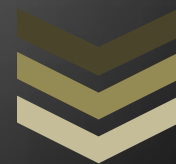


# Economic Impacts of the Composite Recycling Technology Center – A Brief Technical Report



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## Abstract

This brief technical report summarizes economic impacts in terms of employment and income anticipated to result from construction of the Composites Recycling Technology Center at the composites manufacturing campus in Port Angeles, Washington. The project will spur development of innovative carbon fiber products made from recycled materials which would otherwise be landfilled. After demonstration of economic viability for these projects, each will be spun-off to the private sector, and provide continued economic opportunity within the local community. This emergent manufacturing sector has the potential to create catalytic synergies that result in over 338 new family living wage jobs with an annual average wage of \$67,553.

## Overview

This technical note explores the economic impacts anticipated from development of the Composite Recycling Technology Center (CRTC), to be situated in the composites manufacturing campus in Port Angeles, Washington. Formal agreements between the Port of Port Angeles (Port) and advanced composite manufacturers are being established to provide a continuous supply of discarded pre-preg materials (materials) for use by CRTC. At present, these materials are landfilled as waste. CRTC will assemble a staff of material and design engineers to develop methods of processing these materials for use in the production of innovative carbon fiber products. Once the economic viability of these products has been demonstrated, they will be “spun-off” as profitable enterprises which will continue to provide employment opportunities at family living wages in an economically distressed county. Thus, the activities of CRTC extend beyond research and development to sustained commercial viability and, as the CRTC is the nexus of the recycling-final product process, CRTC will serve as the catalyst for additional economic development that will provide family wage employment to local families.

The need for economic development in Clallam County is compelling. In terms of income, the 2014 average wage in Clallam County was \$35,953. A living wage for a family of four is \$40,166.<sup>1</sup> Thus, the average wage is \$4,253 short of the family wage threshold. The Census’ American Community Survey indicates that for 2013, the unemployment rate in Clallam County was 10.4% while the national average was 8.4%.<sup>2</sup> Washington State uses a comparative value of 20% to establish distressed county status: if a county has an unemployment rate 20% or more than the state average, it is considered distressed. The Washington State seasonally adjusted unemployment rate was 6.4% for January of 2015,<sup>3</sup> making the distressed threshold 7.68%. In Clallam County the unemployment rate was 10.3%,<sup>4</sup> 61% greater the state average, and over 80% larger than the national average of 5.7%.<sup>5</sup>

## Methodology

The Port assembled a team to develop a detailed business plan for three innovative carbon fiber products that will be the focal point for its first round of product development operations. As that plan is proprietary, in this technical note they will be called “Water Sports,” “Recreational Goods,” and “Food Storage,” to illustrate the general markets for these products without revealing the precise niche markets targeted. That plan, correspondence with

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<sup>1</sup> See, <http://livingwage.mit.edu/>. Values adjusted for inflation and expressed in 2014\$.

<sup>2</sup> [http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS\\_13\\_1YR\\_DP03&prodType=table](http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_13_1YR_DP03&prodType=table)

<sup>3</sup> <https://fortress.wa.gov/esd/employmentdata/home>

<sup>4</sup> <https://fortress.wa.gov/esd/employmentdata/reports-publications/economic-reports/monthly-employment-report/map-of-county-unemployment-rate>

<sup>5</sup> <http://www.bls.gov/>

representatives of the Port, and support documents provided by Geoff Wood of Profile Composite, provides baseline construction, equipment purchase, employment, income and sales values used in this technical note. Other sources of information are cited as necessary. The economic impact analysis is presented in three phases: construction of the CRTC facility, including equipment purchases in Washington State; product development, manufacture and sales at CRTC; and, lastly, product spin-offs to the private sector. IMPLAN and the Washington State data set for 2012 were used for estimation, employing SAM multipliers. Sector 274, Carbon and Graphite Product Manufacturing, was used to estimate economic impacts for the product development phase. Economic impacts for spin-off products used appropriate production sectors based on the assumption production would parallel processes used to manufacture similar products made from plastics provided by an external supplier. For CRTC spin-offs, that material would be carbon fiber obtained from the recycling chain.

Income and employment provided in the baseline documents was tested for accuracy using published payroll reports for carbon fiber industrial sectors, and estimates derived from IMPLAN. No significant discrepancies were detected for payroll. This was not true for baseline product sales: sales per employee are significantly less than the average sales to worker values for all carbon products. As CRTC utilizes recycled materials, obtained at no cost, this discrepancy may be reasonable. The same discrepancy was detected for total sales to employment for each spin-off product, which can be reconciled in the same fashion. As the goal of CRTC is to use recycled materials that would otherwise be landfilled, these “free” materials should provide a significant competitive cost advantage.

The economic impact analysis uses the familiar measures of direct, indirect and induced employment and income.<sup>6</sup> Employment is presented as annualized FTEs. Wages are presented as a weighted mean across occupations for each effect (direct, indirect and induced) for each sector.<sup>7</sup> Mean wages by sector are presented in Tables 1 and 2. To provide a comparative reference for these mean wage values, a “living wage premium” was constructed. The living wage premium (LWP) is the difference between a sector’s mean wage (SMW) and the living wage (LW), \$40,166 for Clallam County in 2014.<sup>8</sup> Thus,  $LWP = SMW - LW$ , and CRTC, year 5,  $LWP = \$80,233 - \$40,166 = \$40,067$ . All monetary values are presented in 2014 dollars.<sup>9</sup>

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<sup>6</sup> The direct effect measures economic impacts in terms of employment and income for those specified activities. The indirect effect captures expenditures in the supply chain. Induced effects result from expenditures made by those directly and indirectly employed.

<sup>7</sup> These sectors include CRTC, Water Sports, Recreational Goods, and Food Storage.

<sup>8</sup> See, <http://livingwage.mit.edu/>

<sup>9</sup> The business plan projects increases in salaries and benefits at a 3% annual rate. In this technical report unknown changes in the consumer price index are ignored and all salaries plus benefits are reported in 2014\$.

While precise dates for product spin-off cannot be known with certainty, for this technical note spin-offs occur in years 4, 5, and 6. As office personnel and salaries were not provided with manufacturing employment estimates for each spin-off product, personnel with salaries were used from the estimates for CRTC operations, under the following assumptions. First, the manager salary is 1% greater than the highest paid member of the production team (assumed in the business plan); administration and sales have the same salaries, with one job type per spin-off product. The exception was Food Storage, where two sales people were assumed given the greater sales volume. These assumptions are conservative, and likely underestimate total direct employment for spin-off production as related to office staff.

During each spin-off phase, it is assumed CRTC staff are re-deployed to design, develop and produce new products, with several potential products identified in the business plan. The result is that CRTC employment at year 5 continues over the remaining study period. It is similarly assumed that production and income for each spin-off remains constant. Additional synergies resulting from utilization of CRTC materials and processes in the local composites sector are not addressed, nor are the results of firms moving into the composites manufacturing campus as a result of CRTC operations, the presence of an experienced workforce, training for advanced composite technicians at Peninsula College, and an expanding infrastructure capable of supporting a growing carbon fiber sector. Thus, the economic impacts in this technical note likely underestimate potential aggregate growth in this emergent sector, though the catalytic synergies are apparent in the analysis presented.

## **Economic Impacts of the Composite Recycling Technology Center**

### **Construction and Equipment Phase – Year 0**

Construction values consisted of building and infrastructure improvements, of \$2,355,000 and \$121,000 respectively, for a total of \$2,476,000.<sup>10</sup> It was assumed that all those expenditures would occur in Washington State. It was estimated that 40 percent of the equipment budget would be used to acquire machinery made in Washington State. In addition, 3200 hours of in-state labor would be provided by a resident design firm. Together these resulted in an assumption of total in-state purchases of \$658,000 with commensurate labor effects, plus the 3200 hours of design (1.6 FTE). Total employment for construction and equipment (direct, indirect and induced) is 35.4 FTEs. The direct mean wage, analyzed elsewhere, is \$59,242 and living wage premium \$19,076. Other direct, indirect and induced values appear in Table 1.

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<sup>10</sup> As this technical report goes to print, small changes continue in the planning phase and total construction and equipment budgets. As these changes have been in an upward direction, the values in the report are likely biased downward.

<b>Table 1: Economic Impacts of the Composites Recycling Technology Center</b>									
		<b>Income</b>			<b>Employment</b>				
<b>Activity</b>	<b>Effect</b>	<b>Average</b>	<b>Living Prem</b>	<b>Year 0</b>	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Year 4</b>	<b>Year 5</b>
<b>Building</b>	Direct	\$64,391	\$24,225	18.2					
	Indirect	\$66,375	\$26,209	3.5					
	Induced	\$49,717	\$9,551	7.7					
	<b>Total</b>	<b>\$60,797</b>	<b>\$20,631</b>	<b>29.4</b>					
<b>Equipment</b>	Direct	\$45,689	\$5,523	3.6					
	Indirect	\$73,400	\$33,234	1.1					
	Induced	\$51,456	\$11,290	1.3					
	<b>Total</b>	<b>\$52,019</b>	<b>\$11,853</b>	<b>6</b>					
<b>CRTC</b>	Direct	\$80,233	\$40,067		6.25	14.75	34.5	75	111
	Indirect	\$72,139	\$31,973		0.2	1.8	4.5	13.8	19.7
	Induced	\$49,792	\$9,626		3.3	8	18.2	38.1	56.6
	<b>Total</b>	<b>\$70,183</b>	<b>\$30,017</b>		<b>9.75</b>	<b>24.55</b>	<b>57.2</b>	<b>126.9</b>	<b>187.3</b>

### **CRTC Development Phase: Years 1 - 5**

CRTC direct employment begins at 6.25 during the initial research and development phase, paying an average wage of \$93,723, weighted upward by the large proportion of engineering staff. Years 3-5 see rapid escalation of production, with direct employment rising to 111, including 60 skilled composites technicians jobs paying \$70,200 and living wage premium \$30,034, and 17 production worker jobs paying \$35,609, a wage approximate to the County average. Weighted mean wage values across all occupation at year 5 are presented in the Table 1, with direct, indirect and induced average wages of \$80,233, \$72,139 and \$49,792 respectively, with corresponding living wage premiums \$40,067, \$31,973, and \$9,626. The presence of Peninsula College’s advanced composites training program makes it likely these jobs will be secured by local residents. Indirect employment rises from 0.2 in year 1 to 19.7 in year 5, with a mean wage of \$72,139 and living wage premium \$31,973. Induced employment rises from 3.3 to 56.6 with an average wage of \$49,792 and living wage premium \$9,626.<sup>11</sup> The total impact on the community will be 187.3 new jobs paying an annual average wage of \$70,183 and living wage premium \$30,017.

### **Spin Off Products: Years 4 - 9**

Spin-offs occur in years 4, 5 and 6, and economic impacts can be found in Table 2. CRTC economic impacts continue at full operations, as explained above. For Water Sports, we see direct employment at 15 FTEs, paying an annual average wage of \$74,986 and living wage premium \$34,820. Indirect employment is 3.5 with an annual average wage of \$65,912 and living wage premium \$25,746. Induced employment is 7.5 with an annual average wage of \$49,680 and living wage premium \$9,514.

<sup>11</sup> It is to be emphasized the broad range of induced employment, from food and services to surgeons. While the high incomes pull the mean wage upward, the majority of induced jobs are in food services with negative wage premiums.

<b>Table 2: Economic Impacts of the CRTC Spin-offs</b>							
		<b>Income</b>		<b>Employment</b>			
<b>Activity</b>	<b>Effect</b>	<b>Average</b>	<b>Living Prem</b>	<b>Year 4</b>	<b>Year 5</b>	<b>Year 6</b>	<b>Year 9</b>
<b>CRTC</b>	Direct	\$80,233	\$40,067	75	111	111	111
	Indirect	\$72,139	\$31,973	14	19.7	19.7	19.7
	Induced	\$49,792	\$9,626	38	56.6	56.6	56.6
	<b>Total</b>	<b>\$70,183</b>	<b>\$30,017</b>	<b>127</b>	<b>187.3</b>	<b>187.3</b>	<b>187.3</b>
<b>Water Sports</b>	Direct	\$74,986	\$34,820	15	15	15	15
	Indirect	\$65,912	\$25,746	3.5	3.5	3.5	3.5
	Induced	\$49,680	\$9,514	7.5	7.5	7.5	7.5
	<b>Total</b>	<b>\$66,464</b>	<b>\$26,298</b>	<b>26</b>	<b>26</b>	<b>26</b>	<b>26</b>
<b>Recreation</b>	Direct	\$77,359	\$37,193		20	20	20
	Indirect	\$74,632	\$34,466		3.5	3.5	3.5
	Induced	\$49,862	\$9,696		9.9	9.9	9.9
	<b>Total</b>	<b>\$68,923</b>	<b>\$28,757</b>		<b>33.4</b>	<b>33.4</b>	<b>33.4</b>
<b>Food Storage</b>	Direct	\$65,708	\$25,542			53.0	53.0
	Indirect	\$68,835	\$28,669			13.9	13.9
	Induced	\$49,852	\$9,686			24.3	24.3
	<b>Total</b>	<b>\$61,960</b>	<b>\$21,794</b>			<b>91.2</b>	<b>91.2</b>
<b>Grand Totals</b>	Direct	\$75,680	\$35,514	90	146	199	199
	Indirect	\$70,686	\$30,520	17.3	26.7	40.6	40.6
	Induced	\$49,805	\$9,639	45.6	74	98.3	98.3
	<b>Total</b>	<b>\$67,553</b>	<b>\$27,387</b>	<b>152.9</b>	<b>246.7</b>	<b>337.9</b>	<b>337.9</b>

In year 5, Recreational Goods are spun-off with 20 direct FTE jobs paying an average annual wage of \$77,359 and living wage premium \$37,193. Indirect employment is 3.5 FTE jobs with an average annual wage of \$74,632 and living wage premium \$34,466. Induced employment is 9.9 FTE jobs at an average annual wage of \$49,862 and living wage premium \$9,696.

In year 6 Food Storage products are spun-off with 53 FTE jobs at an average annual wage of \$65,708 and living wage premium \$25,542. The lower average wage relative to other spin-offs is explained by the larger proportion of total employment as skilled composite technicians and production workers relative to engineers, jobs likely to be obtained by local residents given the presence of Peninsula College's advanced composites training program. Indirect employment is 13.9 FTE jobs at \$68,835 and living wage premium \$28,669. Induced employment is 24.3 FTE jobs at an annual average wage of \$49,852 and living wage premium \$9,686.

### **Total Economics Impacts**

By the end of the study period in year 9, the potential economic impacts of CRTC are significant. Direct employment is estimated at 199 FTE jobs at an annual average wage of \$75,680 and living wage premium \$35,514. Indirect employment is estimated at 40.6 FTE jobs with an annual average wage of \$70,686 and living wage premium \$30,520. Induced employment is estimated at 98.3 with an annual average wage of \$49,805 and living wage premium \$9,639. The grand total is 338 new jobs at an annual average wage of \$67,553 with average living wage premiums of \$27,387. For economically distressed Clallam County, this would be a catalytic increase in economic welfare.