FROST & SULLIVAN

Applied Robotics™

Solutions in reach

2017 North American Robotic End of Arm Tooling Product Line Strategy Leadership Award

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Background and Company Performance

Industry Challenges

Industrial robots are used across a number of end user manufacturing industries such as automotive, packaging, aerospace, and food and beverage, largely to perform operations that are repetitive in nature or considered monotonous by the human workforce. Although robotics entered the manufacturing landscape over four decades ago, end users have only wholeheartedly embraced the technology within the past 10 to 15 years.

In particular, growth of the robotic end of arm tooling market mirrors that of the overall industrial robotics market. Robotic end of arm tools are the key components in any robotic work cell because they execute the desired functions such as welding, gripping, transporting, and so on. Although the adoption of automation solutions promises increased productivity levels and improved margins across industries, robotic end of arm tooling companies remain challenged by convincing more end users to shift away from legacy systems.

Slow adoption can be attributed to the significant investments attached to implementing robotic solutions, and end users, especially the small and medium sized enterprises (SME) with limited budgets, are unsure of the return on investment they will derive out of such solutions. Furthermore, automation eliminates or minimizes the need for manual intervention. With many SMEs being family-oriented businesses, the fear of job loss holds them back further from embracing automation. While these end users acknowledge that automation will assume greater importance in the future, especially as labor costs rise, a large number of them are hesitant to invest in robotic end of arm tooling because they are often unsure about where to start with automation and how it can be tailored to their specific applications.

This scenario is further exacerbated by the fact that not all companies offer a comprehensive range of end of arm tools, which forces customers to go from one vendor to another in search of the required components. The inconvenience not only consumes a lot of time that leads to a dip in customers' productivity levels, but also adds to their operational costs. Nevertheless the success of a robotic work cell is highly dependent on the robust design and proper integration of the end of arm tools such as grippers, tool changers, and vacuum cups, yet products from different brands can cause interoperability issues, thereby extending customers' development process and their products' time to market. Hence customers prefer one-stop-shop providers that offer a comprehensive range of end of arm tools and effectively mitigate unreliability issues in the supply chain.

Product Line Strength and Customer Impact

Product Breadth

Specialized in designing solutions to effectively meet the changing automation and robotics needs of customers that range from big Fortune 500 companies to small private business

entities across diverse verticals, New York-based Applied Robotics, Inc. (Applied Robotics) offers a broad array of end of arm tools. The products range from tool changers (legacy cxc, sigma, and the new epsilon line) and grippers (vacuum, pneumatic, and electric) to docking and connection technology, collision sensors, and accessories for numerous applications. What is attractive about Applied Robotics' product breadth is that it is not only diverse in terms of range but also highly varied within each product segment. This is because the company incorporates customer input and user responses into its product design to ensure that the products it builds befittingly match evolving customer needs.

Leveraging 30 years of market experience, Applied Robotics has consistently and successfully innovated end of arm tools with unique capabilities in line with advancing technology trends to meet customers' evolving automation and robotics needs. For example, its Epsilon™ line of tool changers addresses the challenge of space constraint that prevents end users from purchasing more robots to incorporate different functions. The tool changer's interlocking mechanism eliminates the need for purchasing an additional robot by allowing customers to reliably use this line of tool changers (with a small footprint) for quickly switching tools without affecting performance in applications, such as assembling, welding, dispensing, or material handling. The direct bolt design, compliant with ISO 9409-1 patterns, eliminates the need to incorporate adaptor plates.

Unlike many of its competitors that provide only tool changers or grippers, Applied Robotics is dedicated to holding its position as a one-stop-shop provider to system integrators. While Applied Robotics already offers a very diverse range of end of arm tooling that caters to a broad range of applications, the company continues to expand its product range in the pursuit of an increased addressable customer base. The launch of its new line of robotic machine tools (deburring, grinding, de-scaling, and polishing tools) aptly fills a significant market gap, as these processes have traditionally been manual operations.

Aligned with its vision of constant innovation to ensure its customers enjoy outstanding business productivity, the company announced the launch of its new Bag Gripper at the Assembly Show 2017 in Rosemont. Equipped with advanced technologies that will allow customers to perform preventive maintenance to avert unplanned downtime, it features one of the lightest weight-to-capacity ratios in the market, is cost effective, and is easily adjustable, even during gripper operation. Furthermore, the addition of vacuum grippers to the Applied Robotics product lineup seals the gap in its grippers segment and now empowers customers' robots to handle anything, regardless of size or whether porous or non-porous. With customers increasingly preferring one-stop-shop providers for their robotic end of arm -tooling needs, Frost & Sullivan applauds Applied Robotics' timely strategy of product line expansion, which helps the company increase its addressable customer base and strengthen its market position.

Product Scalability

While the broad product portfolio positions Applied Robotics to cater to all system integrator needs, offering them at various price points makes its solutions more attractive, especially

to small-to-medium-sized end users that are faced with budgetary constraints and are new to using automation solutions. By offering a lower-priced product, Applied Robotics is able to help end users gain some experience with automation. Once they experience the benefits achievable from robotics and automation solutions, they come back to the system integrator seeking premium-priced tools that ensure higher precision and durability. Eventually, they upgrade to a high-end system with advanced automation capabilities as their needs scale.

The Epsilon line of tool changers, with payloads ranging from 10kg to 1500kg, will cater to all kinds of applications. While Applied Robotics' entry-level products provide short-term benefits in the form of reduced capital and operational costs for the end user, its premium products provide longer-term benefits related to reliability, longevity, and robust performance. Frost & Sullivan opines that Applied Robotics' strategy of offering products at various price points helps the company acquire repeat customers, which helps increase its revenue potential.

Technology Leverage

Most of Applied Robotics' competitors base their tool changer locking mechanism on the heavy ball-and-collet technology with the standard ball bearings that depend on gravity for releasing the collet. While this technology design functions properly in clean environments, the movement of the ball bearings gets impeded in factory environments filled with dust, sand, water, machine debris, or even salt, which collects around the area where the ball bearing is positioned and thus prevents "positive retract". Consequently, the ball bearings fail to release the collet with gravity. In other words, jamming of bearings prevents the gripper from being released, thereby stopping production. This issue seriously impacts operational efficiency and hence customers' production equipment and process productivity, translating into downtime and considerable losses.

Contrary to this ball-and-collet technology, Applied Robotics' tool changers boast a failsafe, light-weight cam locking mechanism, which is controlled by a double-acting cylinder. This technology guarantees a positive retract and release irrespective of the environment in which the tools operate. Additionally, this design prevents the gap between tool and tool changer (that generally widens with use of the ball-and-collet design due to wear and tear) from increasing. During uncoupling, the technology can self-clean the particles around it, which ensures smooth movement of the end of arm tools throughout the entire product life cycle. Thus, end users do not face production downtime, which translates into enhanced operational efficiency and productivity. The tool changer features a mechanical locking fail-safe, which ensures that the robot and tool remain connected even if power or air pressure is lost. Additionally, strong point-to-point connection ensures rotational stability.

Thus, the Applied Robotics cam locking mechanism ensures repeatability and reinforces workplace safety. Frost & Sullivan strongly believes that Applied Robotics' engineering-driven approach to improving workplace safety sets the benchmark in the industry. With

safety being one of the drivers of automation, both the company and the end of arm tooling market stand to benefit from this approach.

Price/Performance Value

Applied Robotics' Epsilon line of tool changers comes with a lifetime guarantee on the locking mechanism, which is a ground-breaking, failsafe, and industry-first feature. Ensuring unmatched reliability throughout the entire product life cycle, the robots fitted with this tool changer will not create a safety hazard in the event of power loss. Applied Robotics' Epsilon line of tool changers, moreover, guarantees safety of not only the operator but also the products being held by the robot. The locking mechanism promises to be as secure after 5 million cycles as it was during the first cycle. The intact locking mechanism eliminates the frequent need for maintenance or repair of the end of arm tools. This reduction in maintenance costs delivers a superior value proposition as operational costs come down and customers' operational efficiency levels go up. Also, by automating processes, Applied Robotics' end of arm tools limit the scope of manual intervention, which expedites customers' designing and development process and shortens the time to market.

Although available at premium prices, Applied Robotics' end of arm tools are of high quality and are long-lasting compared to competitors' offerings. Additionally, the lifetime guarantee lowers total cost of ownership that customers incur. Customers, thus, enjoy the best value for money owing to the unmatched reliable performance of Applied Robotics' end of arm tools, which results in customer loyalty. Frost & Sullivan believes that Applied Robotics' pioneering lifetime guarantee on the tool changer locking mechanism is not only testimony to its sound engineering capabilities, but also provides the utmost value to the customer.

Customer Success Cases—Automotive and Manufacturing

Daimler Chrysler Mexico was searching for tool changers that could enable it to quickly accommodate numerous vehicles and diverse utility needs while keeping both the operational cost and Saltillo facility set-up timeframe as low as possible. Applied Robotics' tool changers attracted its attention. The modular design of these tool changers makes them future-proof and able to be seamlessly retrofitted without having to buy a new model to meet futuristic needs and without compromising on performance. The facility is now equipped to optimally leverage the plant's manufacturing capabilities and area over the long term while enjoying a high return on investment.

During a routine customer check in, Applied Robotics discovered that one customer went through 300 to 400 grippers every year because they executed a high number of work cycles and were wearing out. The customer was spending over $180,000 a year on the repair and replacement of these grippers. However, Applied Robotics' grippers were installed in some of the customer's manufacturing facilities and were found to outperform every other gripper in the manufacturing plants. By replacing the problematic grippers with Applied Robotics' dependable grippers, the customer saved over $200,000 a year. Applied

Robotics' broad gripper portfolio and product robustness helped the customer increase productivity, lower maintenance costs, and improve operational efficiency.

Customer Purchase Experience

Applied Robotics clearly understands the reason behind slow adoption of automation and robotic end of arm tooling. With price representing a critical factor that influences the purchase decisions of end users constrained by small budgets, it becomes imperative to design end of arm tools that will deliver the best value for money. What gives Applied Robotics an edge over its peers in extending a superior value proposition to the robotic integrators is its strong engineering know-how. Often, standard off-the-shelf products fail to fulfill the end users' needs. In response, Applied Robotics proactively collaborates with the system integrators that actually design the robotic cell to first understand an end user's robotic application needs. It then offers design-related inputs and information in the form of technical charts and other data for testing purposes, tailoring its end of arm tools to suit the customer's exact specifications and budgets (especially for SMEs). This thoughtful company also accompanies system integrators onsite to experience the customer environment and their requirements—then it can resolve design-related issues.

With all its tool changers featuring a modular design, Applied Robotics allows system integrators the flexibility to use these tool changers across a wide range of applications. The modular design also makes it easier to customize the tool for various applications thus reducing development time and maximizing productivity. System integrators, by turn, remain loyal to the Applied Robotics brand. Additionally, Applied Robotics' presence in other global regions such as Europe and Asia-Pacific has the advantage of minimizing supply chain unreliability. If a customer cannot source a particular product through a local distributor, Applied Robotics uses its foreign subsidiaries to ensure that the product is delivered to the customer on-time.

To make certain its customers have a highly pleasing and personalized buying experience, Applied Robotics has in place its Applied Robotics Solution Provider (ARSP) channel program that offers customers a simplified certification process, easy-to-understand revenue model, dedicated support, along with new benefits and incentives. Applied Robotics thus paves the way for its partners to record significant growth in revenues and margins. Frost & Sullivan recognizes Applied Robotics' commitment to enhance the customer's purchase experience, through its engineering expertise that suggests the right product or solution for the right customer at the right price, which helps build brand loyalty.

Customer Ownership Experience

Driven by its commitment to enhance its customers' ownership experience, Applied Robotics leverages the rich experience it has gained by working with customers from diverse end user industry verticals. Most of its peers sell their products through distributors and therefore do not have visibility into which end users are using its products. Consequently, when end users face technical issues with the products, they contact the distributors or the

system integrators, who then contact the manufacturer in order to identify the root cause of the issue. This is a time-consuming process. On the other hand, by being involved right from the design phase, Applied Robotics' engineers suggest the best product to customers, as well as ensure that the product functions properly throughout the product's long lifecycle. The company guides each customer on how to properly handle the products and enjoy a high-end product ownership experience.

Lack of resources to design and integrate the different tools of a robotic cell makes small and medium-sized robotic integrators dependent on off-the-shelf tools that may not always match their application needs. These integrators are almost always burdened with designing the entire robotic system instead of just fitting certain tools to the robots, which is time-intensive. In this context, the personalized attention that Applied Robotics gives to these integrators relieves them of some designing load and saves their time. Ultimately, Applied Robotics' engineering team designs high-quality products with advanced capabilities that guarantee best return on investment, which ultimately translates into a highly satisfying customer ownership experience. Frost & Sullivan identifies that Applied Robotics' personalized attention coupled with its cross-sectoral product development experience helps the company design robust products that offer a top-notch, virtually fail-proof performance.

Conclusion

Leveraging its more than three decades of rich experience in the market, Applied Robotics has successfully positioned itself as a one-stop-shop provider of end of arm tools that enhance the performance of robots and enable customers to record a significant boost in productivity and operational savings. What differentiates it from its peers is not just the diversity within each segment of the products it offers, but also its sound engineering capabilities that allow it to collaborate with system integrators and tailor solutions to match customers' exact automation needs.

The modular design of its tool changers and grippers positions them as future-proof offerings, featuring the failsafe locking mechanism that guarantees reliable performance throughout the entire product life cycle. Applied Robotics' strategy of continuous innovation in line with customers' changing automation and robotic needs fortified by the expansion of its product range has been instrumental in positioning it ahead of the competition.

With its strong overall performance, Applied Robotics, Inc. is recognized with Frost & Sullivan's 2017 Product Line Strategy Award.

Significance of Product Line Strategy

Ultimately, growth in any organization depends upon customers purchasing from a company and then making the decision to return time and again. A full, comprehensive product line that addresses numerous customer needs and preferences is, therefore, a critical ingredient to any company's long-term retention efforts. To achieve these dual goals (customer value and product line strength), an organization must be best-in-class in three key areas: understanding demand, nurturing the brand, and differentiating from the competition.

Understanding Product Line Strategy Leadership

As discussed above, driving demand, strengthening brand, and differentiating from the competition all play a critical role in delivering unique value to customers. This three-fold focus, however, must ideally be complemented by an equally rigorous focus on building a superior and comprehensive product line.

Key Benchmarking Criteria

For the Product Line Strategy Leadership Award, Frost & Sullivan analysts independently evaluated two key factors—Product Line Strength and Customer Impact—according to the criteria identified below.

Product Line Strength

Criterion 1: Breadth
Requirement: Product line addresses the full range of customer needs and applications.

Criterion 2: Scalability
Requirement: Product line offers products at a variety of price points and functionality levels.

Criterion 3: Technology Leverage
Requirement: Demonstrated commitment to incorporating leading-edge technologies into product offerings results in greater product performance and value.

Criterion 4: Features
Requirement: Products offer a comprehensive suite of features to serve customers at multiple levels of functionality, ease of use, and applications.

Criterion 5: Supply Chain Reliability
Requirement: There is sufficient control over the supply chain to ensure availability of key components and thereby the availability of products in the product line.

Customer Impact

Criterion 1: Price/Performance Value
Requirement: Products or services offer the best value for the price, compared to similar offerings in the market.

Criterion 2: Customer Purchase Experience
Requirement: Customers feel they are buying the most optimal solution that addresses both their unique needs and their unique constraints.

Criterion 3: Customer Ownership Experience
Requirement: Customers are proud to own the company's product or service and have a positive experience throughout the life of the product or service.

Criterion 4: Customer Service Experience
Requirement: Customer service is accessible, fast, stress-free, and of high quality.

Criterion 5: Brand Equity
Requirement: Customers have a positive view of the brand and exhibit high brand loyalty.

Best Practices Recognition: 10 Steps to Researching, Identifying, and Recognizing Best Practices

Frost & Sullivan analysts follow a 10-step process to evaluate Award candidates and assess their fit with select best practice criteria. The reputation and integrity of the Awards are based on close adherence to this process.

STEP		OBJECTIVE	KEY ACTIVITIES	OUTPUT
1	**Monitor, target, and screen**	Identify Award recipient candidates from around the globe	• Conduct in-depth industry research • Identify emerging sectors • Scan multiple geographies	Pipeline of candidates who potentially meet all best-practice criteria
2	**Perform 360-degree research**	Perform comprehensive, 360-degree research on all candidates in the pipeline	• Interview thought leaders and industry practitioners • Assess candidates' fit with best-practice criteria • Rank all candidates	Matrix positioning of all candidates' performance relative to one another
3	**Invite thought leadership in best practices**	Perform in-depth examination of all candidates	• Confirm best-practice criteria • Examine eligibility of all candidates • Identify any information gaps	Detailed profiles of all ranked candidates
4	**Initiate research director review**	Conduct an unbiased evaluation of all candidate profiles	• Brainstorm ranking options • Invite multiple perspectives on candidates' performance • Update candidate profiles	Final prioritization of all eligible candidates and companion best-practice positioning paper
5	**Assemble panel of industry experts**	Present findings to an expert panel of industry thought leaders	• Share findings • Strengthen cases for candidate eligibility • Prioritize candidates	Refined list of prioritized Award candidates
6	**Conduct global industry review**	Build consensus on Award candidates' eligibility	• Hold global team meeting to review all candidates • Pressure-test fit with criteria • Confirm inclusion of all eligible candidates	Final list of eligible Award candidates, representing success stories worldwide
7	**Perform quality check**	Develop official Award consideration materials	• Perform final performance benchmarking activities • Write nominations • Perform quality review	High-quality, accurate, and creative presentation of nominees' successes
8	**Reconnect with panel of industry experts**	Finalize the selection of the best-practice Award recipient	• Review analysis with panel • Build consensus • Select recipient	Decision on which company performs best against all best-practice criteria
9	**Communicate recognition**	Inform Award recipient of Award recognition	• Present Award to the CEO • Inspire the organization for continued success • Celebrate the recipient's performance	Announcement of Award and plan for how recipient can use the Award to enhance the brand
10	**Take strategic action**	Upon licensing, company is able to share Award news with stakeholders and customers	• Coordinate media outreach • Design a marketing plan • Assess Award's role in future strategic planning	Widespread awareness of recipient's Award status among investors, media personnel, and employees

The Intersection between 360-Degree Research and Best Practices Awards

Research Methodology

Frost & Sullivan's 360-degree research methodology represents the analytical rigor of our research process. It offers a 360-degree-view of industry challenges, trends, and issues by integrating all 7 of Frost & Sullivan's research methodologies. Too often companies make important growth decisions based on a narrow understanding of their environment, leading to errors of both omission and commission. Successful growth strategies are founded on a thorough understanding of market, technical, economic, financial, customer, best practices, and demographic analyses. The integration of these research disciplines into the 360-degree research methodology provides an evaluation platform for benchmarking industry participants and for identifying those performing at best-in-class levels.

360-DEGREE RESEARCH: SEEING ORDER IN THE CHAOS

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