

**PRODUCT PROFILE STUDY**  
**HS 401694: BOAT OR DOCK FENDERS**

## 1. Introduction

Marine dock fenders are an integral part of most large multi-use docks and piers. The principal function of the fender system is to prevent the vessel or the dock from being damaged during berthing. Forces during berthing or anchoring may be in the form of impact, abrasive action from vessels, or direct pressure. These forces may cause extensive damage to the ship and dock structure if suitable means are not employed to counteract them.

## 2. Types of Fender

There is a wide range of dock fender designs. Some are very simple (e.g: tubular fenders held in place by chains) and some are rather sophisticated. Most marine dock fenders are made of natural rubber. Rubber fenders consist of two major types, rubber-in-compression and rubber-in-shear.

*Rubber-in-compression.* This fender consists of a series of rubber cylindrical or rectangular tubes installed behind standard fender piles or behind hung type fenders. The tubes may be compressed in axial or radial direction.

*Rubber-in-shear.* This consists of a series of rubber pads bonded between steel plates to form a series of rubber sandwiches mounted firmly as buffers between a pile-fender system and a pier.

Rubber fenders can be classified as follows:-

1. Extruded Fenders
2. Moulded Fenders
3. Foam-Filled Fenders
4. Pneumatic and Hydro-pneumatic Fenders

**Extruded fenders** are typically manufactured in long lengths by an extrusion process. After manufacture, the elements are cut to length. Extruded fender systems typically absorb a minimum amount of energy. These fender elements are used as fenders for small craft, rub strips on marine structures, and energy-absorbing elements at the wale. Examples of extruded fender shapes are 'Side Mounted Hollow Bore', 'Cylindrical', 'D', 'Square', 'W' and 'Wing'.

**Moulded fenders** are typically mounted to the vertical face of a marine structure. These systems are used to berth ships which are of similar size and hull curvature. Therefore, they are usually found in commercial ports. Examples of moulded fender shapes are 'Arch Fender', 'Circle', 'Circular Dock', 'Fender Bars', 'Hexagonal', and the 'buckling fender' types, such as 'MV', 'V Leg' and 'V Section'.

**Foam-filled fenders** are typically used at berths that support ships of various sizes and with a variety of hull curvatures. Due to the wide variety of ship types that berth at naval facilities, the foam-filled fenders are typically the fender of choice. Foam-filled fenders are fenders typically manufactured by wrapping closed cell foam with a nylon reinforcement embedded in a polyurethane coating. The fenders can be used as stand-alone fenders, fendering between ships, or between a ship and a berthing structure.

**Pneumatic fenders** are inflated with air and float on the surface of the water to serve as a protective buffer for ships. Hydro-pneumatic fenders are similar, but contain water in addition to the pressurized air, with a counterweight at one end so the fender is partially submerged and are specifically designed for the berthing of submarines. Pneumatic and hydro-pneumatic fenders are constructed of an inner rubber layer, reinforcing cord layers and an outer rubber layer that form a synthetic-cord-rubber sheet, which forms a cylindrical air-bag with hemispherical heads at each end, which can be inflated with air. These fenders can be used as stand-alone fenders, fendering between ships, or between a ship and a berthing structure. Hydro-pneumatic fenders can be used in combination with foam-filled fenders or pneumatic fenders to support both ships and submarines at the same berth, if designed appropriately.

### **3. Design Standards**

The following standards and report are widely taken as design standards for fenders:-

1. Technical Standards for port and harbour facilities in Japan
2. British Standard BS6349
3. EAU (German Standard)
4. Various information about fender design is given in the PIANC Report, 2002 (Report of the International Commission for Improving the Design of Fender Systems)
5. AS 4140
6. *Malaysian Standard, MS 1385: 1995 Marine Fenders* - recognizes requirements for vulcanized rubber used in marine fenders for ports. The overall requirements for rubber materials of a dock fender are tear strength and abrasion resistance, water absorption, ozone resistance, compression set, hardness properties, accelerated ageing, tensile strength and elongation at break.

### **4. Distribution Channels**

Fenders are normally procured as part of a package in tenders for port construction and expansion. In this regard, rubber fender manufacturers need to be alert for information relating to new port projects and port expansion projects and liaise with the consultants involved in the projects.

### **5. Major Companies Supplying Dock Fender System in the World**

The supply of fender systems in the world is dominated by a few large manufacturers such as Marine Fenders International (USA), Trelleborg (Hamburg), Bridgestone (Japan), Dunlop (UK), Shibata Industries (Japan) and Qingdao Tiandun Rubber Co. Ltd. (China).

## 6. Major Exporters of Dock Fenders in the World

Reporting Countries Export Statistics (Partner Country: World)					
Commodity: 401694, Boat And Dock Fenders, Whether Or Not Inflatable, Of Vulcanised Rubber					
Year To Date: January - December					
Reporting Country	USD Million			% Change 2010/2009	% Share 2010
	2008	2009	2010		
Reporting Total	N/A	138.98	133.06	-4.26	
1. China	26.54	23.71	29.46	24.27	22.14
2. United States	33.26	38.08	29.34	-22.94	22.06
3. Japan	24.48	24.71	20.93	-15.3	15.73
4. United Kingdom	9.24	8.50	10.31	21.26	7.75
5. Malaysia	6.46	8.41	9.78	16.23	7.35
6. South Korea	4.02	7.98	8.57	7.37	6.45
7. India	4.17	6.78	4.72	-30.39	3.55
8. UAE	N/A	2.58	3.32	28.58	2.50
9. Netherlands	2.94	3.59	2.94	-18.07	2.21
10. Slovakia	1.18	2.54	2.64	3.94	1.99

Source: GTA (49 countries)

- World's export of rubber fenders decreased by 4.26% in 2010 over 2009. In 2010, the top 4 largest suppliers were China (22% share), USA (22%), Japan (15%) and UK (7%), together supplying 68% of rubber fenders to the world.
- The top ten suppliers in 2010 together captured almost 92% of the world's export market. Malaysia was ranked as the 5th largest supplier (7.35% export share) exporting USD9.8 million worth of rubber fenders in 2010, an increase of 16% over 2009 (USD 8.4 million).
- United States export of dock fenders decreased from USD38 million in 2009 to USD29 million in 2010.
- Apart from China who had a big leap in exports of dock fenders in 2010 at 24%, year on year, United Kingdom exports also increased 21%.

## 7. Major Importers of Dock Fenders in the World

Reporting Countries Import Statistics (Partner Country: World) Commodity: 401694, Boat And Dock Fenders, Whether Or Not Inflatable, Of Vulcanised Rubber					
Year To Date: January - December					
Reporting Country	USD Million			% Change 2010/2009	% Share 2010
	2008	2009	2010		
Reporting Total	N/A	104.73	102.42	-2.2	
1. United Arab Emirates	N/A	8.74	14.56	66.71	14.22
2. United States	9.78	8.83	8.85	0.22	8.64
3. Australia	4.26	5.21	8.42	61.73	8.22
4. United Kingdom	5.55	8.38	7.87	-6.13	7.68
5. Germany	4.55	3.05	6.25	104.98	6.10
6. Indonesia	4.70	3.38	5.03	48.9	4.91
7. Italy	11.38	4.93	3.71	-24.67	3.62
8. Brazil	3.40	3.51	3.28	-6.51	3.20
9. Canada	4.24	3.19	3.09	-3.06	3.02
10. Belgium	4.77	3.42	2.96	-13.67	2.89
Sub-total (Top Ten)	52.63	52.63	64.02		

Source: GTA

- Dock fenders are used in various types of ports such as naval ports, container ports, oil and gas ports and cargo ports. The life span of dock fenders usually is about 15 years and depending on the berthing techniques used, its life span could reduce to about 8 to 9 years. In this regard, the market for dock fenders primarily depends on replacement of fenders in existing ports and development of new ports.
- Asian ports dominate the container ports scene. Out of the 20 leading container ports in the world, 14 are in Asia. In 2010, Shanghai, Singapore and Hong Kong were the top three global container ports in the world with Malaysia's Port Klang in 13th position and the Port of Tanjung Pelepas in 16th position.
- In 2010, UAE's import of dock fenders increased by 66% as compared to 2009. This can be related to Dubai Port, which is ranked the 9<sup>th</sup> leading container ports. The two main ports in Dubai which are operated by the Dubai port authority are Port Rashid and Jebel Ali Port. Together they installed 14.5 million worth of fenders in 2010. The majority of UAE import of rubber dock fenders was from France (69%).
- In tandem with its role as a leading trading nation in the world, China has embarked on major port expansions to cater to the increasing tonnage of goods leaving and entering its ports. However, despite being the largest consumer of dock fenders in 2010, China was not a major importer of dock fenders. This could be due to its policy of giving priority to made-in-China dock fenders.
- US whilst being the second largest supplier of dock fenders was also the second largest importer of dock fenders in 2009 after UAE. 34% of US import of rubber fenders were from China and 30% from Japan.

## 8. Malaysia's Exports of Dock Fenders

Malaysia Export Statistics							
Commodity: 401694, Boat And Dock Fenders, Whether Or Not Inflatable, Of Vulcanised Rubber							
Year To Date: January - December							
Partner Country	USD Million			% Share			% Change 2010/2009
	2008	2009	2010	2008	2009	2010	
World	6.46	8.41	9.78	100.00	100.00	100.00	16.23
1. Germany	2.16	1.22	2.45	33.37	14.46	25.04	101.30
2. Australia	0.06	0.21	1.16	0.85	2.52	11.84	445.82
3. Singapore	1.48	0.84	0.83	22.84	9.93	8.46	- 0.99
4. Oman	0.02	N/A	0.82	0.31	0.00	8.40	0.00
5. Vietnam	0.43	0.04	0.53	6.72	0.51	5.47	1,146.34
6. United States	0.12	0.69	0.51	1.87	8.24	5.19	- 26.69
7. Netherlands	0.08	0.02	0.38	1.21	0.22	3.88	1,931.97
8. Thailand	0.06	0.17	0.34	0.88	1.96	3.52	108.27
9. Qatar	N/A	0.11	0.31	0.00	1.37	3.18	170.24
10. France	N/A	0.44	0.31	0.00	5.20	3.12	- 30.22

Source: GTA

- Malaysia's supply of dock fenders increased 16% in 2010, from USD8.4 million in 2009 to USD9.7 million in 2010.
- The top 5 major export markets for Malaysian dock fenders in 2010 were Germany (25%), Australia (11.8%), Singapore (8.4%), Oman (8%) and Vietnam (5.5%).
- Germany & Australia import of dock fenders from Malaysia increased significantly in 2010. In 2010, Germany's imports of Malaysian dock fenders increased 101% whilst Australia's recorded a 445% increase, year on year. For both countries combined the import value of Malaysian dock fenders rose to USD3.6 million in 2010 compare to USD1.4 million in 2009.
- Other countries that had shown significant increase in importing dock fenders from Malaysia in 2010 compare to 2009 are Vietnam (1,146%) and Netherlands (1,931%)

## 9. Malaysia Imports of Dock Fenders

Malaysia Import Statistics							
Commodity: 401694, Boat And Dock Fenders, Whether Or Not Inflatable, Of Vulcanized Rubber							
Year To Date: January - December							
Partner Country	United States Dollars			% Share			% Change 2010/2009
	2008	2009	2010	2008	2009	2010	
World	2.69	2.69	2.26	100.00	100.00	100.00	- 16.25
1. India	0.06	0.07	0.71	2.31	2.47	31.33	962.88
2. Japan	0.42	0.76	0.67	15.51	28.20	29.83	- 11.42
3. USA	0.22	0.07	0.20	8.29	2.75	8.92	171.54
4. China	1.23	0.78	0.17	45.53	28.83	7.47	- 78.32
5. Singapore	0.29	0.80	0.17	10.71	29.82	7.42	- 79.15
6. Norway	N/A	0.11	0.13	0.00	4.18	5.86	17.47
7. UK	0.11	N/A	0.13	4.27	0.00	5.65	0.00
8. New Zealand	N/A	N/A	0.04	0.00	0.00	1.76	0.00
9. Netherlands	0.00	N/A	0.03	0.06	0.00	1.11	0.00
10. Australia	N/A	0.03	0.01	0.00	1.17	0.50	- 63.89

Source: GTA

- Malaysia's import of dock fenders reduced by 16% in 2010 from USD2.69 million in 2009 to USD2.25 million in 2010.
- Major source of imports were from India (31%), Japan (29%), USA (8.9%), China (7.5%) and Singapore (7.4%).
- Whilst much effort has been carried out to push local port authorities to use local rubber fenders, it would seem that preference is still for imported fenders.

## 10. Malaysian suppliers of dock and boat fenders

There are five Malaysian companies manufacturing dock and boat fenders, namely:

1. DOSHIN Rubber Products (M) Sdn Bhd
2. MSL Rubber Industries Sdn Bhd
3. Pyrope Industries Sdn Bhd
4. Tantex Rubber Works Sdn Bhd
5. Min Rubber Industries Sdn Bhd

## 11. Custom Duties

### a) Malaysian Customs Duties Order (2006)

HS Code	Unit of Qty	Import	Export	Sales Tax	*IL/EL	ASEAN CEPT
4016.94.00	Kg	5%	Nil	10%	Required	5%

- Import and export of Boat or Dock Fenders, whether inflatable or not (HS 4016.94.000) require import and export licenses. The licenses are issued by Director General of Environment, Malaysia.

### b) Custom Duties imposed by selected countries

Country	Import Duties (%)
Singapore	0
USA	4.2
Australia	5
UAE	5
EU	2.5

## 12. Opportunities

### INDIA

Kerala plans to set up its third major port at Azhikkal, Kerala, India. This is based on the central government's directive to coastal states to set up such facilities. If the Azhikkal port development plan works out, the state would have three main ports namely Kochi Port Trust, the planned Vizhinjam port and Vallarpadam, which facilitates transshipment of cargo, and is part of the Kochi Port Trust.

The Indian government is planning to invest USD60 billion in its ports by 2020, according to report from Bloomberg, as part of a massive program to overhaul the country's transport and power infrastructure. According to figures from the Ministry of Shipping, port projects worth USD2.3 billion are currently in progress. The government is partly depending on companies such as DP World and AP Moller-Maersk for investments aimed at upgrading India's ports capability from 963 million tonnes in 2010 to 3.1 billion tonnes by 2020. The crucial part of the plan is the development of deeper berths for bigger container ships to boost exports.

### PERU

Peru's port sector will receive over USD2.04bn in investments up to 2015. Peru ranks 106th out of 142 countries for port infrastructure, according to research carried out by Switzerland-based non-profit World Economic Forum (WEF). The new investment would help transform Peru into an important maritime hub in the region facing the Pacific Ocean.

### USA

The Port of Charleston, USA, has announced that it will be making a large investment over the next ten years. The port has revealed a USD1.3bn plan to enhance and expand the port's terminal container by the construction of a new terminal in North Charleston. The facility is the only permitted new port facility under construction on the East Coast of United States. Once built, the terminal will boost container capacity in the port by about 50%.

Craney Island, Virginia, is about to receive Federal funding of around USD27 million in 2012 for the eastward expansion of Craney Island, the site of the Virginia Port Authority's fourth state-owned marine cargo terminal. The total cost of the eastward expansion is USD700 million and that will be done through a 50-50 cost-share agreement with the federal government. The projected cost for completion of the multi-phase terminal project is USD2.2 billion. The terminal will be built in phases and the first phase is a 600-acre expansion.

## **AUSTRALIA**

Sydney Ports Corporation is undertaking a major expansion of its container port facilities at Port Botany to cater for long term trade growth. The expansion is one of the largest port projects to be undertaken in Australia in the last 30 years. Sydney Ports Corporation obtained Government approval for the expansion of the existing port through reclamation of 60 hectares of land. The expansion is being constructed adjacent to the existing Patrick terminal and will provide significant additional capacity to meet projected long-term trade growth. The project will involve projects such as:

- 1,850 metres of additional wharf face for five extra shipping berths
- 60 hectares of reclaimed terminal land
- deep water berths with depths of up to 16.5 metres

## **QATAR**

One of Qatar's major new port projects is the USD4.5 billion Phase 1 of the New Doha Port, south of Al Wakra Township. Comprising general cargo terminals, container terminals and roll-on/roll-off berths along with an administration and customs complex, the port will cover an area of more than 20 square kilometers. With construction due to begin within the first half of 2011, the first phase of the project is expected to be completed by 2014. Qatar has also committed at least US\$1.8 billion to two major projects within the next two years. One of these, which were completed at the end of 2010, is a world-class dry dock and ship repair yard for LNG and other types of vessels. By 2012, the overall port facility will have a capacity to handle 5,000 ships a year.

## **UAE**

DP World, the Dubai based port operator, plans to invest USD850 million over the next three years to boost the capacity of its flagship container terminal at Jebel Ali in Dubai by more than 26 percent. The investment will add an additional 4 million 20-foot equivalent container units (TEU) of annual capacity, bringing the total capacity at Jebel Ali to 19 million TEUs by 2014. DP World, which is the world's third-largest terminal operator, will reconfigure 6,100 feet of berth and 173 acres of yard space from an existing general cargo berth into a new container terminal within the existing container port. The investment will be financed from existing cash resources and cash flow. The new terminal, which will have a draft of 58 feet, will be able to handle the world's largest container vessels planned for the future, DP world said.