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TECHNOLOGY AND INNOVATION IN VALUATION FOR SUSTAINABLE DEVELOPMENT

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ABSTRACT

Many different concepts are taught in the various principles of valuation courses, webinars, seminars, articles, and textbooks published by the ASA. In practice, appraisers typically only use a portion of them, which may vary from project to project. The following case study of a valuation of a distribution center (DC) for ad valorem tax purposes incorporates a significant number of different concepts into one project.

SUBJECT ASSET DISCUSSION

The subject distribution center (SDC) was built in late 2002 and opened for business in January 2003. The applicable valuation date was January 2010 and all of the data and dollar amounts are therefore as of that date.

MULTIPLE APPRAISAL CONCEPTS: APPRAISING A DISTRIBUTION CENTER

Valuing the SDC turned out to be a surprisingly fun project. To develop a credible opinion of value for such a variety of equipment and processes required a level of research, sleuthing/interviewing, engineering analysis, and conceptual application that are not usually necessary to other appraisal assignments. Appraisers rarely have the opportunity to incorporate so many different tools and concepts into one valuation.

The following table outlines the specifications of the SDC.

Table 1. SDC Assets

Total building size	576,408 SQ FT
Total dedicated to warehouse/sorter	497,664 SQ FT 50,
Hang/Ready to wear mezz (not being utilized)	688 SQ FT
Offices/Lunch rooms/Locker rooms	28,056 SQ FT
Store capacity	110 STORES
Expanded store capacity 1	150 STORES
Rated sorter capacity 2	15,600 CARTONS

1 Would require adding additional sorters, conveyers, and other equipment

2 Based on a standard box size of 20" square. Due to a variety of issues including carton size and weight variance, jams, recirculation, "no reads," and other issues, a DC typically cannot ship the actual capacity for which it is rated.

Based on a review of three years of utilization data and interviews with appropriate client personnel, it appeared that the maximum utilization of the SDC (based on two shifts per day and a five-day-per-week operation with planned peak operations) was 49% of the rated surge capacity.

The utilization varied with factors such as store demand, percentage of recirculation, the percentage of no-reads, case jams, and other factors. The busiest time of the year is typically August to December when the stores are stocking up for the back to school and Christmas seasons. Other busy times of the year included brief peak periods (1–2 weeks) around other heavy shopping times, including spring sales and holidays such as Valentine's Day. The light time of the year was typically January to July.

The SDC typically operated two eight-hour shifts per day, five days per week. As of February 2010 (the closest date to the valuation date for which statistics were available) there were 193 employees, equating to 166 full-time equivalent (FTE) positions.

There was a total of approximately

68,580 linear feet (12.99 miles) of conveyor, including powered-rollers conveyors, free-roller conveyors, powered-belt conveyors, skate-wheel conveyors, curves, and other miscellaneous conveyors.

There were six Rapistan model 2420 shoe sorters of various lengths and one ABC Co/Siemens Gen III pop-up sorter primarily dedicated to the pack-to-light (PTL) operations.

OBSOLESCENCE DISCUSSION

The SDC was considered an old-style system because of its layout and technology.

The layout of the SDC was inefficient by 2010 standards. The more efficient layouts of more modern DCs allowed for fewer conveyors, more energy efficiency, higher output, and a much smaller footprint.

The following table shows a comparison of the subject SDC, built in 2022, to two other more recent Distribution Centers (Dcs).

Some of the major areas where the newer systems are more efficient and cost effective are discussed below. Some discussions have been summarized from the original report and some minor issues have been left out for brevity.

RECEIVING

The SDC had mostly manual receiving lines and only four single-automated Print and Apply (P&A) lines. Newer technology utilized dual-automated P&A stations.

The 2008 DC had 10 dual P&A systems. Dual-automated P&A systems can each service two doors and cut down on manual handling and labeling of cartons.

The benefits of newer P&A systems include:

- Reduced labor requirements
- Increased accuracy
- Increased speed (almost double)

Updating the SDC to dual P&A lines would take a significant expense in both control hardware and software.

The SDC also had narrow collector beds, which allowed only one out of every four receiving lines to load at any given time, causing backups.

The newer DCs each had two wider collector beds, which allow almost continual operation of the incoming receiving lines.

The benefits of newer collector systems include:

- Increased accuracy
- Increased speed

SHIPPING / SHIPPING SORTERS

The shipping sorters installed at newer DCs had a very different layout from those at the SDC. The SDC used four sorters to service the 110 shipping docks. These were in an L-shaped configuration along the west and north walls of the building.

Newer designs used two double-length sorters with each set of two shoe sorters along the outside wall above the shipping docks opposite of those docks serviced by the sorter. The shipping feed lines then cross down to

Table 2. SDC Compared with Two Distribution Centers

Specifics	2002 SDC	2008 DC	Size Difference	2006 DC	Size Difference
Capacity	110 stores	150 stores	40 stores	110 stores	0 stores
Building Size	576,408 sq ft	328,000 sq ft	45% smaller	365,000 sq ft	35% smaller
Conveyers	12.99 miles	9.25 miles	30% less conveyor	6.69 miles	50% less conveyor

the shipping doors.

The benefits of newer shipping systems include:

- Less floor space required
- More staging of product
- Less backing up of sorter
- Less recirculation which increased speed and accuracy

The newer sorter installations incorporated automatic speed controls which varied the speed of the sorters based on incoming carton spacing, size, and so on. When there was nothing coming, the sorter slowed down to conserve energy. When cartons started to arrive, the sorter varied the speed in order to make the most efficient use of the space and time between cartons. This saved energy as well as increased throughput.

The scanning tunnels at the SDC were obsolete and company personnel indicated that they could no longer find service parts. Therefore, the scanners would be replaced in the near future.

Data gathered from company personnel indicated that the cost to replace each of the sorter tunnels (with scanning technology) was $56,000, and the cost for a new P&A tunnel was $27,000.

OTHER FACTORS

Newer systems integrated a Graphical System Monitor Interface (GSMI) into the control system. More efficient than visual identification, GSMI allowed issues such as jams or backups to be identified and mediated quickly. Without GSMI, the system could be damaged or, at best, shut down entirely to find and correct processing issues. GSMI allowed operators to be proactive and to avert potential problems, increasing productivity and efficiency. It also gathered useful real-time data useful for the efficient operation of the sorter and better control of the energy usage of the system.

Based on the utilization data provided, it appeared as though the actual potential maximum capacity of the SDC is 49% which equates to 7,644 Cartons Per Hour (CPH) (15,600 CPH x 49%). As of the valuation date, the SDC appeared to be running at 38% utilization which equates to 5,928 CPH (15,600 CPH x 38%). Based on this data, the SDC appeared to be running at approximately 78% (5,928 CPH/7,644 CPH) of actual potential maximum capacity.

There are other obsolescence factors associated with the layout and footprint of the building, such as lower building and building maintenance costs and lower energy usage associated with the building size. These were not considered as they were deemed to be real estate related and not equipment related.

SPECIFIC VALUATION PROCESS

This case study valuation process incorporated a significant number of concepts appropriate for appraising the SDC, and other assets for ad valorem tax purposes. Although the valuation date is 2010, the concepts and application as outlined in various ASA references: principles of valuation courses, webinars, seminars, articles, and textbooks remains the same.

REPLACEMENT COST AND EXCESS CAPITAL COST

Based on its design when compared to newer DCs such as the 2006 DC (which serviced the same number of stores) and the 2008 DC (which was designed to service 40 additional stores), the SDC had excess capital cost associated with the additional length of conveyors required (and associated additional control system, supports, walkways, and so on), additional flats lines required, additional PTL lines, and additional air compressor horsepower required to run the system.

In addition, there were excess capital and operating costs associated with the additional building space required. We did not consider the costs associated with the additional building space since we considered these costs to be real estate related.
The original equipment manufacturer

(OEM) indicated that the cost (as of the valuation date) to build the SDC sorter system (equipment only) as it was would be as follows:

Table 3. SDC Replacement Cost

Mechanical Hardware	$9,625,364
Control Hardware	$1,354,034
Mechanical Engineering	$784,839
Controls Engineering	$954,587
Computer Engineering	$97,199
Project Management	$374,318
Mechanical Installation	$3,131,368
Electrical Installation	$1,210,464
Freight	$626,069
TOTAL	**$18,158,243**

The cost to build the 2006 DC as of the valuation date (which has the same capacity as the SDC) would have been as follows:

Table 4. 2006 DC Replacement Cost

Mechanical Hardware	$8, 297, 165
Control Hardware	$699, 751
Mechanical Engineering	$554, 212
Controls Engineering	$601, 253
Computer Engineering	$76, 937
Project Management	$295,302
Mechanical Installation	$2, 285, 721
Electrical Installation	$1,048,200
Freight	$622,287
TOTAL	**$14,480,829**

The additional $3,677,414 for the SDC in the data above was deemed to be excess capital costs which would not be incurred if the subject retailer were to build a DC with the same store capacity today.

In addition to the equipment supplied by the OEM, additional equipment was purchased by the SDC which had a replacement cost new (RCN) of $1,797,000 as of the valuation date.

As such, the total RCN as of the valuation date for the subject asset was $16,278,000 ($14,481,000 + $1,797,000).

The hang/ready to wear equipment was not being utilized and thus the cost of this equipment was removed from the RCN to arrive at $16,233,000.

Adding in applicable sales tax (to the RCN of the equipment only) we arrived at a total RCN of $17,197,000.

PHYSICAL DETERIORATION/ DEPRECIATION

The SDC system exhibited physical deterioration and depreciation due to its age and the need to replace obsolete equipment such as the scan tunnels.

Data gathered from the subject retailer and OEM indicated that the normal useful life (NUL) for a sorting system was typically 15–20 years.

Based upon this data and an analysis of subject retailer recent DC remodels and other data, we settled on an NUL of 16 years.

As of the valuation date, the SDC had been in operation for seven years (2010 - 2003) . There had not been any significant additions to the SDC sorter system since it was originally built. The only significant expenditures had been for maintenance and repairs. There had been no major upgrades or rebuilds of the system as a whole.

Data obtained from the subject retailer indicated that annual maintenance and repair expenses had been less than 1% of the RCN.

The sorter system at the SDC had been used as designed and had not been subject to unforeseen climates or other hazards that would significantly increase the physical deterioration. Additionally, it had been operated within the expectations of hourly operations and had not been operated significantly more or less than anticipated when installed.

Based on all of the data listed above, we concluded that the actual age of seven years was also the effective age (EA).

Utilizing the 7-year EA and 16-year NUL we arrive at 44% depreciated (or 56% good).

Physical depreciation can have both curable and incurable components.

Our interviews and research indicated that the SDC had the following curable components:

- Replacing the five sorter tunnels at a cost of $56,000 each ($280,000 total)
- Replacing the four P&A tunnels at a cost of $27,000 each ($108,000 total)
- Hardware and software upgrade for the Sort Direct system at $125,000

As such, the total curable physical depreciation was $513,000 ($280,000 + $108,000 + $125,000).

Subtracting the curable depreciation from the RCN we get $16,684,000 ($17,197,000 - $513,000).

We then took the $16,684,000 and multiplied it by the 56% good in order to arrive at $9,343,000.

FUNCTIONAL OBSOLESCENCE

The primary functional obsolescence attributable to the SDC was due to the excess capital costs and the layout of the system. This was taken into account when using the 2006 DC cost new instead of the subject cost new as the starting point of our analysis.

However, the SDC suffered from additional functional obsolescence in the form of excess operating costs in the areas of excess electricity costs and excess labor costs.

Data obtained from the OEM indicated that newer systems that incorporate an energy management system reduce the energy requirements of a similar sorter system by approximately 6%.

Based upon an analysis of the electrical energy expenditure for the SDC in 2009, we concluded that it cost $321,000 to operate the system on an annual basis.

Using the $321,000 and the indication that a more modern system is 6% more energy efficient, we got $19,260 ($321,000 x 6%; rounded to $19,000) spent on excess electrical energy annually.

As of the valuation date, the SDC required 166 FTE employees to operate on two shifts. The newer 2006 DC required 160 FTE employees to operate similar shifts. Thus there were six extra employees required.

Based upon an analysis of client-supplied data, we estimated the annual pay for each employee was $27,000, which came to an annual excess labor cost of $162,000.

Therefore, the excess electricity and labor costs totaled $181,000 ($19,000 + $162,000) in excess operating expenses annually.

Given the client income tax rate of 37.5%, we tax effected the total as follows:

$181,000 x 37.5% = $67,875 (rounded to $68,000).

Therefore, the total after-tax excess electricity and labor costs was ($181,000 - $68,000=) $113,000 on an annual basis.

Utilizing a client rate of return of 10% and a nine-year remaining useful life (RUL), we obtained a present value factor of 5.76.

Using this present value factor and the total annual excess operating cost we got a total functional obsolescence penalty of $650,880 ($113,000 x 5.76; rounded to $651,000).

Subtracting the $651,000 functional obsolescence penalty from the results of our RCN less physical depreciation noted above we arrived at $8,692,000 ($9,343,000 - $651,000).

ECONOMIC OBSOLESCENCE

The SDC suffered from economic obsolescence in the form of excess electric utility rates compared to other Dcs.

In this case, the difference in utility rates was caused by an external factor (the pricing charged by the utility from which they purchase the electricity) and not an inefficiency within the system. For this reason, the excess electricity cost was considered to be economic obsolescence

and not functional obsolescence.

After investigating various data provided by the client as well as applying a present value factor technique similar to the above discussion under functional obsolescence, we arrived at a total penalty of $288,000.

Subtracting the $288,000 economic obsolescence penalty from the results of our RCN less physical depreciation and functional obsolescence noted above we got $8,404,000 ($8,692,000 - $288,000).

INUTILITY

Inutility (or a lack of utilization) can be a sign of either functional or economic obsolescence. In the case of the SDC, inutility most likely indicated a combination of both functional and economic obsolescence.

When a company begins designing a distribution center, the main factor which needs to be considered is the total number of stores that will be serviced from that particular distribution center. The number of stores to be serviced directly impacts the number and size of the sorters required, the number of conveyors required, and other requirements.

Therefore, any difference in store number will directly impact the cost to build a distribution center. The store number is the main metric by which to measure the cost of any particular distribution center.

In order to calculate the exponent or scaling factor, the following data from the 2006 DC and the 2008 DC was utilized:

Rated Store Capacity of 2006 DC = 110 stores

Rated Store Capacity of 2008 DC = 150 stores

RCN of 2006 DC = $14,481,000 (OEM supplied equipment, etc. only)

RCN of 2008 DC = $19,179,000 (OEM supplied equipment, etc. only)

Using the data above we arrived at an exponent or scaling factor of 0.91.

Earlier in this report, it was stated that the SDC was operating at approximately 78% of actual potential maximum capacity.

Using the formula:

Inutility % = [1-(Capacity B/Capacity A)x] x 100

And substituting the appropriate numbers, we got:

Inutility % = [1-(0.78)0.91] x 100

Inutility % = [1-0.80] x 100

Inutility % = [0.20] x 100

Inutility % = 20%

As such, the inutility penalty was $1,680,800 ($8,404,000 x 20%; rounded to $1,681,000).

Subtracting the $1,681,000 from the $8,404,000, we calculated a conclusion of $6,723,000.

CONCLUSION

It is not often that appraisers get to incorporate so many different tools and concepts into one valuation. It typically happens only when valuing a larger process-type facility and then, only if the adequate information can be gathered from the client. As it turned out, we obtained a significant amount of cooperation from both the client and their suppliers. This particular project was extremely fun (as much fun as an appraisal can be) because it required a significant amount of research, sleuthing/interviewing, engineering analysis, and other skills which are not often required in as much depth as in this assignment.

The good news is that this level of detail and research ended up saving the client a significant amount of money on an annual basis.

ABOUT THE AUTHOR

Douglas Krieser, ASA, FRICS, is Managing Director at Valcon Partners, LTD.

He has served as ASA International President, Chair of the Board of Examiners, and on the MTS Committee, as well as other committees and task forces for ASA and the Appraisal Foundation.

Doug has contributed to many value-related publications and ASA textbooks, has written and taught ASA courses and webinars, and has presented at national conferences.

He has performed and supervised valuations for financial reporting, ad valorem tax, and litigation purposes throughout the United States, Europe, Asia, and South America, and has testified in Federal Bankruptcy Court, various State tax courts (and other jurisdictional settings), and other courts regarding a variety of topics including ad-valorem tax.

Reference:

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