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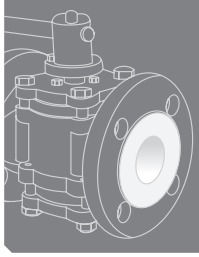

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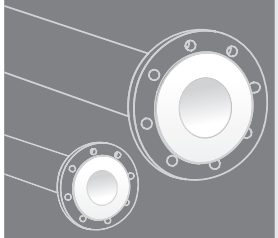

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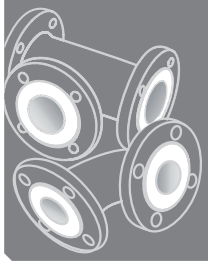

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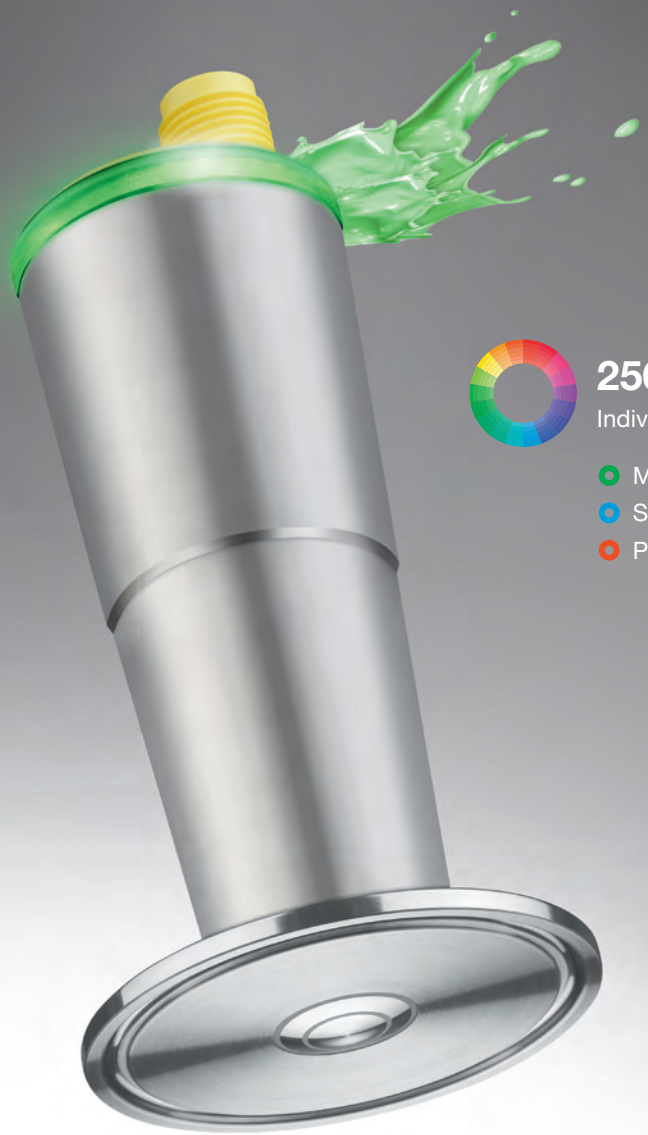

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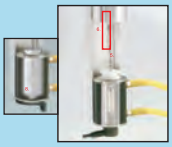
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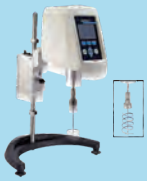
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RHEOLOGY VISCOSITY TEXTURE IN-LINE POWDER MOISTURE GAS

Import and domestic production of APIs

New Delhi, India: India is one of the major producers of Active Pharma Ingredients (API) or bulk drugs in the world. India exported Bulk Drugs/Drug Intermediates worth Rs. 33,320 crore in financial year 2021-22. However, the country also imports various Bulk Drugs/ APIs for producing medicines from various countries and most of the imports of the Bulk Drugs/APIs being done in the country are because of economic considerations. India imported Rs. 35,249 crore worth APIs and Bulk drugs in 2021-22.

In order to make the country Atmanirbhar in APIs and drug intermediates, the Department of Pharmaceuticals is implementing the following three schemes by attracting large investments in the sector to ensure their sustainable domestic supply and thereby reduce India's import dependence on other countries: -

The Production Linked Incentive (PLI) Scheme for promotion of domestic manufacturing of critical Key Starting Materials (KSMs)/ Drug Intermediates (DIs) and Active Pharmaceutical Ingredients (APIs) in India, with a financial outlay of Rs. 6,940 crores and the tenure from FY 2020-2021 to FY 2029-30, provides for financial incentive for 41 identified products. A total of 51 applicants have been selected under the scheme. The Production Linked Incentive Scheme for Pharmaceuticals, with a financial outlay Rs. 15,000 crores and the tenure from FY 2020- 2021 to FY 2028-29, provides for financial incentive to 55 selected applicants for manufacturing of identified products under three categories for a period of six years. The eligible drugs under this scheme include APIs. The Scheme for Promotion of Bulk Drug Parks, with a financial outlay of Rs. 3,000crores and the tenure from FY 2020-2021 to FY 2024-25, provides for financial assistance to three States for establishing Bulk Drug Parks.

Bharat Biotech Completes Clinical Development for Phase III Trials & Booster Doses for BBV154 Intranasal Covid Vaccine

Suchitra K. Ella, Joint Managing Director, Bharat Biotech

Hyderabad, India: Bharat Biotech International Limited (BBIL), a global leader in vaccine innovation and developer of vaccines for infectious diseases, announced that BBV154 (intra nasal vaccine) has proven to be safe, well-tolerated, and immunogenic in subjects in controlled clinical trials. BBV154 is a recombinant replication-deficient adenovirus vectored vaccine with a pre-fusion stabilized

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spike protein. This vaccine candidate was evaluated earlier in phase I and II clinical trials with successful results. BBV154 has been specifically formulated to allow intranasal delivery. In addition, the nasal delivery system has been designed and developed to be cost-effective in low and middle-income countries. BBV154 was developed in partnership with Washington University St Louis, which had designed and developed the recombinant adenoviral vectored constructs and evaluated them in preclinical studies for efficacy. Product development related to preclinical safety evaluation, large-scale manufacturing scale-up, formulation, and delivery device development, including human clinical trials, were conducted by Bharat Biotech. The Government of India partly funded product development and clinical trials through the Department of Biotechnology's, COVID Suraksha program.

Suchitra K. Ella, Joint Managing Director, Bharat Biotech, said, "On this 75th Independence Day, we are proud to announce successful completion of clinical trials for BBV154 intranasal vaccine. We stay committed and focused on innovation and product development; this is yet another achievement for the multidisciplinary teams at Bharat Biotech. If approved, this intranasal vaccine will make it easier to deploy in mass immunization campaigns with an easy to administer formulation and delivery device. Vectored vaccines also enable faster development of targeted vaccines in response to emerging variants of concern. We hereby thank the volunteers, principle investigators, and clinical trial personnel for all their efforts." BBV154 has the double benefit of enabling faster development of variant-specific vaccines and easy nasal delivery that helps mass immunization protect from emerging concern.

Lincoln Pharmaceuticals Ltd reports standalone Net Profit of Rs. 15.01 crore in Q1FY23

Mahendra Patel, Managing Director, Lincoln Pharmaceuticals Limited

Ahmedabad, India: Lincoln Pharmaceuticals Limited, one of India's leading healthcare companies has reported net profit of Rs. 15.01 crore for the Q1FY23 as against net profit of Rs. 11.10 crore in Q4FY22, growth of 35.2% Q-o-Q. Total income for the quarter ended June 2022 was reported at Rs. 129.97 crore, higher 24.4% Q-o-Q over total income of Rs.104.43 crore in Q4FY22. EBITDA for Q1FY23 was reported at Rs. 23.41 crores as compared to EBITDA of Rs. 19.32 crores in Q4FY22 - growth of 21.14% Q-o-Q. EPS for Q1FY23 was at Rs. 7.49 per share. Exports in Q1FY23 was reported at Rs. 66.08 crore.

Commenting on the results and performance, Mahendra Patel, Managing Director, Lincoln Pharmaceuticals Limited, said, "FY23 is

going to be the growth year for the company. Commercial production from the Mehsana facility for the expansion of Cephalosporin products and exports to EU & Australian markets are expected to commence in the current financial year. Company is growing from strength to strength, delivering robust operational and financial performance, maintaining a healthy growth in revenue, margins and profitability. Company will continue to grow with maintaining its net debt status in future also. We expect the growth momentum to continue while maintaining our 'Net Debt Free' status in the coming years." During FY22, company launched 14 products in the domestic market and filled 110 dossiers in the export market. In FY23, company will look to consolidate its position in the lifestyle and chronic segments.

Glenmark Pharma reports Revenue of INR 27,773 Mn and PAT of INR 2,111 Mn for Q1 FY 2022-23

Mumbai, India; August 10, 2022: Glenmark Pharmaceuticals Ltd. (Glenmark), an

innovation-driven global pharmaceutical company, announced its financial results for

the first quarter ended June 30, 2022. Glenmark's consolidated revenue for Q1 FY 2022-23 was at INR. 27,773 Mn as against INR. 29,649 Mn; recording de-growth of (6.3%). When viewed without taking into account the global sales of COVID-related products in the first quarter of FY 2021-22, the base business shows a year-on-year growth of 10.4% in the current fiscal.

Adjusted EBITDAii was INR 4,726 Mn in the quarter ended June 30, 2022 as against INR 5,736 Mn. in the previous corresponding quarter, with margins of 17%. Reported EBITDA was INR

4,316 Mn in the quarter ended June 30, 2022, with margins of 15.5%. Profit After Tax (PAT) for the quarter ended June 30, 2022 was at INR 2,111 Mn as compared to INR 3,065 Mn in the previous corresponding quarter, registering a decline of (31%) YoY.

"We delivered a strong double digit growth in our base business during the quarter excluding the impact of COVID-related products. Europe and ROW markets performed well despite the challenging macro-economic environment; and the India base business also recorded strong growth. We continued to make significant progress in our innovation pipeline; with Ryaltris getting approvals across newer markets, and novel molecule GRC 54276 getting approval for conducting Phase 1 Clinical Trial," said Glenn Saldanha, Chairman and Managing Director, Glenmark Pharmaceuticals Ltd. He further added, "Our goal is to continue growing our base business through new product launches in our key focus areas of Respiratory, Dermatology and Oncology. We remain on track to achieve our guidance for FY 2022-23."

Aurobindo Pharma Ltd: Q1 FY23 Consolidated Financial Results

Mumbai, India: Aurobindo Pharma Limited is pleased to announce that its wholly owned subsidiary company, Eugia Pharma. Specialties Limited, has received a final approval from the US Food & Drug Administration (USFDA) to manufacture and market Pemetrexed for Injection, 100 mg, 500mg and 1000mg. Pemetrexed for Injection USP, 100 mg/vial and 500 mg/vial, Single-Dose Vials, to be bioequivalent and therapeutically equivalent to the RLD, Alimta for Injection, 100 mg/vial and 500 mg/vial of Eli Lilly. The product is being launched immediately.

The approved product has an estimated market size of US$ 1272 million for the twelve months ending March 2022, according to IQVIA.This is the 139th ANDA (including 8 tentative approvals received) out of Eugia Pharma Specialty Group (EPSG) facilities, manufacturing both oral and sterile specialty products. Pemetrexed for injection is indicated for the treatment of Antineoplastics (medications used to treat cancer)

With pembrolizumab and platinum chemotherapy, for initial treatment of patients with metastatic nonsquamous NSCLC, with no EGFR or ALK genomic tumor aberrations, With cisplatin, for initial treatment of patients with locally advanced or metastatic, non-squamous, nonsmall cell lung cancer (NSCLC), Alone, as maintenance treatment of patients with locally advanced or metastatic, non-squamous NSCLC whose disease has not progressed after four cycles of platinum-based first-line chemotherapy, Alone, for treatment of patients with recurrent, metastatic non-squamous, NSCLC after prior chemotherapy.

Hester Biosciences Ltd reports Net Profit of Rs. 3.56 crore and Revenues from Operations of Rs. 50.7 crore in Q1FY23

Ahmedabad, India: One of the India's leading poultry and animal vaccine manufacturing company, Hester Biosciences Limited has reported consolidated net profit of Rs. 3.56 crore and Revenue from Operations of Rs. 50.70 crore for the Q1FY23. Individually, the gross margins of the vaccines and the health products have been in line with the corresponding quarter, however, the overall margins have reduced due to the increase in the proportion of health products sales which have lower gross margins compared to vaccines. Health Products sales constituted 34% of the total sales in Q1 FY23, versus 20% in Q1 FY22.

Hester Tanzania has recently received regulatory approvals for four products with two additional products under approval process. Hester Tanzania has just started commercial operations and Revenues are expected to start in Q2. Hester Nepal has registered 16% growth in domestic revenues, however, there were no tender sales in the current quarter due to delay in tendering by FAO and other multilateral institutions

Agilent ESG Report Highlights Plans and Progress to Ensure Future Sustainable Growth

Mike McMullen, President and CEO, Agilent

Santa Clara, US: Agilent Technologies Inc. released its inaugural Environmental, Social, and Governance (ESG) report, including the company's first TCFD climate risk report; details on its commitment to reach net-zero greenhouse gas emissions by 2050; and progress on cultivating a diverse, inclusive, and engaged workforce. "The tenets of ESG have always been central to our mission, woven into the fabric of our business and a critical part of all that we strive to accomplish every day," said Agilent President and CEO Mike McMullen. "This includes protecting the environment and supporting our workforce throughout our operations and value chain, but also driving societal progress through products and services that advance the quality of life—from ensuring our food supply is safe and our air is clean to improving cancer treatments and outcomes."

Agilent's ESG report builds on over 20 years of annual reporting on the company's corporate responsibility policies, practices, and progress. The cornerstone of Agilent's approach to advancing ESG within its operations is known as the Four Ps—People, Products, Planet, and Prosperity, which underscore the interconnections between Agilent's business, the needs of society, and the risks to the planet. Committed to achieving net-zero greenhouse gas emissions by 2050 and, as an interim goal, reducing absolute Scope 1 and 2 emissions 50% and Scope 3 emissions 30% by 2030.

Curbed the environmental footprint of operations by reducing carbon emissions intensity per square foot by 34% since 2014; reducing municipal water intensity by 22% per square foot since 2014; and diverting 94% of our solid waste from landfills. Increased the share of women leaders at the highest levels from 10% to 30%, built a strong pipeline of women leaders, and maintained a 1.0 gender pay equity ratio across the global workforce. Advanced diversity and inclusion programs that include building a D&I strategy, setting ambitious diversity goals, developing strategies to increase the pipeline of racially diverse candidates, and implementing initiatives to encourage a sense of inclusion and belonging. Achieved industry-leading employee engagement levels, with 87% of the workforce reporting being highly engaged two years into the pandemic, and attrition rates better than the industry average.

Lupin Receives Approval from U.S. FDA for Rufinamide Tablets USP

Mumbai, India: Global pharma major Lupin Limited (Lupin) announced that it has received approval from the United States Food and Drug Administration (FDA) for its Abbreviated New Drug Application (ANDA), Rufinamide Tablets USP, 100 mg, 200 mg, and 400 mg, to market a generic equivalent of Banzel® Tablets, 100 mg, 200 mg, and 400 mg, of Eisai Inc. The product will be manufactured at Lupin's facility in Goa, India.

Rufinamide Tablets (RLD Banzel®) had estimated annual sales of USD 164 million in the U.S. (IQVIA MAT June 2022).

Govt launches 3 schemes to strengthen MSMEs in pharmaceutical sector

New Delhi, India: The government recently launched three schemes to strengthen Micro, Small and Medium Enterprises (MSMEs) in the pharmaceutical sector. Union minister Mansukh Mandaviya noted that the schemes envisage technology upgradation, setting up of common research centres and effluent treatment plants in clusters for the pharma MSMEs.

Small companies should be able to upgrade their facilities to global manufacturing standards, he said. The chemicals and fertilisers ministry rolled out the schemes under the banner of 'Strengthening Pharmaceuticals Industry' (SPI). "I believe the pharma MSME industry will greatly benefit from the schemes. The new schemes have many benefits that will go a long way in making the Indian pharmaceutical industry, Atma Nirbhar, more resilient and future-ready," Mandaviya, who heads both health as well as chemical and fertilisers ministries, said. The schemes provide for credit linked capital and interest subsidy for technology upgradation of MSME units in pharmaceutical sector, as well as support of up to Rs 20 crore each for common facilities, including research centre, testing labs and ETPs, in pharma clusters. SIDBI will be the project management consultant for implementing the scheme.

The Pharmaceutical Technology Upgradation Assistance Scheme (PTUAS) would facilitate pharmaceutical MSMEs with proven track record to upgrade their technology. The scheme has provisions for a capital subsidy of 10 per cent on loans up to a maximum limit of Rs 10 crore with a minimum repayment period of three years or interest subvention of up to 5 per cent (6 per cent in case of units owned by SC/ST) on reducing balance basis. Similarly, Assistance to Pharma Industries for Common Facilities Scheme (API-CF) would strengthen the existing pharmaceutical clusters' capacity for sustained growth. It provides for an assistance of up to 70 per cent of the approved project cost or Rs 20 crore, whichever is less.

In case of Himalayan and north-east region, the grant-in-aid would be Rs 20 crore per cluster or 90 per cent of the project cost, whichever is less. Pharmaceutical and Medical Devices Promotion and Development Scheme (PMPDS) would involve preparation of study reports on topics of importance for the Indian pharma and medical device industry. ■

Dry Vacuum Technology for Chemical & Pharmaceutical Processes

Uli Merkle
Head of Marketing Services
Busch Dienste GmbH

Vacuum plays an essential role in chemical and pharmaceutical processes. Whether in vacuum conveying, inertization, distilling or drying processes, vacuum is used everywhere to make processes safer, faster and more economical or to make them possible in the first place.

The various technologies for generating vacuum are versatile. Liquid ring vacuum pumps and steam ejectors have been the robust workhorses for many decades when it comes to generating vacuum. However, like rotary vane vacuum pumps with recirculating oil lubrication, they have one disadvantage: they require an operating fluid that comes into contact with the process gas. In the mid-1990s, Busch Vacuum Solutions launched the first screw vacuum pump on the market, the COBRA. The major difference to the vacuum pumps known at that time was that screw vacuum pumps did not require any operating fluid to compress the process gas. This is why they are called “dry” screw vacuum pumps (Fig. 1). Dry screw vacuum technology is now also widely used in the chemical and pharmaceutical industries.

Function

In a screw vacuum pump, two interlocking screw-shaped rotors rotate in opposite directions (Fig. 2). The process gases are drawn in, trapped between the cylinder and screw chambers, compressed and transported to the gas discharge. During the compression process, the screw rotors do not come into contact with each other or the cylinder. Precise manufacturing and

minimal clearances between the moving parts enable this operating principle and, in addition, ensure a low ultimate pressure of up to 0.01 millibar (absolute).

COBRA screw vacuum pumps operate with a cooling system which ensures even heat distribution, greater thermal efficiency and stability throughout the pump body. This allows the temperature to be selected so that it is high enough not to condense the process gas but low enough to avoid potential temperature-related problems such as gas deposition or spontaneous ignition. The absence of operating fluid allows a compression of the process chamber without contamination or reaction.

Protecting the vacuum system

Depending on the process gas, the vacuum pump can be exposed to certain risks. It is therefore important that the process gases are sufficiently known to minimize these risks. Different components are often required, which can be installed on the inlet or pressure side, in order to convey the process gas without damaging the vacuum pump. This is called a vacuum system, which can also consist of several vacuum pumps (Fig. 3).

For safe operation of the vacuum system, it is important to protect it from corrosion and deposits caused by crystallization or polymerization, and to increase the material resistance.

Protection against corrosion

Various measures can be effective in protecting the vacuum system or the individual vacuum pumps against corrosion. The first possibility is to prevent corrosive substances from entering the interior of the vacuum pump. This can be implemented by upstream condensers or gas scrubbers.

The second possibility to avoid corrosion is to keep the process stream in the gas phase. In a screw vacuum pump this can be implemented by setting a certain operating temperature. In addition, the process gas can be diluted by a supplied ballast gas to reduce the partial pressure of the condensable gases. So, the following simple logic applies: suction in gaseous form and ejection in gaseous form. The minimum temperature must therefore be selected so that it is high enough to prevent gases from condensing out. The maximum temperature must be selected so that the vacuum pump is not damaged or so that the maximum permissible temperature according to ATEX classification is not exceeded.

A third possibility is to use compatible materials for the vacuum pump.

In COBRA screw vacuum pumps from Busch Vacuum Solutions, for example, all parts in contact with the process are made of ductile cast iron by default and have a special coating that is resistant to almost all chemicals.

Protection from particles entering the system

Screw vacuum pumps should always be operated with an inlet screen or an inlet filter. This is to prevent particles from entering the inside of the vacuum pump. Due to the precise manufacturing of screw vacuum pumps with the associated small clearances and tolerances, there is a certain sensitivity to entrained particles. Dry screw vacuum pumps are frequently used with particulate dryers, especially in the pharmaceutical industry. A certain number of such particles can easily pass through the vacuum pump together with the process gas or be flushed out at the end of the process. Nevertheless, it is advisable to take appropriate precautions in order to prevent particles from being sucked in on a regular basis. For example, Busch offers a large number of different particle filters for every application.

Leak-tightness of the vacuum pump/vacuum system

Vacuum pumps and vacuum systems in a chemical environment must be so tight that no or still a minimum of ambient air can enter and create a potentially explosive atmosphere, or toxic or explosive gases can escape. Polymer o-rings are generally used to prevent leaks between two stationary parts. The resistance depends on the selected polymer. The seal material therefore also needs to be adapted to possible process gases. Busch Vacuum Solutions has had a dynamic sealing concept for rotating shaft feedthroughs certified by TÜV SÜD in accordance with the Technical Instructions on Air Quality Control (TA Luft). These seals are considered technically leak-tight.

Tips for operation

For most applications it is recommended that the vacuum pump is warmed up for a certain lead time before process operation. This allows the specified temperature to be set. After the end of the process, it is recommended to purge the vacuum pump with non-condensable inert gas to completely remove the process gas from the vacuum pump before switching it off. Nitrogen is normally used for this flushing process. Flushing the vacuum pump with a cleaning liquid at the end of the process is also possible and recommended if there is a risk of deposits forming inside the vacuum pump during cooling.

Explosion protection

With different sealing systems, various coatings and appropriate accessories, COBRA screw vacuum pumps from Busch can be configured to be compatible with virtually any chemical. In addition, various ATEX versions are available for COBRA screw vacuum pumps in accordance with EU Directive 2014/34/EU. Also, any other national regulation can be adapted for these vacuum pumps like EX-proof in US or KOSHA in South Korea. This means that these vacuum pumps can also be used worldwide in potentially explosive areas and for conveying explosive gases and vapors. Flame arresters may also be integrated if necessary. ■

Healthcare Transformation 4.0, it's Time to Adapt & Innovate

Sajiv Nath
Managing Director, Yokogawa India

Our future achievement is directly proportional to our ability to understand the need of the hour, adapt, transform, and integrate new technology at all levels. Some of the industries looking at transformation are pharma, oil & gas, energy, and COVID-19 has been a driver for change.

India Brand Equity's recent report states that the Indian pharmaceutical sector supplies over 50% of global demand for various vaccines, 40% of generic demand in the US and 25% of all medicine in the UK. India is the largest provider of generic drugs globally. According to the Indian Economic Survey 2021, the domestic market is expected to grow 3x in the next decade. India's domestic pharmaceutical market is estimated at US$ 42 billion in 2021 and likely to reach US$ 65 billion by 2024 and further expand to reach ~US$ 120-130 billion by 2030. Globally, India ranks 3rd in terms of pharmaceutical production by volume and 14th by value. The domestic pharmaceutical industry includes a network of 3,000 drug companies and ~10,500 manufacturing units. Pharmaceutical companies'

investments are increasing in R&D and are striving to implement advanced technology, which will help them reduce time to market & improve the quality of products. This technology shift will allow them to boost their efficiency and increase their exports

So do we have a chance to move to the number one position?

Transformation is an influential hug-effect on every aspect of our lives, including various day-to-day activities. In hindsight, there is a lot to be achieved in healthcare and medicine, especially in the developing countries of the Asia Pacific region. In a business and social environment ruled by high volatility, uncertainty, complexity, and ambiguity (VUCA), manufacturers in process industries need to embrace emerging digital technologies to transform operations, control costs, reduce downtime, enhance the safety of operation and improve profitability. Currently, the COVID-19 pandemic is globally impacting most socio-economic factors. This unprecedented turmoil has significantly impacted the healthcare industry and even more in developing nations like India. The pandemic has highlighted the lack and loopholes present in the existing healthcare infrastructure of the developing countries. At present, healthcare experts are trying to identify ways to predict, identify and prepare for similar future challenges. Pharmaceutical companies in the process industries need to set smart manufacturing goals with digital technology. This will enhance the safety and profitability, and "go-to-market" speed of new medicines. For many end-users, including the healthcare industries, autonomous operations are the destination to achieve their smart manufacturing goals with the power of cognition of machines and minimum human intervention. Thus, eliminating the chance of human error and chance of disruption when human beings can't or won't be able to reach. Human resources will be utilized for more qualitative and safer actions.

The manufacturing process in this industry has witnessed unprecedented demand but still seems to lack the 360-degree transformation. The supply versus the need faces a considerable gap. The industry needs to look at Industry /Pharma 4.0 as the next move to fill this gap and save lives.

I believe India has a chance to be in the number one position and need to adapt to change, transform, and improve the pharma production infrastructure. The need for technology-aided medical devices and care is evident to tackle the ongoing and future crises. Artificial intelligence (AI) and Machine Learning (ML) are slowly driving innovation in the healthcare domain and transforming towards Industrial Autonomy from the current level of automation. AI, ML and Blockchain have the power to solve the challenges of quality, accessibility, affordability, and the doctor to patient ratio.

Let us look at and understand how these

technologies are expected to change the healthcare sector.

AI and ML in Healthcare

Machine learning and Artificial Intelligence are currently helping in disease prevention and diagnosis, help develop customized drugs based on an individual's unique DNA, extract more meaning from data across various clinical trials, and advise multiple treatment options.

For the ongoing COVID pandemic, AI and ML technologies contribute to screening, predicting, forecasting, and contact tracing along with drug/vaccination development. In December 2019, an AI bot called blue dot scans hundreds and thousands of foreign-language news reports, animal and plant disease networks and other reputable sources that have detected a cluster of pneumonia-like illnesses in Wuhan, China. This system alerted the Blue Dots experts, who identified it parallel to the deadly SARS outbreak in 2003. Even before the scientists could figure out other details, the bot had already predicted the upcoming peril.

Similarly, AI is being used in many incidents like AI-powered drones monitor citizens abiding by the government rules or not, AI-empowered chatbots are being to be used by hospitals to help initial screening of the patients, and manage and analyse the numerous CT scan reports.

Healthcare workers throughout the globe are struggling today. They face unprecedented workload and stress, and they are exhausted. The use of Robots as frontline health workers is a reasonable solution to address these concerns. Health workers today are succumbing to Coronavirus infection due to the increased exposure with affected patients daily. This can be solved using robots as frontline workers; not only will this reduce the interaction between doctor and patient, but it will also provide accurate diagnosis and medication.

Blockchain in Healthcare

Among the various gaps highlighted during the COVID-19 pandemic, the lack of managed, trustable, and accurate data was of prime concern. The data retrieved from public hospitals and clinical laboratories are not always accurate.

"The demand and use of telemedicine applications, online booking of appointments, teleconsultation, online medical support, intelligent diagnosis, intelligent devices, wearable medical equipment are evident across nations. In developing countries like India, the need for adopting technology in the healthcare domain is immense."

Blockchain will play a vital role in tracking the spread of Coronavirus, identifying high-risk patients, controlling the spread of infection in real-time, and capturing data that can be further shared within various public networks for accurate information. Blockchain technology will be instrumental in recording the patient records, symptoms, locations, and patient history and maintain privacy.

With blockchain technology, patient history, ledger records, symptoms, sample test results, treatment status, and discharge summary are recorded and maintained for government sites. This data is critical for nations to identify the exact red zones, high-risk patients, track vaccination and take necessary actions.

At present, technology is used to combat the COVID-19 pandemic by providing improved solutions, user privacy protection, outbreak tracking, the performance of the medical supply chain, and monitor daily operations.

The demand and use of telemedicine applications, online booking of appointments, teleconsultation, online medical support, intelligent diagnosis, intelligent devices, wearable medical equipment are evident across nations. In developing countries like India, the need for adopting technology in the healthcare domain is immense. It is time for both government and private setups to concentrate on technology solutions in the healthcare domain. With innovation and implementation of technology will help the nation stay ahead and future challenges.

How will Industrial Autonomous to Industrial Autonomy (IA2IA) work?

The industry will take time to embrace change as it needs to change the present mindset. However, the benefits of such change are so huge that one cannot ignore it but only to its peril. Some of the benefits of these transformations will be effective utilization of Infrastructure. Wastage that happens now can be used to enhance infrastructure further and other benefits like-

- Lower Manufacturing Cost
- Making the processes future-ready for any crisis
- Updating plants to international standards
- Advanced R & D and manufacturing infrastructure
- Seamless knowledge & information sharing
- Build healthcare equalities and apply it to building back better
- Make medicines affordable

Industry 4.0 /Pharma 4.0 will ensure public health leadership and workforces that will be aligned with the demand and change. The new edge Autonomous processes will support the healthcare systems response in times of emergency, including last-mile distribution of medical countermeasures. ■

"The Government needs to particularly focus on industrially feasible technology development"

Rajiv Gandhi
CEO & MD, Hester Biosciences Ltd.

Mr. Rajiv Gandhi, CEO & MD, Hester Biosciences Ltd talks about the latest product range and recent developments in novel vaccines of the largest poultry vaccine manufacturer in India. Mr. Gandhi also shared some insights into the global veterinary vaccines market and various challenges.

How are you preparing for any future pandemics? What are some of your major project expansions, future projects, and investments?

Vaccination is crucial to contain outbreaks of epidemics and pandemics. The key is to secure animal health to protect human health as 75% of diseases are zoonotic which means they originate in animals and transmit to humans. Hester is investing in technology upgradation, R&D, and skilled human resources. We are strengthening our new product vaccine portfolio by developing new vaccines like Classical Swine Fever (CSF), Sheep Pox, and an improved version of Brucella vaccines.

Our bulk antigen production capacity expansion project is completed, and trial runs are ongoing. The expansion of the fill-finish line (Kadi – Ahmedabad) is expected to be completed by Q4 FY23. These two expansions will double our production capacity in vaccine production. Recently, the Government of India allowed the manufacture and sale of Avian Influenza Inactivated vaccine, H9N2 strain – this will also contribute to our vaccine pool. Furthermore, we have been investing in expanding our field force and introducing new territories which will help in having the last mile connect with our customers.

We also fulfill the demand for animal vaccine supplies from the Government of India as well as international organisations such as the World Organization for Animal Health (WOAH) and the FAO. We are supplying vaccines to alleviate and control the outbreak of Lumpy Skin Disease, affecting cattle, in India. All our three manufacturing plants in India, Nepal, and Tanzania have the combined capacity to produce 8.99 billion vaccines. Hester Petcare, our recently launched product range for companion animals is focused on the evolving needs of companion animals, veterinarians, and pet parents. Currently, we have launched 11 products in segments such as anti-infective, joint and gut, nutrition, and grooming.

What are some challenges in bringing new research into the market flow? Can these challenges be addressed through government initiatives, and how conducive is the Indian market vis-a-vis other international markets in the region?

With the significant advancement of technology in the last decade, there is a flow of new platform technologies in vaccine development. Some of the recent developments which have been successfully implemented in a few animal or human vaccines are viral vectored vaccines, genetically engineered vaccines, edible vaccines, and nucleic acid-based vaccines. In addition, there have been research efforts in the direction of broadly protective vaccines against multiple antigens. While, on one hand, these new developments are very useful in bringing novel vaccines to the market, the patents protections, high cost of licensing the technologies, building the required skill set and innovative infrastructure

> "We need to focus our research to address and control the emerging diseases of poultry and livestock in our country, which has seen recent outbreaks of Avian Influenza in poultry, African Swine Fever, and Porcine Reproductive and Respiratory Syndrome Virus infection in swine, Lumpy Skin Disease in cattle, etc."

are some of the challenges faced by vaccine manufacturers, particularly, in the veterinary vaccines segment.

The infrastructure is very well established in most of the developed world countries but has still to come up to speed in India. There is a need for optimal academia-industry collaborations and funding support to manage the risks in developing vaccines with these comparatively new technologies. The Indian government has taken several initiatives in building innovative infrastructure and making funding opportunities available. However, this needs to be significantly increased over time with a particular focus on industrially feasible technology development. The grants or funding for research projects need to match the investment required for the development of complex vaccine candidates which have high risk before they go to market. The government can have a big role to play in enhancing the cold chain maintenance system and required infrastructure for maintaining the proper efficacy of the vaccines.

We need to focus our research to address and control the emerging diseases of poultry and livestock in our country, which has seen recent outbreaks of Avian Influenza in poultry, African Swine Fever, and Porcine Reproductive and Respiratory Syndrome Virus infection in swine, Lumpy Skin Disease in cattle, etc. Comprehensive development of a newer generation of animal vaccines combined with a large and widespread vaccine marketing network covering the remotest parts of India is the key to human and animal health. In addition, developing more robust R&D capabilities, new-age therapies, and an innovative product mix to meet the expectations of veterinarians, and animal owners including livestock and pet owners is crucial.

What is the future of animal vaccines in the Indian and international markets?

The Indian animal vaccine market is projected to reach $232 million by FY 2026, according to market research reports. Various government-led programmes for immunization against and eradication of diseases such as PestedesPetits Ruminants (PPR) and Lumpy Skin Disease (LSD) have spurred the manufacturing of animal vaccines. Also, rising pet ownership and informed pet owners have set the demand for vaccines soaring. Pet owners are more conscious than ever about the importance of regular vaccinations for their animal companions. This is also a result of widespread awareness campaigns such as vaccination rabies control for example by the government and local bodies.

The global veterinary vaccines market is projected to reach USD 11.3 billion by 2025 from USD 8.0 billion in 2020, at a CAGR of 7.2% between 2020 and 2025. We are seeing this massive growth mainly because of a significant rise in zoonotic diseases, an increasing number of people owning companion animals, large-scale animal immunization programmes by

governments and international bodies, to prevent and control disease outbreaks, and a fast-rising demand for animal-derived products such as eggs, meat, and milk.

In 2021, the market was dominated by the attenuated live vaccines segment accounting for a revenue share of over 35%. Live attenuation, the oldest vaccination method in veterinary science, is also under trial for the development of additional applications using recombinant technologies. The recombinant vaccine segment is slated to bring excellent growth over the forecast period. Recombinant vaccines help reduce the risk of pathogenicity in animals post-vaccination. They are also said to have the capability to achieve vaccination against multiple virus strains. This is because recombinants can carry multiple gene inserts. As a result, these vaccine formulations can eliminate the need for adjuvants, increase the vaccine's viability, and improve stability. Some of the recombinant veterinary vaccines are against canine distemper, pseudorabies, Newcastle Disease, Lyme disease, and Avian Influenza. ■

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Integrated Autoclave with Shredder is an Ideal Solution for Hospitals & Healthcare Centers

The medical waste sterilization equipment has been engineered and designed using advanced engineering tools. Reliance Instruments Corporation offers custom-made solutions for different customer and project requirements. Our Sterilizer can perform up to 8log10 microbial inactivation sterilization quality, and the level of sterilization is certified by Indian and European Standards

- 8log10 Microbial Inactivation
- Inspection Report for Sterilization Level as per International Standards
- Strong and Long-Lasting Shredder
- Up to 80% Volume Reduction

- Archimedes Screw: Avoids waste sticking on the interior wall of the machine
- Durability and Safety
- PLC Touch Panel

Integrated autoclave with shredder is an ideal solution for hospitals and healthcare centres to dispose infectious medical waste. The machine is fully automated and easy to operate, so that hospitals can apply it to process hazardous medical waste safely where it is generated. After loading, the medical waste will be shredded through the built-in shredder and then be sterilized. The whole process is completed in one closed vessel, that ensures no exposure of stink. The system has a complete automated treatment process; thus, the reliance on a professional operation team can be substantially reduced. This unit requires minimum space to install and a basic infrastructure to operate. The machine is very compact as well, including automated lifter, dumper, vacuum pump, optional steam generator, etc., and it requires a minimum space to install and basic infrastructure to operate.

Features & Advantages

- Safer and easier: the closed system and fully automated process make medical waste treatment safer and easier to operate.
- Low operation cost
- On-site treatment: prevent the risk of secondary infection
- Low maintenance cost: Easily disassembled shredder largely shortens the maintenance and blades changing time.
- Odor control: Advanced odor control technology ensures a clean ambient of hospital and medical waste treatment facilities.
- Long lifespan: heavy-duty design and key parts from world famous brands ensures a long-term run. ■

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Can Electromechanical Actuators Push Hydraulic Cylinders Aside

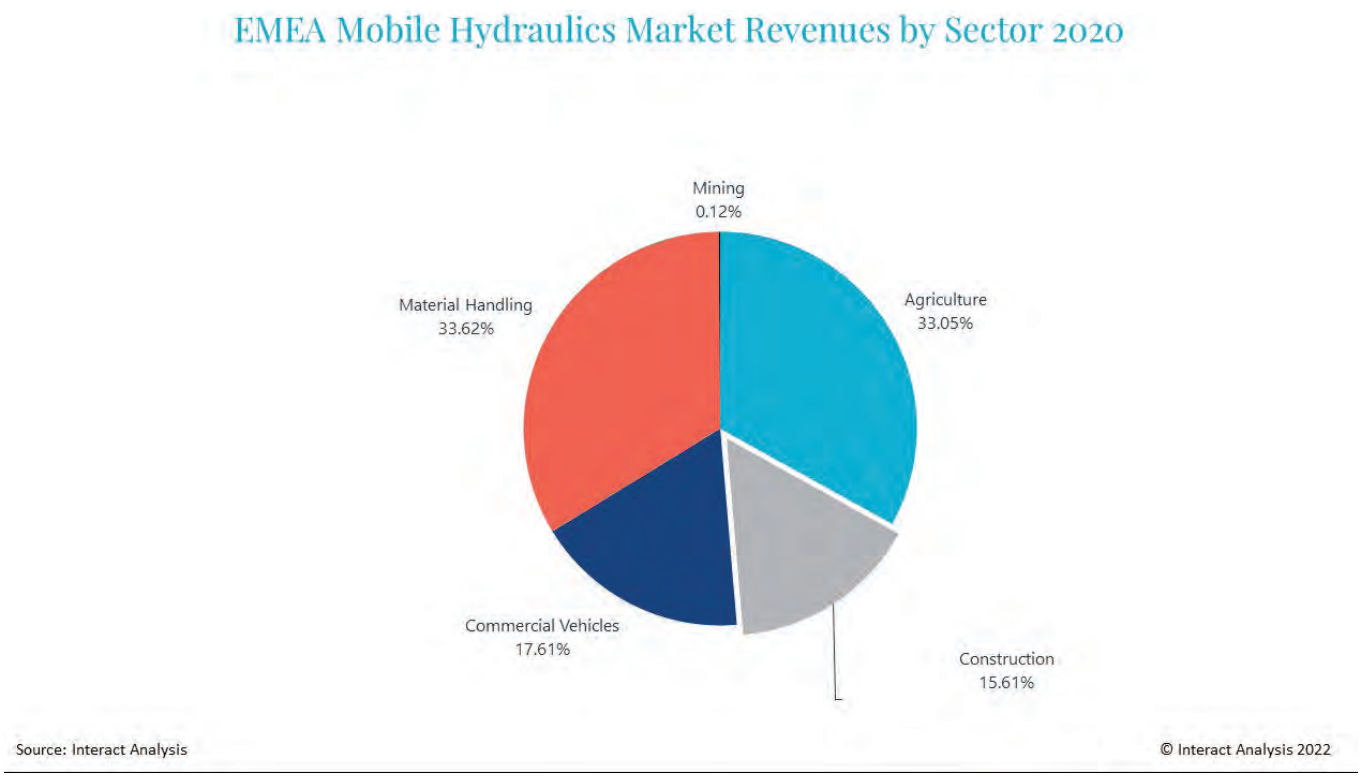
Brianna Jackson
Research Analyst, Interact Analysis

Hydraulic suppliers, traditional hydraulics offer unmatched power density. There are applications with low power demands and flexible duty cycles which could foster this kind of hydraulic substitution. In the most recent edition of our mobile hydraulics report, our data suggests that hydraulic cylinders may be replaced by electromechanical actuators within vehicles in the material handling sector more quickly than previously thought.

High Growth and High Substitution in the Material Handling Sector

For select applications the power density and cost obstacles for replacing hydraulic cylinders with electromechanical actuators are already relatively easy to overcome. This is particularly true for material handling vehicles such as forklifts, aerial work platforms, and telehandlers. Within the material handling sector, the advantage of replacing hydraulics is multi-fold: improving vehicle efficiency, preventing fluid leaks, and noise reduction. For example, JLG's Davinci AE1932 electric scissor lift features zero hydraulics, instead opting for electromechanical linear actuators in place of hydraulic cylinders.

Despite electromechanical actuators being highly suitable for applications within the material handling sector, hydraulic sales to the sector are still rapidly growing. Sales of hydraulics within the material handling sector are projected to overtake agriculture by 2026. As a result, the material handling sector will become the second largest sector in the mobile hydraulics market. Much of



Global-mobile-hydraulics-market-revenues-by-sector-2020Global-mobile-hydraulics-revenue-by-sector-2026

this can be attributed to the rapid growth which is forecasted for forklift sales within warehousing applications over the next several years.

The question then becomes to what extent will electromechanical actuators penetrate the market and replace traditional hydraulic cylinders. In our research, we quantified the rate of total hydraulic replacement of cylinders through an analysis using a ratio of cylinders per pump in the market. To explain in greater detail, we estimated that for the entire market the number of cylinders per pump sold was 1.68 in 2019. However, we expect that ratio to decline to 1.57 by 2026. This represents an overall decline of -6.4% over the forecast period.

For the material handling sector, this decline in the number of cylinders per pump is even steeper at -8.8% over the forecast period. This would imply a greater rate of replacement in favor of electromechanical actuators within the material handling sector. This analysis should be taken with a pinch of salt as changes to the number of pumps will also impact the ratio. We do believe however, is that it's directionally insightful and the results mirror what we heard during interviews with hydraulics suppliers and OEMs.

Which Vendors are Riding the Trend

Vehicle OEMs are risk averse in changing the systems which have already been proven for their vehicles, hence, change in vehicle architecture happens slowly. However, OEM sentiment may be warming to altering vehicle hydraulic architectures as the rate of electrification picks up. Many market leaders in the global mobile hydraulics market do not offer hydraulic cylinders. Resultantly, the hydraulic cylinder market is significantly more fragmented. This leaves a wide-open field for both hydraulic vendors as well as motion control product vendors to fill this space. So far, most of the electromechanical actuators that would be suitable for mobile applications are offered by vendors such as Thompson and Ewellix, two vendors that are steeped in the motion control market. There are also smaller startups entering this market such as Sweden-based Cascade Drives whose technology is already being utilized in forklifts. This is clear evidence that vehicle electrification will offer opportunities for the motion control vendors that were previously reserved for hydraulics suppliers.

In anticipation of this trend, many mobile hydraulics vendors are expanding their technological expertise by acquiring and partnering with electromechanical actuator manufacturers. For example, Danfoss has recently announced a partnership with RISETM Robotics with the goal of producing an electromechanical actuator that can match traditional hydraulic cylinders in terms of power. The partnership is intriguing from a strategic viewpoint because Danfoss isn't a player in the traditional cylinder market. This move could indicate a shift in priorities from just optimizing individual components to providing whole system solutions that can maximize efficiency. Other top vendors such as Bosch Rexroth and Parker Hannifin feature electromechanical actuators in their industrial portfolios which they could feasibly expand to mobile machinery.

While hydraulic cylinders are unmatched in terms of power density and are unlikely to be displaced in most applications in the near-term, they could be replaced by electromechanical actuators in applications that have lower power-density requirements. The material handling sector is more poised to adapt the technology due to benefits such as noise reduction, leak prevention, and enhanced control.

Final Thoughts

As electrification in off-highway continues to develop, mobile hydraulic vendors will need to be continuously monitoring these sorts of trends. Status-quo bias can be prevalent in mature markets, and it will be important for mobile hydraulic suppliers to recognize that some level of substitution is likely to occur. While this substitution will represent lost business for some, it represents an opportunity for forward-thinking suppliers, and we expect many to jump on the trend. ■

An Ideal Match of Advanced Embedded Solutions

Mohd Zeya Kaif
Marketing Executive (ESIoT Sector)
Advantech

Advantech has been supporting Medical, especially in automation and digitization. With advanced embedded solutions exceptionally designed for Pharma packaging, Cloud Computing for Pharmaceutical workflows, Pharmaceutical manufacturing and distribution, QA and QC. There are numerous decisions doctors make that influence patients' well-being. Medical applications are rapidly digitalizing to improve patient care and achieve better outcomes.

Three phases comprise this transformation:

- **Image processing:** analyzes high-definition data using the in-depth capacity of the system.
- **AI-powered decisions:** guides doctors for better decision-making using patient data.
- **Streamlined operations:** increases efficiency and safety.

What does the modern system require?

The performance and reliability of an imaging PACS (Picture Achieving and Communication System) are crucial to service providers, making finding the right AI solution difficult. A PACS provides economical storage and convenient access to images from multiple source machine types like X-ray plain film and magnetic resonance imaging. One of the most common models is the "standalone" type which works on a standalone basis without computer or server connectivity.

It can also be referred to as an imaging information management system (IMS). The global specialty PACS market size forecast is to reach USD 3.5 billion in 2024 from USD 2.6 billion in 2019, at a CAGR of 6.0%. This technology can facilitate precise diagnosis.

Here is one solution from Advantech to achieve about mentioned results.

Based on the Intel 10th Gen Xeon W series processors, Advantech AIMB-587 provides users with the perfect solution in medical diagnostic applications by supporting 10 Gbit/s bandwidth and powerful multi-threaded processing capabilities. With a PCIe x16 expansion slot and two more 10 GbE LAN ports, it is ready to connect with your servers, providing endless performance advantages.

In short, with high-speed transmission achieve reliable, privacy-concerned, and secure solutions are now available with AIMB-587's TPM 2.0 compliant hardware and software platform. With TPM 2.0 enabled, PACS data can be encrypted as well as protected from malicious attacks that may attempt to extract information from the system. With up to eight SATA ports, both RAID 0, 1 and 5 can be configured along with Azure cloud backup services. The medical segment has unique demands for time-to-market and system designs, and Advantech can provide customer design-in services. Our independent design organizations have many years of experience in delivering medical products. Here at Advantech, we are committed to ensuring that all the compliance standards are met, providing an innovative solution for small to large medical systems with EMC and safety requirements.

Ultrasounds are utilized in many different fields. An ultrasound machine is a vital tool for doctors to diagnose and treat patients, especially those with limited mobility or travel/movement restrictions caused by COVID-19. Modern ultrasound machines require extreme processing performance and graphics rendering to enhance diagnostic accuracy and instantly acquire precise images.

Ultrasound machines have limited space for cooling solutions and even request quiet in the hospital environment. High-end ultrasound usually leverages FPGA, graphics cards, or AI accelerator modules. System design is complicated and causes higher costs with additional GPU or VPU engine integration.

This combination of restrictions and requirements creates the following challenges:

Additional hardware/software integration costs yield high development expenses, Despite space restrictions, these solutions necessitate highly reliable to deliver accurate and timely service for healthcare.

Commonly thermal modules, being too large for compact devices and too noisy for use in medical environments — are ill-fitted for mobile ultrasound solutions.

Advantech's SOM-6883 empowers AI-based diagnostics without the use of a

second graphics card. These features ease the development, reduce costs, and quicken the time-to-market for ultrasound systems. Advantech provided professional design-in services aimed at expediting the implementation.

As it is equipped with 11th Gen. Intel Core™ Processors (Tiger Lake-UP3) and 96 EUs with Intel iRIS® Xe graphics. In addition, Advantech QFCS (Quadra Flow Cooling System) technology with a low profile and low noise features can release all TDP power to derive 100% performance. Advantech's QFCS thermal solution is compatible with Intel® strain gauge standards. This silent, slim, and light solution efficiently dissipates CPU heat and is easily adaptable to customer needs. When paired with SOM-6883 it delivers excellent performance with a minimal noise level (45dB).

Pharma Packaging has its challenges when it comes to operations. One problem that arises now and then is the guaranteed quality checking of pharmaceutical products. The primary task of pharmaceutical packaging is to protect the product and preserve its characteristics, from the production plant to the user. With the help of Advantech's EPC-R7200 companies can give their visual inspection and quality check a smooth flow. Why embedded applications for visual and QC applications? EPC-R7200 can be used widely in video-based applications since the unit is based on the NVIDIA-based SOM module and the NVIDIA is having Cuda cores to process the video applications. Wisley streaming of video processing application will be smoother when we complete it to intel based CPU. As this SOM consists of pascal based NVIDIA architecture containing 256 cores that can experience more than double the performance or twice the energy efficiency of the jetson module.

With our DIO expansion in EPC, one can connect cameras to identify the defective things on the conveyor belt and can reject the material in real-time since we can the more FPS (Frame Per Second) from the Jetson SOM.

With the advancement in the technology in the field of the Pharma Industry, Advantech has been able to match the pace. With the versatile and diverse range of solutions to support the industry demands. From bioprocessing to pharma packaging, digital transformation in the pharmaceutical, and cloud computing for pharmaceutical workflows to improve pharmaceutical manufacturing and distribution to revolutionize the Pharma Industry, Advantech products are an ideal and unbeatable match. ■

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