

Bringing the Taste of India to Millions of Families through Automated Storage Facilities

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Amul's transformation journey goes all the way back to the 1960's, trendsetting the homeland for milk evolution and its legacy with respect to Milk reception, Milk processing, Milk product development, Cleaning, Milk & Milk Products storage, etc. Fast forward to the 21st century, Amul Dairy has stood the test of time in bringing fresh raw produce from the farm to factory and finally to the tables of many families in the humid and scorching India.

Warehousing is inevitable part of supply chain requiring lots of attention and to generate profit with optimal use of related resources. In earlier era, Amul was using the conventional type cold storage for storage of Cheese, Butter, Ice cream, Chocolates. As the demand for dairy products increased, Amul Dairy faced the problems of shortage of storage capacity for finished goods & semi-finished goods. The storage capacity of earlier conventional warehouse was very less as compare to increasing trend of production especially for cheese products. In Conventional warehouse, we used to place Cheddar Cheese block in plastic crate and stored on MS pallet. Each loaded pallet has approx. 960 kg of Cheese and to utilize maximum storage capacity of godown, we were stacking three loaded pallets with help of MS rod locking arrangement. It is not possible

to stack more than three pallets as its handling is difficult and riskier. Space required in conventional warehouse for footprint is very high because lots of labor activities, manpower and materials handling equipment movement. In this scenario, we were able to store maximum 1200 MT of Cheddar Cheese using three conventional warehouse having an area of 650 Sq. mtr each. Also, we were facing problems of batch traceability of Cheddar Cheese frequently in conventional storage.

With the increasing orders, challenges for Amul with the conventional racking warehouse, the most important question here, was whether all the storage space of the warehouse utilized properly? Are there any different ways of storing the goods? Can additional space be created with the storage pattern itself without expanding the existing structure?

Looking at the challenges, In year 2013-14, Amul Dairy has taken initiatives to convert their conventional storage into semi-automated warehouse and started with Electric Mobile Racking system to store raw cheddar cheese as the required throughput was low and 100% selectivity was needed as a first step.

The first mobile racking system was installed at Kheda Satellites Dairy, Khatraj in 33 mtr X 34 mtr available area. The system was established in pre-engineered building structure having PUF insulation.

The height of building is 14 mtr and racking system was designed for total 3800 pallets position in G+5 level pattern in controlled atmosphere. With help of this system, we can store around 3648 MT of Cheddar Cheese within available area of 1122 sq. mtr. Now we can store 3 times more Cheddar Cheese



In Earlier Era, Conventional Godown at Kheda Satellite Dairy, Khatraj

Warehousing is inevitable part of supply chain requiring lots of attention and to generate profit with optimal use of related resources. Amul Dairy has started digitalization throughout the entire document storage systems. Earlier Amul Dairy used the conventional static racking, which consumed time and energy. Documents are now stored in mobile racking system and controlled through software for ease of operation. With the adopted latest technology of Mobile Racking, ASRS and Smart Shuttle system, now Amul Dairy got more storage space within the available area with higher volumetric efficiency and is able to optimize the internal working process. Warehouse technology has helped us in reducing both building costs and storage space with less refrigeration and lighting.

than conventional type warehouse in less space.

An integrated, fully automated mobile racking system, the complete fully loaded rack having weight of 378 MT Cheddar Cheese is moving on rails and provides an array of benefits, including: Increased floor-space utilization, 100% selectivity of pallets *i.e.* direct access to each pallet, Reduced staff costs, Increased handling capacity, Optimized logistics and Enhanced efficiency. For safety and ease of handling of pallets, we are using reach truck as material handling equipment which can handle the pallets at height of 11.2 mtr with 100% selectivity. Amul Dairy also implemented these solutions for other products like Butter, Powder, chocolates and RUTF product later.



Mobile Racking System at Kheda Satellite Dairy, Khatraj

Amul Dairy installed Automated Storage and retrieval system (ASRS) for processed cheese with stacker crane to optimize throughput and efficient storage using lower footprint area. ASRS that allows to handle a greater number of cycle/minute as mobile racking system has manual activities for handling of pallets. The loaded pallets are kept on the infeed conveyor of ASRS system. Then complete operation will be taken place automatically for storage and retrieval activities which includes automatic

gate opening, transfer pallets to stacker crane, define locations and so on. Storage and retrieval activities are carried out through warehouse management system (WMS) software as per First In, First Out (FIFO). Also, System shows real time status on SCADA. It is possible to retrieve any pallets by entering the product name only. The installed capacity of system is 540 pallets location and build in 14 mtr X 33 mtr area inside 14 mtr high pre-engineering Building with PUF insulation.

After implementation of this technology, we understood that ASRS will provide more throughput because of fully automatic system but same time it is highly benefited, if the height of system will be more than 36 mtr. To build such high warehouse, require higher capex due to civil work.

In 2019-20, Amul Dairy started to look at the expansion of its cheese storage facility, with the planned storage of over 6,000 pallet locations for their chilled room of 2,433 m² for storage and material movements in the warehouse. The total space was envisaged for the storage of 'Raw Cheese' on the Mobile Racking System (approx. 2100 pallets) and the storage of 'Processed Cheese' into the ASRS (approx. 4000 pallets).

Amul Dairy has already installed 3 mobile racking systems across various units. Amul moved ahead for further expansion for 2100 pallets mobile racking system. However an ASRS system could pose minor challenges for a conservative number of pallets as Amul Dairy wanted to ensure its civil investment was optimal so the investment on the floor slab and the building height must be optimized to hit the sweet spot without compromising on the storage capacity and the throughput.

A Step Towards Energy Efficient and Sustainable Warehouse

Amul team came up with 'Single Level Shuttle

warehouse

a.k.a Mother-Child Shuttle’ multi-deep ASRS. Through the right holistic approach for the development of “Mother-Child Shuttle” ASRS, the remaining 3,936 pallet locations issue was resolved. The integrated design will now handle the highest number of pallet positions in the given space in both type of solutions *i.e.* Mobile Racking System and the High Density ASRS System.

The operation of energy efficient smart shuttle system will start with RFID based QR code at production level. Once QR code is pasted on filled Pallets then it will transfer to warehouse. The person will scan the QR code at inward conveyors of system then system will work automatically for storage of pallets. The entire system works on warehouse management system (WMS) for storage and retrieving activities.

This is the most densely populated cheese storage where Cheese at a temperature of +40 Deg C enters into automated store and just in a matter of 48 hours pulled down to +4 Deg C. A whole lot of sensible heat required to be removed from the stack, is seamlessly done by the Help of 15 evaporators coils. The high heat transfer coefficient of the coil with ammonia overfeed circulation system maintains a low temperature difference. To aid the evaporator coils high air quantity is induced through the coil keeping it within the Prescribed limits of velocity and zero drift carryover.

Since the packing facet density is very high, it was challenging to bring down the stack temperature in a period of 48 hours, through a temp gradient of 36 Deg C. HVLS fans with variable frequency Control was installed to produce a high face velocity and to give a windchill effect. An air speed of 2 to 2.5 m/sec was



Energy Efficient Smart Shuttle System at Kheda Satellite Dairy, Khatraj

forced through the stack to have a high convective heat transfer at the same time not producing loose moisture carryover inside the room.

In the old refrigeration system, the average refrigeration power consumption was 19,000 kwh per day. Now after installation of new refrigeration system with energy efficient and high-tech cold storages, the average refrigeration power consumption is reduced to 17,000 kwh per day in spite of higher production and products handling.

Document Storage System

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Mobile Racking System for Document Storage

Conclusion

With the adopted latest technology of Mobile Racking, ASRS and Smart Shuttle system, now Amul Dairy got more storage space within the available area with higher volumetric efficiency and is able to optimize the internal working process. It achieved almost double pallet positions in the same footprint over a conventional pallet racking system. With a smaller footprint, warehouse technology has helped us in reducing both building costs and storage space with less refrigeration and lighting.



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