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INGERSOLL rAND: Creating effective engineering and technology centRes (a)

Rahul Sheel and Neharika Vohra wrote this case solely to provide material for class discussion. The authors do not intend to illustrate either effective or ineffective handling of a managerial situation. The authors may have disguised certain names and other identifying information to protect confidentiality.

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In October 2011, Ravi Madhavan joined the engineering and technology centres (ETC) at Ingersoll Rand (IR) India as senior director of engineering. His prior experience as vice-president of product engineering in another leading global company matched IR’s desired candidate profile. The position was established to lead IR’s ETCs in India to a new path, making them more efficient and effective. IR India established its ETCs in 2004 to support the product development activities of different IR businesses in India and abroad.

Soon after he joined, Madhavan found that the ETCs were not able to perform as designed. Projects were missing their delivery targets, and there were major differences in the understanding of the requirements among the strategic business unit (SBU) teams, which led to continuous changes in deliverables and resulted in customer dissatisfaction. Key employees of the ETCs were unhappy, and some high performing team members left the organization.

In general, the ETCs were designed to cater to the needs of the various SBUs. However, without effective support from these centres, the company’s SBUs could outsource work to private companies, threatening the existence of the ETCs as internal service providers. In early 2012, only a few months after joining the ETCs, Madhavan was assessing the situation and determining whether he had the right organizational configuration to grow and sustain the ETCs in IR India.

History of Ingersoll Rand: The parent company

IR was a US$13 billion[[1]](#footnote-1) diversified industrial company that had been operating in numerous countries since 1871 and traded under the stock exchange symbol NYSE:IR. The first invention that led to the establishment of the company, originally called the Ingersoll Rock Drill Company, was a steam powered rock drill (see Exhibit 1) invented by Simon Ingersoll (1818–1894). The drill was instrumental in excavation, mining, tunnelling, and highway construction. The company further specialized in heavy tools, developing other useful products such as the hammer drill, jackhammer drill, downhole drill, stopper drill, paving breaker, air-operated hoists, clay diggers, riveting hammers, chipping hammers, and grinders.

In 1902, the company developed the first portable compressor and began a compressor line of business to go along with its tool business. However, the company was known largely for its rock-drill products and enjoyed a narrowly focused industrial company image until the year 2000. In that year, Herbert Henkel, the company’s chief executive officer at the time, attempted to change that image by changing its logo. However, his efforts met with limited success.

In 2005, the company engaged in further re-branding exercises. It identified a strategy to more broadly change its image—“to inspire progress by unleashing the potential in people and technologies.” IR hoped to do this by diversifying from a maker of “construction/heavy machinery” to a company that would be active in the “diversified industrial” sector. Since 2000, IR also made a number of acquisitions, particularly, in the non-construction and non-heavy-machinery sectors (see Exhibit 1). The company decided to focus on integrated home solutions by investing in security technologies and manufacturing door locks. It made its largest investment in 2008, when it acquired Trane Inc., a global leader in indoor climate-control systems and solutions, valued at $10.1 billion.

In 2011, IR operated in various different business units including the following:

Climate Solutions: Climate-control products delivered energy-efficient refrigeration and heating, ventilation, and air conditioning (HVAC) equipment, as well as refrigeration for transport, stationary refrigeration, and manager-controlled temperature environments. This segment included leading brands such as Hussmann, Thermo King, and Trane.

Residential Solutions: A broad segment of residential products and services, which were only available in North and South America, provided safety, comfort, and efficiency to homeowners. This range of products and services included mechanical and electronic locks, energy-efficient HVAC systems, indoor air-quality products, advanced controls, portable security systems, and remote home management products. This segment included such brands as American Standard, Schlage, and Trane.

Industrial Technologies: The industrial technologies segment included products and services that enhanced energy efficiency, productivity, and operations. The range of products and services included compressed air systems, tools, pumps, fluid-handling systems, golf and utility vehicles, and micro turbines. This segment included such brands as Club Car and Ingersoll Rand.

Security Technologies: The security technologies segment included products related to electronic and biometric access control systems and software; locks and locksets; door closers; exit devices; steel doors and frames; portable security devices; and time, attendance, and personnel scheduling systems. The focus of the scheduling systems was on various different markets including commercial construction, health care, retail, maritime, transport, education, and government procurement. The brands included CISA, LCN, Schlage, and Von Duprin.

Ingersoll Rand in India

IR started its India operation in Kolkata in 1921, making it the oldest Indo-U.S. joint venture company in India. In 1958, it opened a branch in Ahmedabad and established the first Indian manufacturing facility in Naroda, Ahmedabad in 1965, where small garage-type reciprocating air compressors were produced. In 1978, IR established its second manufacturing plant in Bangalore for production of construction, mining, and water-well-drilling equipment. The company produced compressors in the United States and only customized them slightly in India in the initial phase. In 1983, the Naroda plant started assembling screw compressors, and in 1989 packaging the centrifugal compressors under the brand name Centac. The centrifugal compressor was a breakthrough technology because it had a higher flow capacity, it was more reliable, and it required less maintenance compared to the reciprocating compressors commonly sold at that time. The plant also started manufacturing gas compressors in 1994 and received ISO 9000 certification in 2000. In addition, the company acquired a majority stake in Wadco Tools, which was based in Sahibabad, India. The company launched an indigenously built hydraulic drifter drill in 2001. The plant at Naroda expanded to other areas of production as the company decided to shift the production of its polyethylene terephthalate packaging facility from the United States to Ahmedabad. The manufacturing of the rotary compressor facility was also shifted from Bangalore to Naroda.

The Indian economy showed resilience in 2008–09, during the global economic crisis. In 2008, IR experienced weaker demand globally for its products and services, and an internal analysis predicted that the outlook would be similar in 2009 as the markets saw a decline in North America and Western Europe, which accounted for a majority of its sales. The revenues from the newly acquired Trane were also on a decline, except in the Asian markets. Therefore, it was important for the company to direct its focus to the growing markets in Asia, including India (see Exhibit 2 and Exhibit 3). In addition, the lower cost of production in India meant that it was lucrative for the company to increase its focus on India. The years 2008 and 2009 saw an increased transfer of manufacturing from the United States and Europe to Indian facilities. The company had already transferred production of blowers to Naroda from Europe. The company wanted to move to India the production of four product families, comprising 67 models, which would result in an increase in annual export potential of $2.6 million. The company also started a repair and rebuild facility in Naroda to increase recurring revenues.

IR’s former chairman and chief executive officer, Henkel, stated in an interview in 2009 that the company planned to make India a major manufacturing hub, and that in the following three years, the company planned to invest about $100 million in its Indian operations to double the size of the company. Energy efficiency, climate-control, and security technologies were key focus areas for the company, in addition to local manufacturing, innovation, and market-centric product development in areas such as food preservation. The company was also looking to start a new manufacturing facility that would primarily cater to manufacturing products for the heating, ventilation, and air conditioning industry. It would also focus on products for transport air conditioning and food security. The foundation of this growth appeared to be customer-driven innovation, a robust infrastructure to support after-sales services, a significant investment in facilities to transform the company into a world-class manufacturing operation with a customer-first mindset and a drive to fulfil customer needs. In May 2009, for the first time, the company named a president of Indian operations and outlined three focus areas for IR’s India operations: growth, innovation, and productivity.

The Engineering and Technology Centres

The ETCs were started in 2004 with ambitious goals: accelerate innovation; leverage key India-based competencies in advanced software design, next-generation controls, automation solutions, mechanical design, and systems simulation; and design energy-efficient, competitive products and solutions for India and emerging markets. Every SBU of the company had its own set of engineers such as product engineers (for mechanical) or controls engineers (for electrical and software). The ETCs worked with the company SBUs in emerging economies and took on jobs that the in-house development teams of the SBUs did not have the time or expertise to complete, such as new product development and product improvement. The two centres, located in Bangalore and Chennai, aimed to contribute to IR’s global growth by providing high-tech, niche engineering solutions and technologies, as well as providing support for regional product development. The centre at Chennai had been a part of Trane before it was acquired by IR in 2008.

The focus of these technology centres was to support product development needs of the SBUs and create market opportunities “in India, for India, by India.” The ETCs were to invest 30 per cent of their time creating products and services for India and the rest creating products and services for the global businesses. The ETCs were able to develop B-100, a refrigerated transport technology for the Indian environment. The product—designed for “last mile” distribution of temperature-controlled and refrigerated products to ensure that perishable food items such as fruits and vegetables remained fresh during transport—was designed with a bare minimum of special features, which was necessary and affordable to meet the needs of the local customer.

Another product that was developed by ETC was the Trane residential split air conditioner with a Zigbee wireless remote control capability. Trane, the air conditioning brand acquired in 2008, catered to the commercial space segment, which included hotels and offices. Trane wanted to enter the residential segment in India because it was a growing market. The idea received instant support, and a compelling business case was created. The climate-control business leader also liked the idea and prepared a product portfolio for both short- and long-term plans. The team developed an advanced interactive remote control device (see Exhibit 4) that was a key differentiator in the drive to educate the customer in the running efficiency of the air conditioning unit. Internal studies suggested that to feel comfortable within an office environment, a differential of 5°C from the external environment was adequate. However, people were known to keep their homes and offices at 18°C, which did not allow the air conditioner to work efficiently. The industrial design of this residential air conditioning segment was completed, and the product was launched. The product was well received but did not meet the forecasted sales volumes. It was felt that Trane’s lack of brand image in the residential segment, its premium pricing, and the connected home solution with automated locks made this product appear too futuristic for the Indian market.

Structure of the ETC

Each ETC was divided into two functions: mechanical product engineering and controls engineering. Mechanical product engineering dealt with both design and manufacturing aspects of a product. Controls engineering, on the other hand, used sensors to measure the output performance of the device being controlled, and those measurements were then used to give feedback through intelligent software logic to the input actuators that made corrections towards the desired performance. Controls engineering also housed the software development team. However, because IR was a traditional engineering-focused organization, the team’s software capability did not meet the desired level. The teams of mechanical product and controls were housed at each SBU, who reported to the ETC head. New employees who joined ETC would become associated with a particular SBU and would dedicate time working for that specific SBU. Normally, these employees would not be reassigned to a different SBU because they usually worked on specific product domains and technologies. This also meant that each SBU always needed to be ready to support these employees by providing an adequate number of projects.

Problems Faced by the ETCs

After his arrival, Madhavan found that for many of the ETC projects, its clients (i.e., SBUs) would change the initial project specifications at a later stage, leading to confusion, misunderstanding, and delay in the project delivery. The project’s documents were unable to resolve such issues. Many unintended conflicts with clients emerged. The ETCs were at a disadvantage because, in most cases, they would have to accommodate the SBUs’ demands and work on the changed specifications. SBUs would also ask for periodical updates on the projects undertaken, which the ETC teams working on the project would find difficult to satisfactorily provide, in many cases. Often, the engineers working on the projects would provide vague answers such as “we are on schedule.” However, the concerned business unit would not be given details on aspects of the project that were completed or that remained to be done. If the SBU employees asserted that the ETC team had not delivered, it was difficult to prove otherwise with available data. To address a query about the status of the project, a meeting of all the counterparts involved had to be called, requiring numerous meetings to obtain the status of all projects. Most projects would involve a team where members worked in different geographic locations. The updates would be sent by e-mail, and it would be difficult for managers to monitor the status on a dashboard.

Different SBUs also had different systems for product development, making it difficult for the ETCs to align their own systems to all the different SBUs, thereby adding to the chaos and confusion. The situation was even more complex due to some third-party vendors involved in the process. For example, the ETCs would enter into a partnership with a vendor for a project’s specific need without specific deliverables confirmed upon the contract’s signing. This would result in the client (i.e., the SBU) not accepting the final output and the vendor sometimes refusing to redo the work, claiming that the work was delivered as expected. This process would result in a blame game, ultimately affecting the project at hand.

Problems related to people development processes

IR India also lagged behind in people development processes, which were common across the company’s global counterparts. For example, the U.S. company had a strong emphasis on development planning meetings between employees and their managers. However, managers in India did not actively participate in the development planning process. In fact, managers would just write down their employees’ development requirements each year with no follow up during the year. Human resources (HR) required employees to complete development planning forms every year. One of the managers in India recalled his experience with the development planning process, stating that “development planning is just something on paper . . . we used to just copy and paste the same thing since the last five years. Nothing ever happened with reference to what we wrote.”

The local talent review process was weak, with no data available on key talent and successors. Talent prospects were weak at the leadership level and at the next two levels, and no potential future ETC leader had been identified. There were no potential successors for 20 per cent of positions at the next level nor for 51 per cent of positions at the level after that. At the results announcements of each employee performance evaluation, employee promotions were also announced. Many employees who were not promoted after the performance review (conducted biannually) would choose to leave the company at that time, as they saw this as a twice a year opportunity to get promoted.

In 2012, a new HR team was established by the IR India management. The new team, headed by Savina Verma, realized that a lot of work was needed to make the ETCs more efficient in terms of process and people practices in order to create best-in-class ETCs. In one of its first initiatives, the new HR team implemented an employee pulse survey called “Your Ideas Our Future” (see Exhibit 5). The survey invited employees to identify their pain points and suggest ideas for improvement. One survey question asked the employees if they felt that they received the right kind of training. The feedback from employees to this question was generally negative. Employees felt that training was based mostly on managerial nominations, and the choice of training programs for employees was left to the discretion of the manager. One manager recalled his experience with the training program as follows:

Every year there used to be a program on root cause analysis. Every year we used to attend because my manager used to nominate me. So we used to attend. . . . I had undergone the same training three times. Did it add any value to me? Probably not, because I never got to work on any project that really used that. Why this used to happen, I will tell you. We used to do competency mapping. So every time they used to ask me, “Do you know the subject?” I would say, “Yes.” Then they asked “Have you implemented it?” I would say, “No.” So they would say that is why we need to give you another training [session].

After further probing from the HR team, it was found that employees wanted technical training. For example, geometric dimensioning and tolerancing[[2]](#footnote-2) training for mechanical engineers was common in the U.S. company, but it was a skill that engineers in India particularly struggled with. There were several such technical areas where training was required, but the HR team members had little information about the kind of technical competency needed because it was beyond their level of expertise.

There also appeared to be a sense of distance between various units and hierarchy levels. For example, the engineering services team and technical publication team, at the lowest level of the business hierarchy, did not see themselves as important parts of the organization. The engineering services team designed computer-aided design jobs based on input received from product designers. The technical publication team wrote the manuals for the products. The employees at this level could only be promoted to product engineer, which was the lowest position in the mechanical and controls division.

Individuals who loved to do technical work were promoted to people management positions. However, only some of them were considered competent in their new roles. Other managers who had been promoted still preferred to do technical work rather than to manage people. The HR team, however, had little knowledge of the competencies of each manager. If a manager’s post for one of the client SBUs became vacant, the HR team would find it difficult to identify a suitable successor. Additionally, the transfer of talent from one project to another was difficult to manage. The ETC employee engagement survey reported an engagement level in 2011 of 68 per cent, which dropped slightly to 67 per cent in September 2012.

The Road Ahead

In the years that IR existed in India, the company grew from a firm selling imported products manufactured outside India to a company assembling and selling products in India. The recent strategy was to manufacture products in India primarily for the Indian market, as well as for export. Because India was a price-conscious market, it was important to develop relevant products to capture available gaps in the market. The ETCs were created specifically to partner with the Indian SBUs in climate-control products and industrial technologies, to help them develop relevant products useful for emerging markets. According to NASSCOM,[[3]](#footnote-3) the Indian offshore engineering research and development market was expected to reach $37–$45 billion by 2020, driven by an increase in global spending.

In his new role, Madhavan assessed how the ETCs could be leveraged to support IR and how best to align people, places, and processes with a strategy to prepare for the future. He knew that, although the ETCs were supported by the global businesses, the SBUs were also free to explore other private vendors for projects if the ETCs did not meet their needs. The ETCs were created to be innovation-driven units. It was difficult to think about increasing the rate of innovation when employees were dealing with organizational frustrations. The ETCs needed to change to ensure that they could develop as an effective organization focused on the IR goals.

**EXHIBIT 1: ACQUISITION ACTIVITIES OF INGERSOLL RAND**

|  |  |
| --- | --- |
| **Year** | **Activity** |
| 2000 | Acquire 100 per cent ownership of Dresser-Rand.  Acquire Hussmann, manufacturer of stationary refrigeration equipment.  Acquire Interflex, provider of time and attendance, scheduling and security systems.  Acquire Superstav, Czech Republic-based manufacturer of compact equipment. |
| 2001 | Acquire Kryptonite Corporation, manufacturer of portable security products. |
| 2003 | Complete sale of Torrington. |
| 2004 | Complete sale of Drilling Solutions and Dresser-Rand. |
| 2005 | Acquire CISA, ITO, and SuperRay.  Acquire majority interest in Shenzhen Bocom System Engineering Co. Ltd., a China-based provider of integrated security technologies and services.  Acquire Dolphin Electromagnetic Technologies, an India-based provider of integrated security technologies and services.  Acquire Astrum GmbH, a leading developer of personnel scheduling and management software and services.  Acquire U.S. distribution rights for Tramac-branded hydraulic breakers.  Establish a joint venture for the manufacture and distribution of door locks with Taiwan company Fu Hsing Industrial Co. |
| 2006 | Acquire Geith International, an Ireland-based equipment attachments manufacturer.  Acquire the global low-pressure air business of BOC Edwards.  Acquire ZEKS Compressed Air Solutions, a leading North American provider of compressed air treatment technologies. |
| 2007 | Acquire remaining interest in Instrum Rand.  Sell road development business unit for $1.3 billion to AB Volvo.  Sign an agreement to purchase privately-owned Officine Meccaniche Industriali Srl (OMI), a leading European provider of compressed air treatment equipment.  Sell Bobcat utility equipment and attachments business units for $4.9 billion to Doosan Infracore.  Announce definitive agreement to acquire Trane Inc. (formerly American Standard Companies) in a transaction valued at approximately $10.1 billion. |
| 2008 | Complete the acquisition of Trane Inc., a global leader in indoor climate-control systems, products, and services in a transaction valued at approximately $10.1 billion. |

Source: Company documents.

**EXHIBIT 2: FINANCIALS OF INGERSOLL RAND INDIA (in ₹ Thousand)**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **2011–12** | **2010–11** | **2009–10** |
| Sales (Gross) | 5,997,141 | 4,970,526 | 3,760,037 |
| Other Income | 1,005,880 | 778,991 | 571,449 |
| Total Income | 7,003,021 | 5,749,517 | 4,331,486 |
| CAGR For Total Income (%) | 3.38 | - | - |
| Manufacturing and Other Expenses | 5,322,800 | 4,352,041 | 3,307,541 |
| Depreciation | 50,360 | 47,530 | 41,486 |
| Interest | 4,710 | 5,340 | 18,539 |
| Voluntary Retirement Compensation | - | - | 10,316 |
| Profit Before Depreciation & Income Tax | 1,282,800 | 1,059,061 | 773,040 |
| Profit Before Tax | 1,232,440 | 1,011,531 | 731,554 |
| Tax | 404,810 | 325,300 | 257,522 |
| Profit After Tax | 827,630 | 686,231 | 474,032 |
| CAGR for Profit After Tax (%) | 7.49 | - | - |
| Dividend | 757,632 | 189,408 | 189,408 |
| Dividend—₹ Per Share | 24.00 | 6.00 | 6.00 |
| Fixed Assets (Net) | 453,761 | 253,621 | 239,154 |
| Current Assets, Loans, and Advances | 8,999,040 | 9,357,978 | 8,731,850 |
| Total Assets | 9,452,801 | 9,611,599 | 9,020,530 |
| Share Capital | 315,680 | 315,680 | 315,680 |
| Market Price Per Share:  52 weeks High (H) and Low (L) | H 558.50 | H 518.40 | H 376.90 |
|  | L 355.20 | L 337.00 | L 264.55 |
| Reserves and Surplus | 7,823,829 | 7,876,749 | 7,411,020 |
| Net Worth | 8,139,509 | 8,192,429 | 7,726,700 |
| Loans (Secured and Unsecured) | - | - | - |

Notes: ₹ = INR = Indian rupee; $US1 = ₹49 on January 31, 2012; GAGR = compound annual growth rate.

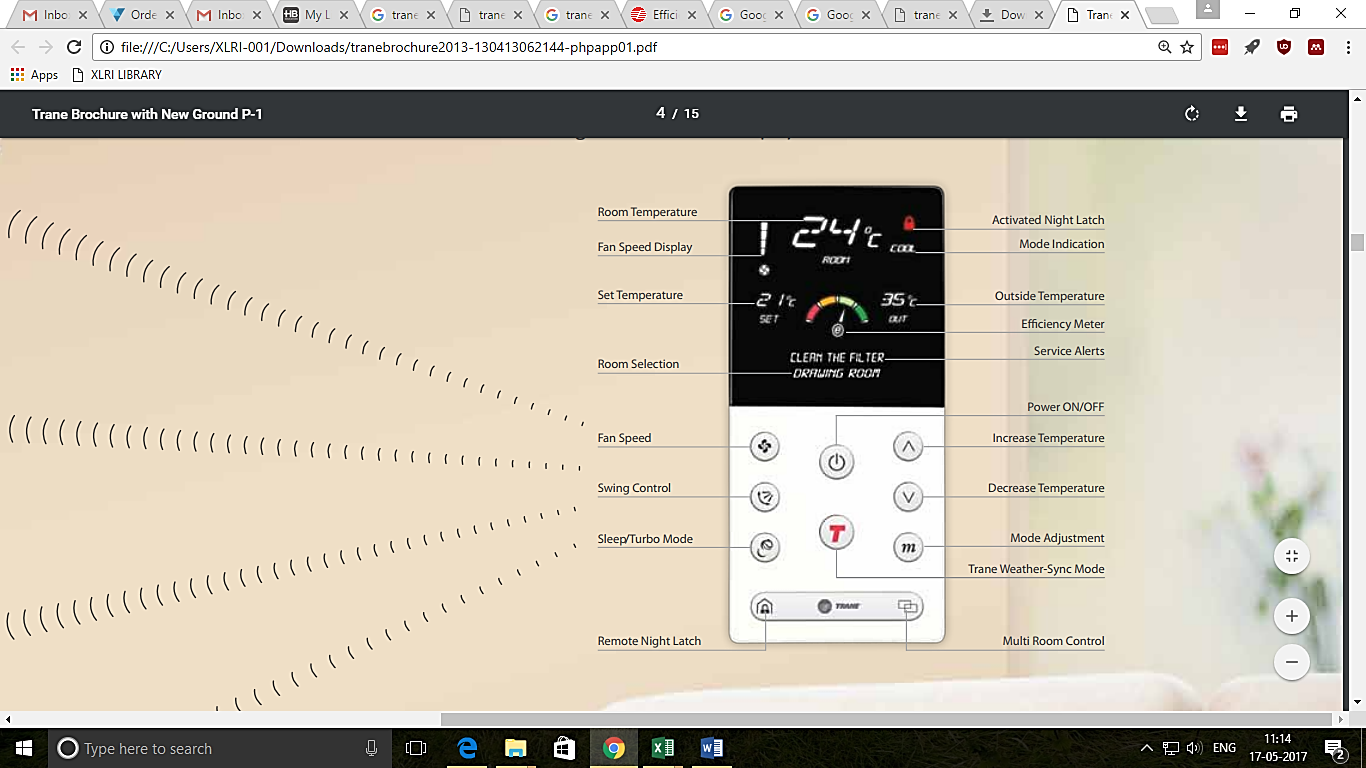
Source: Company documents.

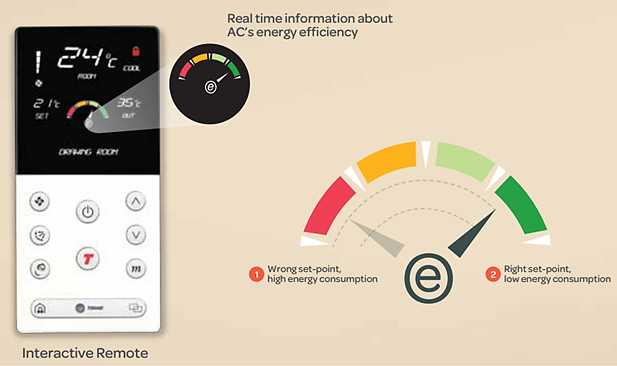
**EXHIBIT 3: INGERSOLL RAND (GLOBAL) FINANCIAL INFORMATION (in $US Millions, except per-share amounts)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Consolidated Statements of Comprehensive Income** |  |  |  |
|  |  |  |  |
| For each year ending December 31 | **2012** | **2011** | **2010** |
| Net Revenues | $14,034.90 | $14,782.00 | $14,001.10 |
| Cost of Goods Sold | −9,758.20 | −10,493.60 | −10,159.90 |
| Selling and Administrative Expenses | −2,776.00 | −2,781.20 | −2,679.80 |
| Gain (loss) on Sale/Asset Impairment | 4.50 | −646.90 | - |
| Operating Income | 1,505.20 | 860.30 | 1,261.40 |
| Interest Expense | −253.50 | −280.00 | −283.20 |
| Other, Net | 25.00 | 33.00 | 32.50 |
| Earnings before Income Taxes | 1,276.70 | 613.30 | 1,010.70 |
| Provision for Income Taxes | −227.00 | −187.20 | −228.10 |
| Earnings from Continuing Operations | 1,049.70 | 426.10 | 782.60 |
| Discontinued Operations, Net of Tax | −5.70 | −56.80 | −117.50 |
| Net Earnings | 1,044.00 | 369.30 | 665.10 |
| Less: Net Earnings Attributable to Non-Controlling Interests | −25.40 | −26.10 | −22.90 |
| Net Earnings Attributable to Ingersoll Rand | $1,018.60 | $343.20 | $642.20 |
| **Amounts Attributable to Ingersoll Rand Ordinary Shareholders:** |  |  |  |
| Continuing Operations | $1,024.30 | $400.00 | $759.70 |
| Discontinued Operations | −5.70 | −56.80 | −117.50 |
| Net Earnings | $1,018.60 | $343.20 | $642.20 |
| **Earnings (Loss) Per Share Attributable to Ingersoll Rand Ordinary Shareholders** |  |  |  |
| *Basic:* |  |  |  |
| Continuing Operations | $3.37 | $1.23 | $2.34 |
| Discontinued Operations | −0.02 | −0.17 | −0.36 |
| Net Earnings | 3.35 | 1.06 | 1.98 |
| *Diluted:* |  |  |  |
| Continuing Operations | $3.30 | $1.18 | $2.24 |
| Discontinued Operations | −0.02 | −0.17 | −0.35 |
| Net Earnings | $3.28 | $1.01 | $1.89 |

Source: Company documents.

**EXHIBIT 4: TRANE RESIDENTIAL SPLIT AIR CONDITIONER AND WIRELESS REMOTE CONTROL**



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Source: Company documents.

**EXHIBIT 5: SOME INDICATORS FROM THE 2012 ENGINEERING TECHNOLOGY CENTRES EMPLOYEE ENGAGEMENT SURVEY**

|  |  |
| --- | --- |
|  | % |
| Employees are getting the training they need to keep up with the customer demands. | 55 |
| My immediate manager has made a personal investment in my growth and development. | 47 |
| Customer problems get corrected quickly. | 69 |
| We regularly use customer feedback to improve our work processes. | 70 |
| My management team does a good job of communicating the reasons behind the changes that are made. | 54 |
| My performance reviews have been useful in helping me to improve my job performance. | 63 |
| I would gladly refer a good friend or family member to Ingersoll Rand for employment. | 79 |
| I rarely think about looking for a new job with another company. | 49 |
| I am proud to work for Ingersoll Rand. | 83 |
| Overall, I am extremely satisfied with Ingersoll Rand as a place to work. | 66 |

Source: Company documents.

1. All currency amounts are in US$ unless otherwise specified. [↑](#footnote-ref-1)
2. Geometric dimensioning and tolerancing was a system for defining and communicating engineering tolerances. It was presented in a symbolic language on engineering drawings and computer-generated three-dimensional solid models that explicitly described nominal geometry and its allowable variation. It told the manufacturing staff and machines what degree of accuracy and precision was needed on each controlled feature of the part. [↑](#footnote-ref-2)
3. Pradeesh Chandran, “India to Deliver over 1/3 of ER&D Offshoring Services by 2020,” *Business Standard,* October 10, 2012, accessed June 27, 2017, www.business-standard.com/article/companies/india-to-deliver-over-1-3-of-er-d-offshoring-services-by-2020-112101000223\_1.html. [↑](#footnote-ref-3)