W12888

DHL SUPPLY CHAIN

A 2009 World Economic Forum publication declared, "Human activity generates annual greenhouse gas emissions of around 50,000 mega-tonnes CO2 (*Carbon Dioxide emission*). We estimate that 2,800 mega-tonnes or 5.5 per cent of the total are contributed by the logistics and transport sector."[1]

The executive summary stated, "Significant movement is expected towards reduced supply chain carbon intensity. This will create both opportunities and risks for logistics and transport firms, with changes in supply and demand driven by regulation of carbon emissions, higher and more volatile fuel prices and evolving consumer and client demand. The sector can play an influential role in decarbonization, both in its own operations and through broader supply chain optimization. This provides direct benefits through reduced costs, managed risks and business growth."[2]

It concluded with several recommendations for supply chain stakeholders. Among the six recommendations for logistics and transport providers was to "switch (transport) modes where possible." For shippers and buyers, it was recommended to "plan to allow slower and better optimized transport." Finally, policy makers were also invited to "reflect the cost of carbon in energy tariffs; support carbon measurement and labeling standards and build open carbon trading systems."

COMPANY INFORMATION

After reading the report, Yee Hwai, a member of the solutions team at DHL Supply Chain, recognized the very findings he had uncovered in a recent simulation analysis, undertaken as part of the Go Green environmental protection program initiated by parent firm, Deutsche Post DHL. As the thought leader on sustainability in the industry, Deutsche Post DHL recognized there were clear opportunities to begin resolving the carbon emission problems faced by many of its customers. DHL even stated on its website, "We recognize environmental protection as our responsibility as well as a business opportunity."[3]

[1] *"Supply Chain Decarbonization — The Role of Logistics and Transport in Reducing Supply Chain Carbon Emissions," p. 4, https://members.weforum.org/pdf/ip/SupplyChainDecarbonization.pdf, accessed April 2012.*
[2] *Ibid.*
[3] *www.dp-dhl.com/en/responsibility/environment.html, accessed April 2012.*

Deutsche Post DHL was the first logistics company to set a quantified carbon efficiency goal — to improve its CO2 efficiency across global operations by 30 per cent compared to the 2007 baseline.

THE PROBLEM

The simulation exercise Hwai undertook pertained to a consumer electronics company (CEC). Prominent among its line of products were 32" and 42" LCD TV sets (LCD32" and LCD42"). Production of the LCD TV sets was subcontracted to various original design manufacturers (ODMs) located in China and Taiwan. The responsibility of DHL Supply Chain was to ship the LCD TV sets from the ODMs to the distribution centre (DC) located in Shanghai. In the latest contract, the CEC had allocated a budget of CNY 3 billion (Chinese renminbi) for the production and shipping of 920,000 units of LCD42" and 530,000 units of LCD32" TV sets to its DC. Hwai had worked with the CEC to configure the optimal supply chain that would fulfill this order within the CNY 3 billion budget while satisfying various constraints pertaining to economy of scale, production capacity, supplier risk management and service level requirements on the shipping front. At that point, this optimization exercise did not consider the volume of CO2 emissions.

The CEC had a list of seven ODMs to which it could subcontract the production of LCD TV sets according to their availability and prices. ODM1 and ODM2 were the only companies that could produce both LCD32" and LCD42". The remaining five ODMs produced LCD42" exclusively. Their unit production costs are listed in the data sheet (see Exhibit 1). To engender economies of scale in the production, the CEC guaranteed a minimum order of 200,000 to any selected ODMs. Also, to mitigate dependency risk on any ODM, the maximum order for either LCD32" or LCD42" was capped at 600,000 units. ODM1 and ODM2 had high production capacities and, if chosen, they each had the ability to produce 600,000 units of LCD32", as well as 600,000 units of LCD42".

Several transportation modes were available to ship the TV sets from the ODMs to the DC: regular air, air express, road, road LTL (less than truckload), road network, rail and water. The distances from the ODMs to the DC and the various shipping rates are tabulated in the data sheet. ODM5 was located near the DC, restricting shipping to road, road LTL and road network. ODM6 was located in Taiwan and shipping could only be conducted via air or water. Across shipping modes, the rates of carbon emission (see data sheet in Exhibit 1) varied greatly from as high as 1.44 (regular air or air express) to 0.007 (water) kilogram (kg) per ton shipped per kilometer (km) travelled. Each LCD32" weighed about 16.5 kgs and each LCD42" weighed about 22 kgs.

Shipping times varied from two days (via air express) to 10 days (via water). Based on historical information on shipping times and customer order cycle times, the CEC decided that to maintain satisfactory inventory levels, DHL Supply Chain had to ship a minimum number of 32" and 42" LCD TV sets, according to the criteria listed at the bottom of the data sheet below (see Exhibit 1). There was no constraint on shipments via water.

In the simulation exercise, Hwai assumed a likely consequence of government legislation to reduce the emission of CO2 would appear in the form of a tax incentive. He also anticipated the brand value of the LCD TV sets could rise as a result of customer awareness. Hwai estimated these factors could translate into a 10 per cent increase in the budget for this specific supply chain. He was eager to find out the potential reduction in CO2 emission made possible through a potential CNY 3.3 billion budget for manufacturing and shipping the TVs from the ODMs to the DC.

Exhibit 1

DATA SHEET

Product	**Weight in Metric Ton**	**Units to be shipped**
LCD42”	0.022	920,000
LCD32”	0.0165	530,000

CO2 Emission in Kg per Ton-Km shipped[1]	Regular Air	Air Express	Road	Road LTL	Road-Network	Rail	Water
	1.44	1.44	0.0613	0.0613	0.0613	0.0285	0.007

			Shipping Cost per Metric Ton CNY						
Product - ODM	**Distance to DC in Kms**	**TV Unit Production Cost CNY**	Regular Air	Air Express	Road	Road LTL	Road-Network	Rail	Water
LCD42” ODM1	2508	1,983.40	64,400	70,840	6,182.40	5,216.40	4,830.00	4,250.40	3,091.20
LCD42” ODM2	1553	2,254.00	115,920	127,512	7,084.00	5,796.00	5,667.20	5,7960	2,704.80
LCD42” ODM3	1380	2,582.40	103,040	113,344	7,084.00	5,796.00	5,667.20	5,7960	3,284.40
LCD42” ODM4	2150	1,976.10	64,400	70,840	6,182.40	5,280.80	5,216.40	4,250.40	3,091.20
LCD42” ODM5	30	2,711.30	**X**	**X**	9,660.00	9,016.00	8,694.00	**X**	**X**
LCD42” ODM6	690	2,704.80	135,240	148,120	**X**	**X**	**X**	**X**	3,413.20
LCD42” ODM7	686	2,125.20	103,040	112,700	7,084	5,796	5,538.40	5,860.40	2,769.20
LCD32” ODM1	2508	1,818.00	64,400	70,840	6,182.40	5,216.40	4,830	4,250.40	3,091.20
LCD32” ODM2	1553	1,996.40	115,920	127,512	7,084	5,796	5,667.20	5,796	2,704.80

Supply Chain Production and Shipping Constraints	
Minimum production of LCD42” (ditto for LCD32”) at any manufacturing ODM	200,000 units
Maximum production of LCD42” at manufacturing OEM (ditto for LCD32”) at manufacturing ODM	600,000 units
Minimum number of units of LCD42” (LCD32”) to be shipped by Regular Air or Air Express	46,000 (53,000)
Minimum number of units of LCD42” (LCD32”) to be shipped by Road or Road LTL or Road Network	92,000 (79,500)
Minimum number of units of LCD42” (LCD32”) to be shipped by Rail	138,000 (79,500)

Source: Created by author.

[1] *Arithmetically, a TV weighing say 20 kgs and shipped by road over 800 kms will emit (20 / 1000) x 0.0613 x 800 or about 0.98 kg of CO2.*