

## The Need for Carbon Research

We introduced the concept of carbon as a value study resource susceptible to improvement through value study and the concept of creating a value index using carbon as the resource instead of money.

Whether one realizes it or not, value methodology utilizes a set of tools that repeatedly narrows down the scope of a wide study subject to focus on specific areas for value improvement. One can call the entire methodology a selection technique and not be mistaken. For example:

The ABC analysis tool helps one pick the most cost effective area to study. For example, is it transportation, medicine or housing? In the military one might have to choose between the study of tanks, rifles, or artillery.

Then the WBS tool comes into play. Work breakdown structure helps one display the systems and subsystems cost for the study selected. During design of a construction project, the WBS most commonly used is the UNIFORMAT code of accounts.

Once a system is picked to study, the FAST diagramming tool is used to display all of its functions, make sure none are missing, and allow cost to be allocated to function.

Finally one gets to use the Value Index tool to select the function areas most conducive to further study.

### The Value Index

The definition of the value index as defined by the Foundation is:

**index, value** – 1. The monetary relationship of function worth to function cost [expressed as  $VI=FW/FC$ ] where VI is never greater than unity, [e.g.;  $VI=0.79$ ], 2. The monetary relationship of function cost to function worth [expressed as  $VI=FC/FW$ ] where VI is never less than unity, [e.g.,  $VI=1.0 = \text{good value}$ ].

We favor the use of the second value index definition because it seems easier to understand for most people and easier to explain. For example, a  $VI = 1.81$  can be read that 81% improvement potential is possible to get it back to 1.00 which is good value (and carbon neutral)!

### The Cost Component of the Value Index

Since Larry Miles began Value Analysis years ago, everyone has been learning how to allocate product cost, component cost, and component attributes to function to develop FC, or function cost. This task, while still daunting to some, has been overcome by most when the cost has been represented by the resource dollars, pounds, yen, dinars, etc.

Now, to improve carbon emissions, one must represent the cost in kg (or tons) of CO<sub>2</sub> emitted during the value stream (see LEAN<sup>1</sup> manufacturing for definition) of product production, distribution and use.<sup>2</sup>

Not many people know how much CO<sub>2</sub> is generated by manufacture of products and most all of the research focus (footprint models, et al) has been on the use of the products; i.e., its consumption of energy and/or fuel. If only one could generate function alternatives based on CO<sub>2</sub> emissions before production it might be possible that the “use” impact of CO<sub>2</sub> emissions could also be affected.

### **The Worth Component of the Value Index**

If you think FC is difficult, then determining function worth FW is impossible. Why, to the author’s understanding, the French don’t even have a French Word to describe “Worth.”

The definition of function worth as defined by the Foundation is:

**worth, function** - 1. The lowest overall cost that is required to perform a function, 2. The least cost attainable through using a functional equivalent, 3. The cost of a function without regard to the consequences of failure, 4. Referred to as the value of a function in some texts [not a preferred usage].

To some extent as a profession we have been ridiculed by taking the above definition literally in that we have equated the function cost of a \$250 tie clip to the ½ cent function worth cost of a paper clip because they both “restrict tie”. To lessen the ridicule we have softened this worth determination stance by comparing worth to lower products that have been commonly used by society to perform the function (such as a tie tack in lieu of the paper clip).

By so doing, we are actually setting a value standard which is the lower cost of achieving the function in a family of products. This value standard then becomes the “worth” used to compare the rest of the products in the family.

The author thinks this is the way to go. At least it’s a start until someone else comes up with something better. We had better do research on families of products to determine their carbon emissions impact on the world. We can set one against the other if only we knew the CO<sub>2</sub> contribution of each over the value stream and life cycle stream.

### **State-of-the-Art Example**

The following example<sup>3</sup> illustrates the macro, use oriented, state of the art in America today. It documents the CO<sub>2</sub> emissions of two people take a trip from Washington, DC to New York City and from Washington, DC to Orlando, FL by 3 means of transportation; airplane, car, or bus.

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<sup>1</sup> See SAVE International conference proceedings for 2005 San Diego Conference paper on LEAN.

<sup>2</sup> Note – including the term “use” introduces the concept of life cycle cost (LCC) which is the economic measure of value.

<sup>3</sup> Source: The Washington Post, June 10, 2007

The data provided for the trip is provided below.

	Trip 1 2 people	Trip 2 2 people	Method of Travel	Average CO2/mile	Value Index
Mileage	227.5	852.4			
Pounds of CO2	412	1,591	Mid-size 4dr car - 22mpg		
	1,135	2,715	Commercial airliner		
	342	1,366	Passenger train		
	159	615	Bus		
Pounds CO2/mile	1.81	1.87	Mid-size 4dr car - 22mpg	1.84	<b>2.59</b>
	4.99	3.19	Commercial airliner	4.09	<b>5.75</b>
	1.50	1.60	Passenger train	1.55	<b>2.19</b>
	0.70	0.72	Bus	0.71	<b>1.00</b>
The "worth" or baseline standard would be by bus to "transport people"					

The author calculated the Value Index shown in the right column. This is a crude first start that poses many unanswered questions such as what kind of vehicle?, how many people does each carry?, how many were on-board?, etc.

Yet it does provide a piece of information that no one had before reading the article. Now we need somewhere to store this data so all can retrieve it for the next value study.

### The project this cries for

We need a free, searchable data base on the Foundation website on the internet. It should be searchable by category, classification, product type, model, value stream, work breakdown structure, model year, and life cycle so one can find out the CO<sub>2</sub> emissions of each. And, the program might also be developed to compare the selection to the lowest function worth CO<sub>2</sub> cost stored and provide the Value Index.

This is quite a dream. Can anyone help? Will anyone fund this research?