Case Study: Thomson/RCA

Energy monitoring helps company cut costs by modifying its compressed air system

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BACKGROUND

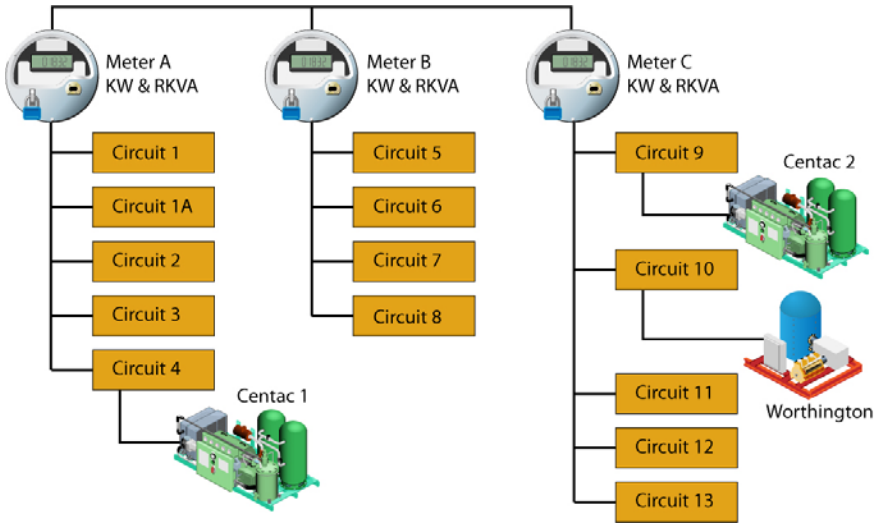
When French communications, media and entertainment giant Thomson SA purchased RCA from American conglomerate General Electric, Thomson remained headquartered in Europe but operations continued at several RCA offices, including those in Indianapolis, Indiana. Later, when these offices moved to a new facility north of the city, plans were made to rent the vacated space.

This old location was quite large, with a central boiler plant providing chilled water, compressed air, heat, and domestic hot water to several buildings spread out over more than 80 acres. With the possibility of leasing this space, Thomson needed a way to track and identify energy use of the various systems and equipment within the buildings, in part so the company could accurately specify utility costs and bill them to individual lessees.

To get this data, Thomson-RCA implemented an AutoPilot Energy Information System comprising Opto 22 hardware and software, and designed by Holmes Energy. Using analog and digital interfaces that connected Opto 22 I/O processors to field equipment via multiple I/O modules, the Autopilot System was able to monitor 108 different I/O points. The monitored machinery and equipment included gas and electric meters, as well as chillers, cooling towers, boilers, and water heating equipment. The AutoPilot System also monitored the facility's compressed air system. This in turn enabled tracking of the electrical demand and power consumption of two 500-horsepower Centac compressors and one 350-horsepower Worthington compressor, along with system pressure and airflow.

COMPRESSED AIR SYSTEM

The Opto 22-based AutoPilot System was initially intended only to monitor energy use and offer real-time screens detailing the status of each monitored point, both individually and as a part of a group. But the system also provided human-machine interface (HMI) screens that offered data archiving and historical reports, as well as charts and graphs showing consumption and power demand in 15-minute intervals, along with monthly and annual totals.



To better manage its compressed air system and other facility equipment, Thomson-RCA implemented an Opto 22-based energy monitoring system.

As Thomson underwent internal restructuring, the company placed more and more emphasis on utility cost reduction. Based on the reports generated by the AutoPilot system, attention and scutiny turned towards the compressed air system, its excessive energy use, and actions that could be taken to curb this demand. As the monthly reports were reviewed, Thomson noticed a significant variation in the compressed air system's efficiency based on the demand for air and which compressor or compressors were operating. The most obvious difference seemed to occur when

the Worthington (the smallest compressor) was run by itself during third shift and on weekends when the demand for compressed air was much lower.

Another somewhat startling discovery was made when the AutoPilot system reported the compressed air system's efficiency sometimes varied wildly, from a low of 148 cubic feet per kilowatt to a high of 191—a 30% difference.

Compressed Air System Performance February

Date	Centac 1 KWH	Centac 2 KWH	Worthington KWH	Total KWH	Total CU FT	CU FT/KWH
Sat 01	9137	0	0	9137	1489472	163
Sun 02	9138	0	0	9138	1501384	164
Mon 03	9764	2176	8	11948	2086201	175
Tues 04	9219	0	3360	12579	2272159	181
Wedns 05	9172	0	3551	12723	2226339	175
Thurs 06	9156	0	3539	12695	2185692	172
Fri 07	9149	0	3530	12679	2162727	171
Sat 08	9138	0	91	9229	1366614	148
Sun 09	9139	0	0	9139	1412168	155
Mon 10	9290	266	2678	12234	2092729	171
Tues 11	4558	5945	1002	11505	2189517	190
Wedns 12	2434	8924	0	11358	2142391	189
Thurs 13	560	8379	0	8939	1649571	185
Fri 14	1303	8887	0	10190	1950471	191
Sat 15	0	8185	0	8185	1324151	162
Sun 16	0	8199	0	8199	1332030	162
Mon17	2849	8889	0	11738	2086521	178
Tues 18	4988	8647	0	13635	2285534	168
Wed 19	5176	8885	0	14061	2334612	166
Thurs 20	6236	8057	0	14293	2358234	165
Fri 21	9851	4929	0	14780	2452214	166
Sat 22	9178	0	0	9178	1627944	177
Sun 23	5636	3279	0	8915	1649091	185
Mon 24	5273	8783	0	14056	2308992	164
Tues 25	5479	9067	0	14546	2422776	167
Wedns 26	5075	9113	0	14188	2391736	169
Thurs 27	1482	8753	2446	12681	2360016	186
Fri 28	1158	8842	3545	13545	2494519	184
Totals:	**163538**	**138205**	**23750**	**325493**	**56155805**	**173**

Gathering real time data from its compressors gave Thomson the information it needed to better manage this equipment and cut costs.

FACT FINDING

To better determine the differences between the three compressors, identify how many kilowatts (kW) each was consuming, explain the variances in their efficiency, and find each one's optimum operating parameters under different conditions required experimenting with different compressor combinations and loads. In one such experiment, the first Centac compressor required 380 kW, the second Centac slightly under 350 kW, and the Worthington less than 250 kW. Based largely on this data (aggregated by the AutoPilot system), it became clear that running the Worthington alone on weekends offered the largest opportunity for savings. But in addition to the advantage of the Worthington over the bigger Centacs during low demand periods, it was also discovered that under all conditions, Centac 2 was more efficient than (what was thought to be) the identical Centac 1.

"Discoveries such as this—ones that offer tremendous revenue saving opportunities—are only made possible through the close examination that real-time monitoring provides," says Bill Holmes, designer and integrator of the AutoPilot system. "But before one can even begin to consider how to cut costs, before any control can or should be exercised, and even before energy usage behavior can change, one needs to first closely observe and accurately measure."

"We were able to assign accurate dollar figures on what it cost to generate compressed air, chill water, and produce steam, and then accurately allocate costs."

- John Munchel, Manager of Maintenance

RESULTS

Using the AutoPilot data, Thomson's boiler plant personnel began changing the operating sequence for the three compressors in order to maintain the highest system efficiency under all operating conditions. Controls were modified to allow the Worthington to run as the primary unit with the Centacs serving as automatic backups. The data (and some quick math work) had conclusively shown that with good compressor management, a demand reduction of approximately 175 kW could be achieved and the facility's compressed air requirements could still be satisfied.

Once the new operating procedures had been implemented (with the Worthington in the lead position), compressed air reports showed that the demand reduction of 175 kW resulted in a drop in monthly kWh consumption consumption of nearly 64,000. Air compressor electrical costs were reduced by 20%, leading to an annual cost savings in excess of $35,000.

Compressed Air System Performance June

Date	Centac 1 KWH	Centac 2 KWH	Worthington KWH	Total KWH	Total CUFT	CU FT/KWH
Sun 01	0	0.00	5485.00	5485.00	1,502,913	274.00
Mon 02	10	5971.00	4850.00	10831.00	2,332,414	215.35
Tues 03	0	8589.00	3481.00	12070.00	2,482,579	205.68
Wedns 04	0	8458.00	3783.00	12241.00	2,550,120	208.33
Thurs 05	0	8597.00	3313.00	11910.00	2,489,633	209.04
Fri 06	0	8656.00	3324.00	11980.00	2,499,173	208.61
Sat 07	2778	52.00	5504.00	8334.00	1,842,828	221.12
Sun 08	1600	0.00	5484.00	7084.00	1,655,432	233.69
Mon 09	0	5965.00	4861.00	10826.00	2,370,435	218.96
Tues 10	0	8487.00	3417.00	11904.00	2,403,916	201.94
Wedns 11	2301	8527.00	2108.00	12936.00	2,424,496	187.42
Thurs 12	25	7862.00	3721.00	11608.00	2,433,399	209.63
Fri 13	0	8188.00	3297.00	11485.00	2,195,832	191.19
Sat 14	0	121.00	5572.00	5693.00	1,550,128	272.29
Sun 15	0	0.00	5250.00	5250.00	1,373,408	261.60
Mon16	0	6061.00	4774.00	10835.00	2,220,513	204.94
Tues 17	8	8246.00	3449.00	11703.00	2,424,871	207.20
Wed 18	0	8607.00	3306.00	11913.00	2,467,707	207.14
Thurs 19	7	8485.00	3335.00	11827.00	2,385,516	201.70
Fri 20	0	8174.00	3553.00	11727.00	2,131,849	181.79
Sat 21	0	76.00	5503.00	5579.00	1,470,338	263.55
Sun 22	0	0.00	5413.00	5413.00	1,419,311	262.20
Mon 23	0	0.00	5345.00	5345.00	1,369,913	256.30
Tues 24	0	0.00	5318.00	5318.00	1,347,923	253.46
Wedns 25	3615	501.00	2941.00	7057.00	1,407,906	199.50
Thurs 26	3236	0.00	0.00	3236.00	450,541	139.23
Fri 27	2400	0.00	3831.00	6231.00	1,295,028	207.84
Sat 28	0	0.00	5329.00	5329.00	1,418,818	266.24
Sun 29	0	0.00	5474.00	5474.00	1,474,643	269.39
Mon 30	0	0.00	5402.00	5402.00	1,417,855	262.47
Totals:	**15,980**	**119,623.00**	**126,423.00**	**262,026.00**	**56,809,438**	**216.81**

Auto Pilot reports show drops in Thomson's energy consumption totalling close to 64,000 kilowatt hours per month.

With such positive results, it wasn't long before Thomson expanded use of the AutoPilot System.

"In addition to tracking the power used in the buildings, we also began monitoring all of the individual equipment in the powerhouse and other facility systems," says Thomson's Manager of Maintenance, John Munchel. "With that information we were able to assign accurate dollar figures on what it cost to generate compressed air, chill water, and produce steam, and then accurately allocate costs between any departments or companies we would lease to."

ABOUT HOLMES ENERGY

Founded in 1979, Holmes Energy is headed by Bill Holmes, a Registered Professional Engineer, mechanical systems designer, and former professor of thermodynamics, power systems and energy conservation at Purdue University. Holmes' impressive client list includes General Electric, Dupont, Honda, GenCorp, and Hoover, and he is the recipient of multiple awards and recognition from the State of Indiana, the Association of Energy Engineers, and the U.S Department of Energy. For more information go to http://www.holmesenergy.com.

ABOUT OPTO 22

Opto 22 was started in 1974 by a co-inventor of the solid-state relay (SSR), who discovered a way to make SSRs more reliable.

Opto 22 has consistently built products on open standards rather than on proprietary technologies. The company developed the red-white-yellow-black color-coding system for input/output (I/O) modules and the open Optomux® protocol, and pioneered Ethernet-based I/O.

In early 2013 Opto 22 introduced *groov* View, an easy-to-use IoT tool for developing and viewing mobile operator interfaces—mobile apps to securely monitor and control virtually any automation system or equipment.

Famous worldwide for its reliable industrial I/O, the company in 2018 introduced *groov* EPIC® (edge programmable industrial controller). EPIC has an open-source Linux® OS and provides connectivity to PLCs, software, and online services, plus data handling and visualization, in addition to real-time control.

All Opto 22 products are manufactured and supported in the U.S.A. Most solid-state SSRs and I/O modules are guaranteed for life.

The company is especially trusted for its continuing policy of providing free product support, free training, and free pre-sales engineering assistance.

For more information, visit opto22.com or contact **Opto 22 Pre-Sales Engineering**:

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