management: General Affairs Office

Contact: 82-2322-8322 #38369

Amount

5%

Total: 9.6kg +2,753g

Trash Record

2022.03.21

1F-C1	2022.03.21.	06:21	420g	420g
1F-C2	2022.03.21.	08:44	500g	920g
1F-B1	2022.03.21.	10:32	430g	1,350g
1F-B2	2022.03.21.	12:45	425g	1,775g
1F-A1	2022.03.21.	14:21	440g	2,215g
1F-C1	2022.03.21.	16:34	530g	2,753g

WR-1C01

Serial Number:
RC-DRS-0015

Device IP: 192.168.0.15

Management: General Affairs Office

Contact: 82-2322-8322 #38369

Amount

FULL

Total: 9.6kg +50,653g

Out of service

2022.03.21

1F-C1	2022.03.21.	06:21	420g	48,320g
1F-C3	2022.03.21.	08:44	500g	48,820g
1F-C2	2022.03.21.	10:32	430g	49,250g
1F-A1	2022.03.21.	12:45	425g	49,675g
1F-A2	2022.03.21.	14:21	440g	50,115g
1F-B1	2022.03.21.	16:34	530g	50,653g

WR-1C01

Serial Number:
RC-DRS-0015

Device IP: 192.168.0.15

Management: General Affairs Office

Contact: 82-2322-8322 #38369

Disinfect

10%

Insufficient

Out of service

2022.03.21

1F-C1	2022.03.21.	06:21	420g	420g
1F-C2	2022.03.21.	08:44	500g	920g
1F-B1	2022.03.21.	10:32	430g	1,350g
1F-B2	2022.03.21.	12:45	425g	1,775g
1F-A1	2022.03.21.	14:21	440g	2,215g
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WR-1C01

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Device IP: 192.168.0.15

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Contact: 82-2322-8322 #38369

Device Failure

5. E-Paper Display

E-paper is not only power-saving, but displays information and the Recycle Bin status at a glance as well.

It shows the time and weight of each collection, so the caregiver can easily note how much urine a patient has urinated.

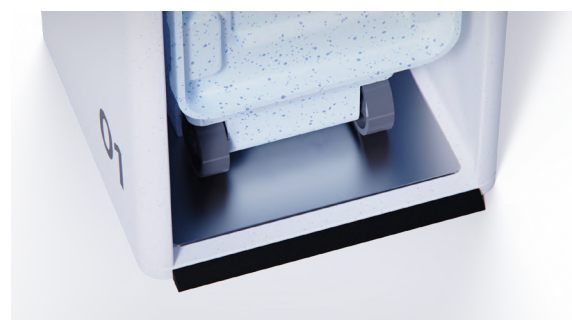
6. Modular mechanism design

Modular design allows for different heights for different hospitals or nursing homes. Components can also be repaired or replaced more easily.



7. Weighing scale

The scale is at the bottom of the recycling station and the weight of the recycling bin is subtracted from the weight of the diapers, allowing caregivers to calculate the weight more easily.

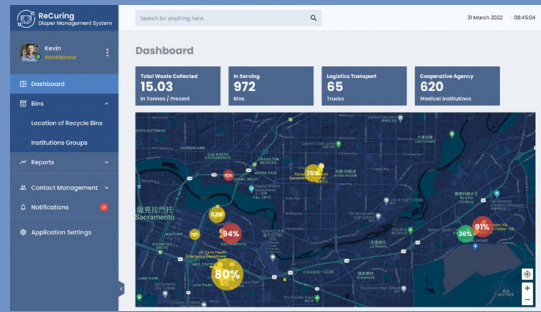


ReCuring Diaper Management System

Helping diaper recycling plant better follow up on the logistics of wasting resources.

Recycle Bin Status Monitoring

In the dashboard, administrators can see the status of recycling bins, and they can also see their capacity, allowing them to assign routes to transporters more easily.



Bins - Location of Recycle Bins (972)

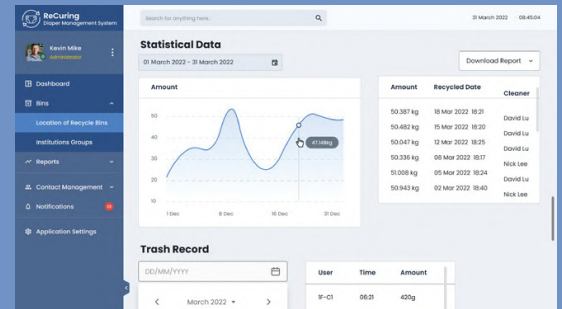
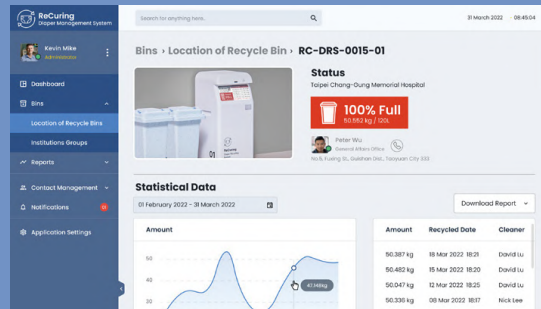
List of recycling bins in the service.

Location/Institutions	Serial Number	Group Name	Status
Taipei Chang-Gung Memorial Hospital	RC-DRS-0005-01	Hospital	100% Full
Wan Fang Hospital, Nursing Home	RC-DRS-0008-02	Nursing Home	1%
Linkou Chang-Gung Memorial Hospital	RC-DRS-0008-02	Hospital	4%
Taipei City Hospital Heping Branch, Nursing Home	RC-DRS-0003-31	Nursing Home	93%
Ti-Service General Hospital	RC-DRS-0005-14	Hospital	2%
Jingnan Long Term Care	RC-DRS-0002-07	Long-term Care	87%
Kang Ning Long Term Care	RC-DRS-0003-09	Long-term Care	70%
Taiyuan City Long Term Care	RC-DRS-0006-14	Long-term Care	100% Full

Showing 1 - 8 results of 972

Waste Data Following Up

All recycling progress status data and recycling station status data is stored in the cloud, making it easy to reach the facility manager.



Human Resource Management System

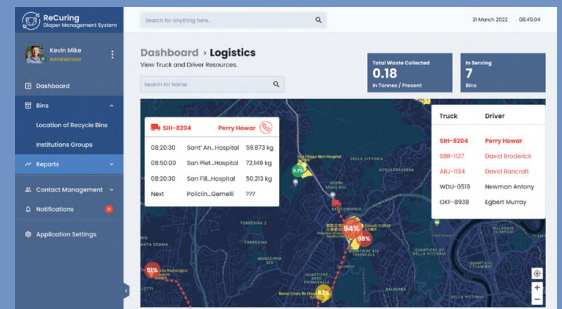
Drivers can be contacted through the system in case of abnormal events and route changes.

Contact Management - Logistics Operator

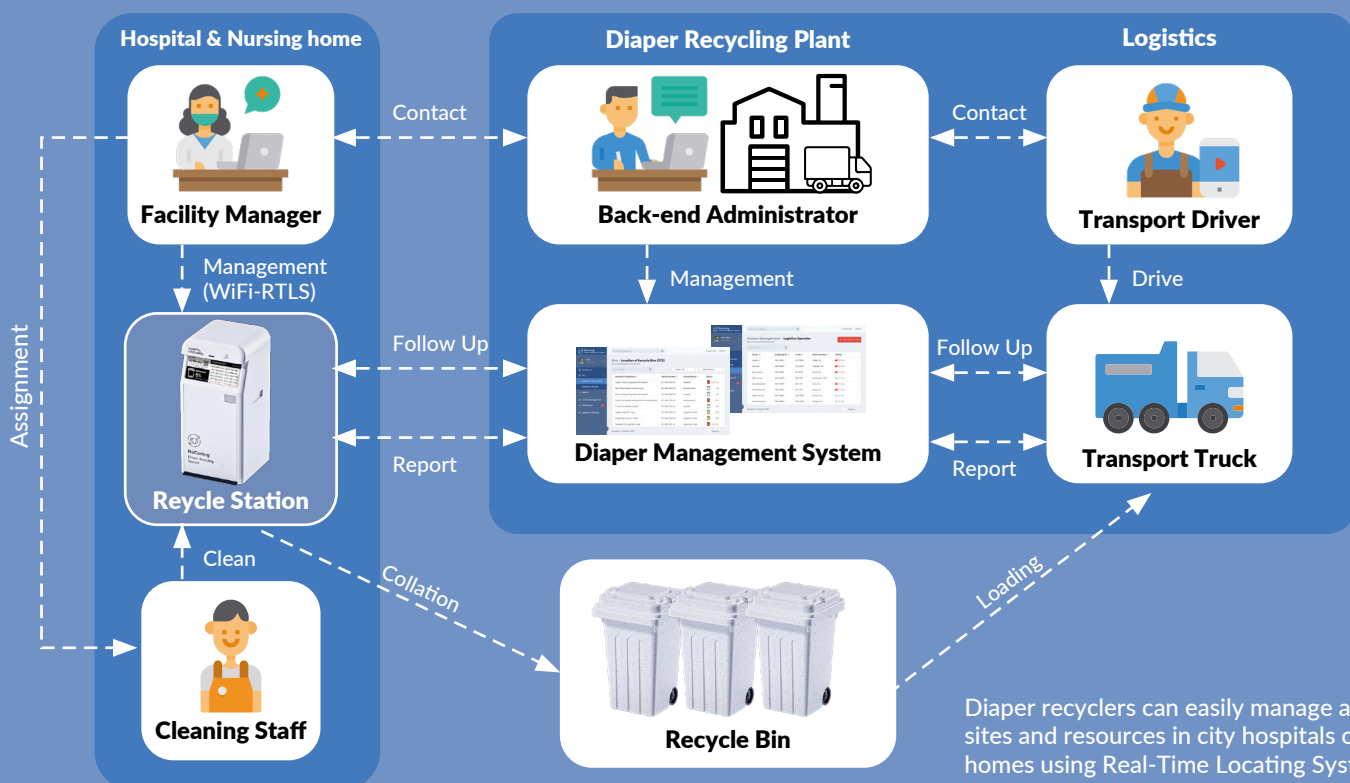
View Truck and Driver Resources.

Driver	Employee ID	Truck	Work Location	Status
David Lu	DRS-00001	VST-8609	Taipei, TW	On Duty
Nick Lee	DRS-00001	RNO-0307	Taiyuan, TW	On Duty
Perry Howar	DRS-00001	SH-6204	Roma, ITA	On Duty
Allen James	DRS-00001	SRK-0306	Amsterdam, NED	On Call
David Broderick	DRS-00001	SRK-1027	Torin, ITA	On Duty
David Bancroft	DRS-00001	ABU-104	Roma, ITA	On Duty
Light Murney	DRS-00001	CKP-8938	Firenze, ITA	On Call
Newman Antony	DRS-00001	WOU-0018	Palagna, ITA	On Call

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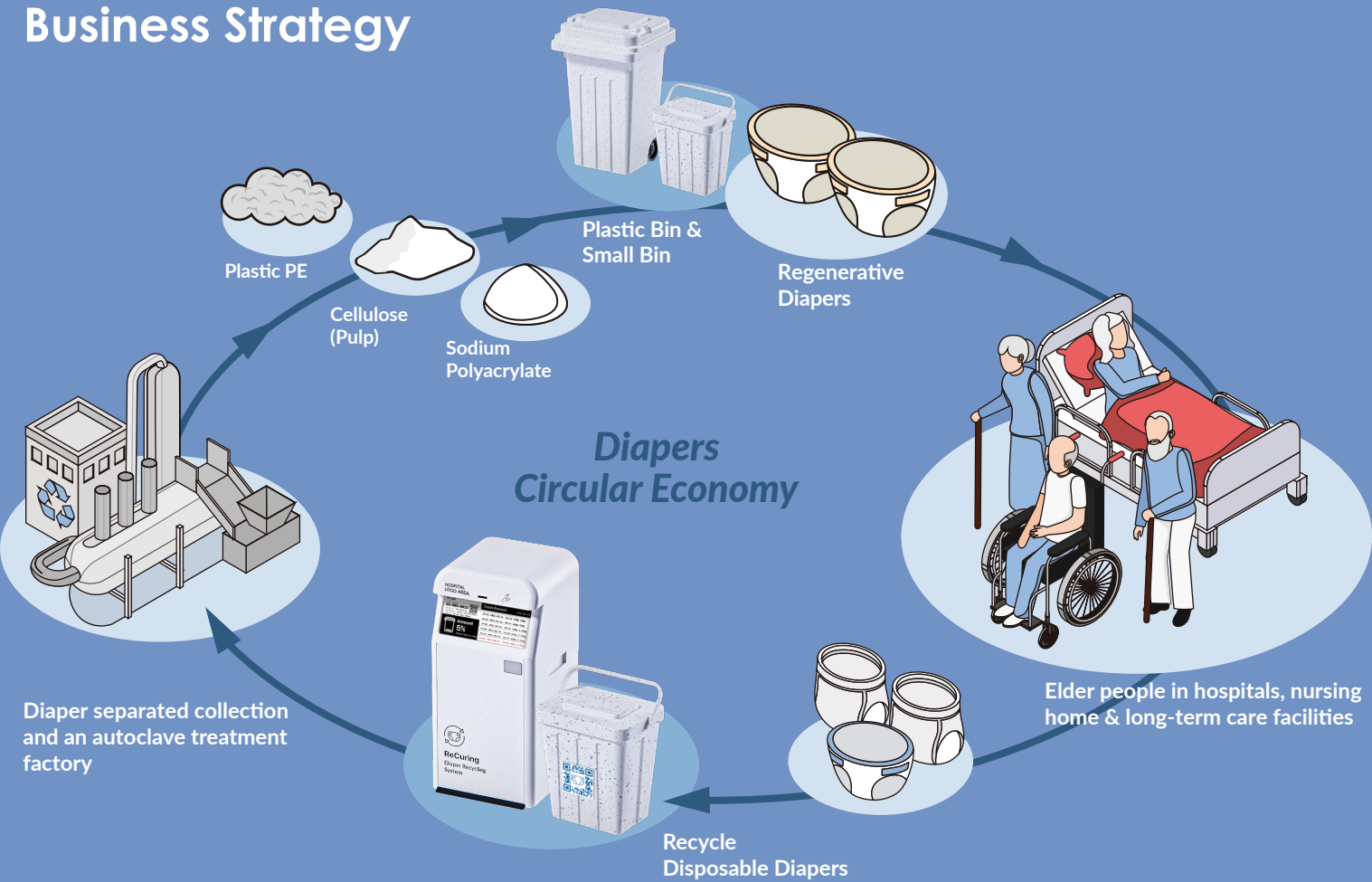


Service System Work



Diaper recyclers can easily manage all recycling sites and resources in city hospitals or nursing homes using Real-Time Locating Systems (RTLs).

ReCuring Diaper Business Strategy



Recycling and material sales can generate revenues while returning recycled products to healthcare facilities, both solving hospital waste problems and reducing operating costs.

By recycling 100% of diapers in hospitals or nursing homes, environmental and economic benefits would far outweigh the cost of building recycling stations.

Results Benefits

15 hospitals in cooperation

Recycle Diapers **700 tons**

Recycling diapers **1 ton**

Reduces CO2 emissions from incineration by **215 kg**

In Taiwan, more than **15 hospitals** are expected to deploy ReCuring's collection service after 2024. The service system can recover nearly **700 tons** of diapers a year, and the CO2 produced by incineration and landfill will be avoided.


Waste disposal costs at hospitals are estimated to be cut by **40%** using ReCuring. Discounts on recycled diapers will encourage hospitals and nursing homes to use ReCuring's diaper recycling system.

Tested Concept and received positive feedback




I like the intelligent recycling equipment in the recycling and weighing function, especially the sterilization of hands place above.

- Caregiver at Chang Gung Health Village




Even though the work is more involved, I am happy to ensure the diapers are collected.

- Cleaning Staff at Shin Kong Hospital



Creating smart health care services is our mission. As well, hospitals waste a lot of diapers every year, so if these resources can be reused for recycling, it will help the environment.

- President of Chang Gung Hospital



Implement an intelligent system in hospital recycling facilities not only to track diaper sources, but also to ensure a smooth operation at the recycling plant.

- Taiwan's major diaper recycling companies