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IP APPROACH Patent Valuation Report - Enhanced

US 10,456,959 B2

Report: April 15, 2021

“BAMBOO RAILROAD TIE MANUFACTURING SYSTEM”

Valuation Summary:

High Value: \$ 278,800

Low Value: \$ 139,400

Current Market Value: \$209,100

Methodology

An Intellectual Property valuation researcher will provide an initial market approach patent valuation taking into account patent metrics such as the number of forward references, the number of backward references, the number of claims, the length of the independent claims, claim strength, the remaining life, the market score, the technology score, the commercial score, and where applicable the foreign counterpart status.

A senior licensing / patent brokerage expert will then perform a second review of the patent value metrics above to establish the current market valuation and provide a lower and upper value range.

The information provided herein is based upon a market approach methodology. The report shall not constitute or be interpreted as legal, business or economic advice, regarding the scope of the patent(s) value or other intellectual property rights. In no event shall IPApproach LLC be liable for any incidental, consequential, or special damages of any kind, or any damages whatsoever associated with this report. IPApproach LLC is not liable in any way for its use.



EXECUTIVE SUMMARY:

IPApproch, LLC is pleased to present the attached exclusive patent for sale “**Bamboo Railroad Tie Manufacturing System**” which includes U.S. patent **US 10,456,959 B2**, assigned to **TieBam Inc.**The IP relates to method of manufacturing railroad ties from bamboo.

The technology disclosed in the patent portfolio provides the following advantages:

- ✓ Employing bamboo is far more “Green” or ecologically friendly than traditional railroad crossties.
- ✓ Bamboo crossties can be produced more quickly and cheaply than conventional crossties.
- ✓ Bamboo crossties manufacturing system is energy efficient.
- ✓ The bamboo railroad crosstie produced in this fashion is extremely resilient and strong, making it suitable for applications in the railroad industry.
- ✓ Bamboo can be grown to maturity within three to five years without causing damage to the environment.
- ✓ Substantially less arable land is required to harvest.
- ✓ Planning cycles are much more manageable with bamboo.
- ✓ Bamboo can be treated prior to processing, making it resistant from mold or rotting.
- ✓ Bamboo does not have to be covered or pressure-treated with creosote or coal tar to maintain this resistance.

Global market of railroad tie is market is estimated to grow from **USD 2741.40 million in 2019 to USD 3369.88 million by 2025, at a CAGR of 3.5% during the forecast period.** The railroad ties are used to fix the track position, which prevents the track from moving when the train is running. It also decreases the steel rail's pressure on the ballast bed and increases the force area. The railroad ties are resistant to moisture, weather, and immune towards infestation by insects. These properties surge its demands in train and subway applications. The key players profiled in the railroad tie market include **Austrak Pty Ltd, Vossloh, Lankhorst Mouldings, AGICO GROUP, Peterson Astec**



Industries Inc, Tank Fab, Koppers Inc., A&K Railroad Materials, Inc., Nisus Corporation., BRIDGEWELL RESOURCES, Gross & Janes Corporation, Sannosuke Kobayashi Co. Ltd., and Integri Co. among others.

Patent Bibliography:

Patent #: US 10,456,959

Title: Bamboo railroad tie manufacturing system

Current Applicant: Tiebam Inc

Applicants (Assignees): Tiebam Inc

Named Inventors: Jason Avraham David Johns Patrick Wang Jean-Luc Kouyoumji Reuben Smith

Filing Date: 1/21/2016

Issue/Pub Date: 10/29/2019

Priority Date: 1/21/2015

Patent Termination: 7/31/2038

Classifications / Sub Classes: B29C43/003 ; B27J1/003 ; B27M3/0053 ; B27N3/00 ; B27N3/20 ; E01B3/02 ; E01B3/10 ; D21B1/061 Fi



PORTFOLIO BIBLIOGRAPHY:

S. No.	Patent No./ Application No.	Title	Priority Date	Filing Date	Publication Date
1.	US 10,456,959 B2	Bamboo railroad tie manufacturing system	Jan 21, 2015	Jan 21, 2016	Oct 29, 2019



References:

Backward Citations = 2

Backward Citations by Examiner = 2

Non- Patent Citations = 0

Forward Citations = 10

Abstract:

A system for crafting railroad crossties of compressed bamboo is described. The system employs a hydraulic press configured to effectively compress multiple stalks of bamboo into a strong unified beam within a mold. Bamboo is first mashed, dried, and treated. A resin is employed as a permanent adhesive, binding the stalks together. The bamboo is stacked within a mold and compressed under the pressure exerted by the hydraulic press. An oven is used to heat the compressed bamboo, and then the bamboo is cooled. The compressed bamboo beam may then be trimmed to remove excess bamboo, and is cut into crosstie segments if needed. The resulting crosstie is sturdy, ecologically friendly, and rapidly manufactured.



Claim Summary:

Total = 12

Independent = 2

Dependent = 10

Independent Claims

1. A method of manufacturing railroad crossties from bamboo, the method comprising:
cutting bamboo stalks to be of equal length;
mashing the cut bamboo stalks;
heat-treating the mashed bamboo stalks to remove starch therefrom;
dipping the heat-treated bamboo stalks into a resin;
drying the dipped bamboo stalks in storage;
stacking the dried bamboo stalks tightly within a press mold of a hydraulic press;
compressing the stacked bamboo stalks in the press mold via the hydraulic press;
locking the compressed bamboo stalks under pressure within the hydraulic press so as to form densified compressed bamboo;
releasing the locking pressure of the hydraulic press;
heating the densified compressed bamboo in an oven while still within the press mold for at least two hours at 70 degrees Celsius;
removing the heated and densified compressed bamboo from the oven;
cooling the heated and densified compressed bamboo; and
removing the cooled and densified compressed bamboo from the press mold as a bamboo railroad crosstie.



Independent Claims (Continued)

8. A method of manufacturing railroad crossties from bamboo, the method comprising the following first through thirteenth steps performed in sequence: first, cutting bamboo stalks to be of equal length; second, mashing the cut bamboo stalks; third, heat-treating the mashed bamboo stalks to remove starch therefrom; fourth, dipping the heat-treated bamboo stalks into a resin; fifth, drying the dipped bamboo stalks in storage; sixth, stacking the dried bamboo stalks tightly within a press mold of a hydraulic press; seventh, compressing the stacked bamboo stalks in the press mold via the hydraulic press; eighth, locking the compressed bamboo stalks under pressure within the hydraulic press via metallic plates and metallic rods for at least 5 minutes so as to form densified compressed bamboo; ninth, releasing the locking pressure of the hydraulic press; tenth, heating the densified compressed bamboo within the press mold in an oven for at least two hours at 70 degrees Celsius; eleventh, removing the heated and densified compressed bamboo from the oven; twelfth, cooling the heated and densified compressed bamboo; and thirteenth, removing the cooled bamboo from the press mold as a bamboo railroad crosstie.



Patent Evaluation Index Summary:

Remaining Life of Patents: 17 years and 3 months

Patent Commercial Factor: 2 / 4

This patent appears to have good commercialization potential when compared to other related patents in the field. The patent covers technology that is likely not used in the marketplace; however, aspects of the patented technology may not be currently used, or the market for use is just emerging.

Patent Technology Factor: 2 / 4

The technological factors of this patent compare well with other closely related patents in this technology field.

Total Patent PFI Evaluation Index: 2 / 4

SAMPLE



TECHNOLOGY BRIEF (US 10,456,959 B2):

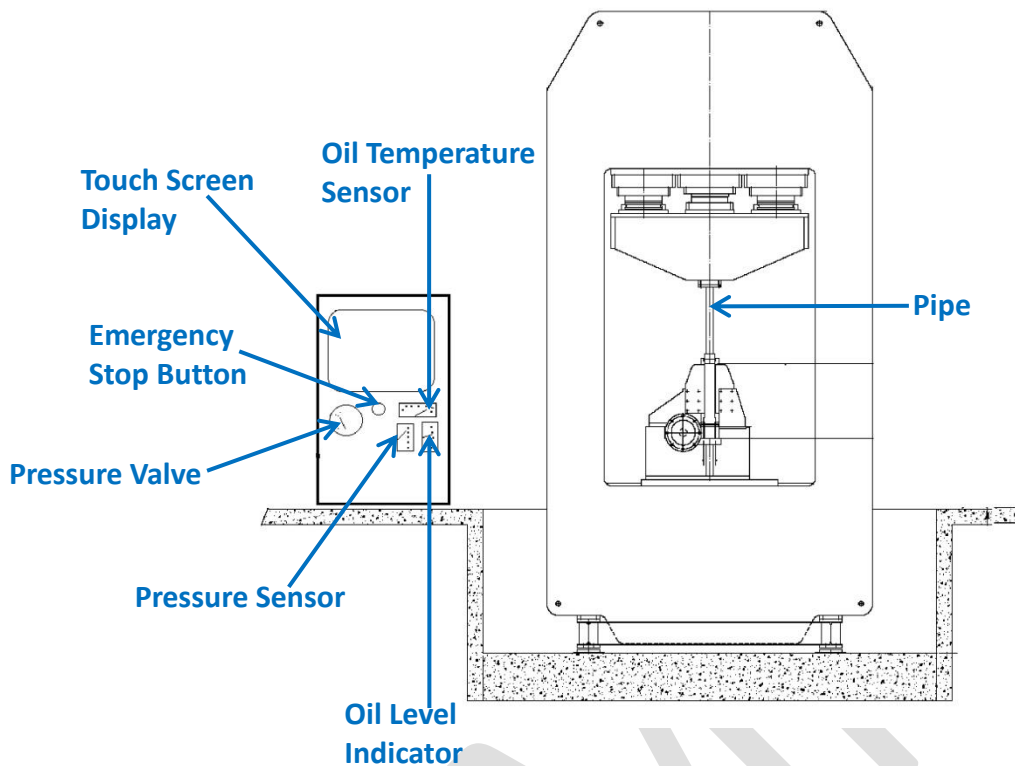


FIG.1: BAMBOO RAILROAD TIE MANUFACTURING SYSTEM

The present invention relates to a system for the rapid and effective manufacturing of railroad cross ties from strand woven bamboo. The system comprises with hydraulic press, one emergency stop button, touch screen display, pressure valve, one hydraulic pump, cushion system, oil level indicator, temperature sensor and pressure sensor. The manufacturing processes are described in following manner. The bamboo is cut to be of equal length. The bamboo is smashed, dried to remove the starch, and to make it more stable and resistant to mold. The bamboo is then dipped in a liquid resin. The resin-dipped bamboo is stacked within a press mold tightly. Once the mold is filled the hydraulic press activated. The bamboo is then locked under pressure within the mold for duration of time. The bamboo is locked into position with a metallic plate and metallic rods. Next, the bamboo is relieved of the pressure from the hydraulic press. The bamboo is then placed in an oven, and is heated for two to eight hours at 70 degrees Celsius depending on the glue specifications. The bamboo is removed from the oven and allowed to cool. The bamboo is removed from the mold. The upper surface of the bamboo is sanded. The ends of the bamboo cross tie are cut to remove any imperfectly pressed straps.



GLOBAL MARKET OF RAILROAD TIE:

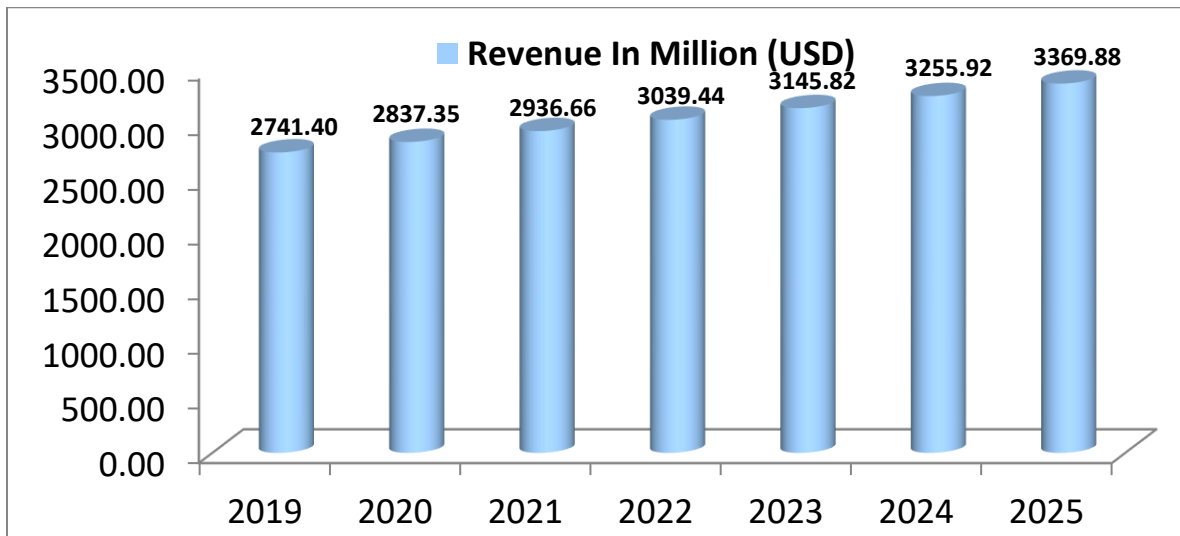


FIG.2: GLOBAL MARKET OF RAILROAD TIE

A railroad tie is also called a railway sleeper. It is a rectangular block component, which is always laying between ballast bed and the rail to keep the correct space of gauge. It is available in different types such as a wooden tie, concrete tie, and steel tie.

Global market of railroad tie is estimated to grow from **USD 2741.40 million in 2019 to USD 3369.88 million by 2025, at a CAGR of 3.5% during the forecast period.** The railroad ties are used to fix the track position, which prevents the track from moving when the train is running. It also decreases the steel rail's pressure on the ballast bed and increases the force area. The railroad ties are resistant to moisture, weather, and immune towards infestation by insects. These properties surge its demands in train and subway applications.

North America is expected to witness significant growth in the railroad tie market during the forecast period. The market of Asia Pacific will grow owing to the rising demand for wooden tie in subway application. The Middle East & Africa is anticipated to witness sustainable growth, due to the increasing railway infrastructure activities in the region.

The key players profiled in the railroad tie market include **Austrak Pty Ltd, Vossloh, Lankhorst Mouldings, AGICO GROUP, Peterson Astec Industries Inc, Tank Fab, Koppers Inc., A&K Railroad Materials, Inc., Nisus Corporation., BRIDGEWELL RESOURCES, Gross & Janes Corporation, Sannosuke Kobayashi Co. Ltd., and IntegriCo** among others.

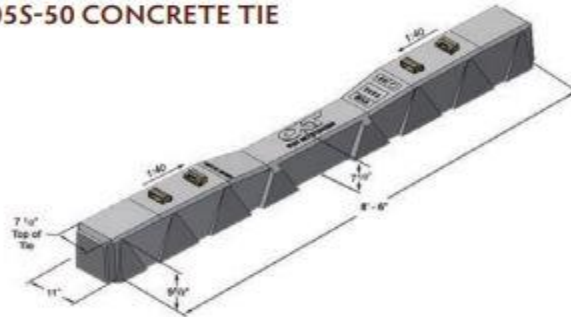


EXEMPLARY PLAYERS AND PRODUCTS:

L.B. Foster Company

COMPANY NAME	L.B. Foster Company
PRODUCT/ SERVICE NAME	505S-50 CONCRETE TIE
HEADQUARTERS	Pennsylvania, USA
REVENUE	NA
WEBSITE	https://lbfooster.com/en

505S-50 CONCRETE TIE



SOURCE: <https://lbfooster.com/perch/resources/cxttiesbrochurelowres.pdf>

Overview:

L.B. Foster offers a complete line of CXT[®] concrete railroad ties. All CXT concrete ties are designed in accordance with AREMA specifications and can be customized to meet customer requirements. CXT concrete ties will improve reliability of existing tracks and build long term performance into tomorrow's industrial applications, shipping ports, transit systems and high speed trains. L.B. Foster's dedicated sales and engineering staff can work closely with you to optimize tie design and develop spacing based on axle load impact, speed and tonnage.

Features:

- CXT concrete ties, using any fastening system with a pre-set gauge, can be installed at rates of up to 1,200 ties per day.
- Fewer concrete ties per track mile are required versus timber or other types of ties.
- The Fastclip, Safelok III and Vossloh are fully captive (clip, pad and insulator are pre-installed by the manufacturer prior to shipment).
- CXT can customize our concrete ties for most rail sections using specialized insulators.



Koppers Inc.

COMPANY NAME	<i>Koppers Inc.</i>
PRODUCT/ SERVICE NAME	<i>The Wooden Crosstie</i>
HEADQUARTERS	<i>Pennsylvania, USA</i>
REVENUE	<i>1.16 billion USD</i>
WEBSITE	http://koppers.com/



SOURCE: http://koppers.com/system/dragonfly/production/2013/02/01/11_03_15_858_Koppers_Railroad_Brochure.pdf

Overview:

Economical and reliable pressure treated wood crossties, switch ties and lumber are the foundation of Koppers railroad products and services. With nine wood treatment plants located on major rail lines throughout the United States and Canada, Koppers is uniquely positioned to meet the demands of Class I and short line railroads and railroad contractors from coast-to-coast.

Features:

- Wood treated with Koppers creosote performs better and requires less maintenance.
- Longer-lasting ties mean less replacement costs.
- Nine wood treating plants located on major rail lines means lower transportation costs and shorter delivery times.
- Koppers products suit both Class 1 and shortline railroads as well as coast-to-coast commercial lines.
- Uninterrupted supply to our customers for 25 years.



IntegriCo Composites Inc.

COMPANY NAME	IntegriCo Composites Inc.
PRODUCT/ SERVICE NAME	IntegriTies™
HEADQUARTERS	Louisiana, USA
REVENUE	NA
WEBSITE	https://www.integrigo.com/



SOURCE: <https://www.integrigo.com/integrities>

Overview:

IntegriCo Composites' IntegriTies™ provide benefits for all major rail tie applications from the extreme loading conditions of Class I heavy axle load applications to the caustic environment of an industrial chemical processing plant.

Features:

- High compression strength.
- Longer life cycle in harsh climates.
- Immune to insect infestation.
- Fungus and mildew resistant.
- Can be installed with existing equipment alongside wood ties.
- Reduced maintenance benefits especially in critical applications such as tunnels and elevated track.
- Resists damage from caustic and corrosive environments.
- Excellent gauge retention across the life of the tie.
- Built to last up to fifty years in wet, underground, environments.



Vossloh AG

COMPANY NAME	Vossloh AG
PRODUCT/ SERVICE NAME	Commercial Tie 8'6"
HEADQUARTERS	Werdohl, Germany
REVENUE	918.3 million EUR
WEBSITE	https://www.vossloh.com/en/



SOURCE: <https://www.vossloh.com/en/products-and-solutions/products-at-a-glance/concrete-ties/>

Overview:

In January 2017, Rocla Concrete Tie, Inc. was acquired by the Vossloh Group, and now concrete tie products are part of the larger rail infrastructure portfolio offered by Vossloh North America. Rocla is the leading supplier of pre-stressed concrete crossties and switch ties in North America, serving Class I, industrial, and transit railroads. Rocla maintains its commitment to providing high quality concrete tie products delivered on-time and on budget.

Features:

- Improved track surface, alignment and gauge holding performance which reduces the risk of derailment.
- Strong, stable track structures which can support high speed and heavy haul rail applications.
- Smooth running surface which lowers overall costs by increasing rail life and reducing locomotive fuel consumption.
- Longer lifecycles by providing exceptional durability and resistance to weathering and corrosion.



American TieTek LLC,

COMPANY NAME	American TieTek LLC,
PRODUCT/SERVICE NAME	TieTek™ composite ties
HEADQUARTERS	Texas, USA
REVENUE	NA
WEBSITE	http://www.tietek.net/



SOURCE: <http://www.tietek.net/product.asp>

Overview:

TieTek has developed a high-performance, long lasting composite crosstie with an estimated lifespan of over 40 years. The ties install like wood, are extremely strong, and are impervious to weather, moisture and other harsh environments. They are unaffected by fungi, insect damage and are highly resistant to wear. These characteristics enable TieTek™ composite ties to deliver superior long-term economic benefits, improved track performance, reduced operational costs and bring a positive environmental contribution.

Features:

- Significantly reduced maintenance, longer tie life, minimum disposal costs and reduced rail down time.
- TieTek™ composite ties have been shown to improve track performance over time.
- They are not susceptible to plate cutting or decay, and they hold spikes and screws very well, so they maintain gauge on both straight and curved track over millions of gross tons of load, increasing track reliability and safety.
- TieTek™ composite ties are 85% recycled material.
- Each mile of TieTek track uses approximately 2 million plastic bottles, 9 million plastic bags and 10,000 scrapped vehicle tires instead of consuming over 750 trees.



POTENTIAL BUYERS & LICENSEES:

A & K RAILROAD MATERIALS, INC.	INTEGRICO COMPOSITES INC.	THE INDIAN HUME PIPE
ABETONG	KIMES STEEL & RAIL, INC.	VOSSLOH AG
AMERICAN TIETEK LLC	KIRCHDORFER GROUP	WEIHAI RUIHE RAILWAY SLEEPER
ANYANG GENERAL INT. CO.	KOPPERS INC.	AND MANY MORE...
ARCELORMITTAL	KUNMING RAILWAY SLEEPER	
ARKANSAS STEEL ASSOCIATES, LLC	L.B. FOSTER COMPANY	
ASTEC INDUSTRIES, INC.	LANKHORST MOULDINGS	
ATLAS TRADING INT. LLC	NINGENMURA COMPANY	
AUSTRAK PTY LTD	NISUS CORPORATION	
AVENG INFRASET	PANDROL LIMITED	
BIOS COMMERCIAL WOOD	PATIL GROUP	
BRIDGEWELL RESOURCES	PETERSON ASTEC INDUSTRIES INC	
BUCK CO. INC.	SANNOSUKE KOBAYASHI CO. LTD.	
EWOOD SOLUTIONS	SCHWIHAG	
GANTRY RAILING LTD	SHANGHAI BOSHENG IND., CO., LTD	
GREENRAIL GROUP	SICUT ENTERPRISES LIMITED	
GROSS & JANES CORPORATION	SUMITOMO CORP. OF AMERICAS GROUP	
HENGCHANG RAILROAD SLEEPER	TANK FAB	



Patent Valuation

Estimated Value of Patent US 10,456,959:

Utilizing the Market approach methodology described on Page 1 and Appendix I.

The value is anticipated as:

High Value: \$ 278,800

Low Value: \$ 139,400

Current Market Value: \$209,100

SAMPLE



Appendix I: Patent Valuation:

There are 3 classic valuation methodologies: Cost, Income and Market Approach. IP Approach utilizes the Market Approach for providing patent valuation. This valuation is based upon market value which is realized from market transactions and makes use of the prices actually paid for comparable assets.

In addition, the following patent value indicators are utilized which include: backward citations; forward citations; Claims; Patent family; Litigations; Licensing opportunities; Current technology in patent sector; and Life remaining.

Patents are a veritable moving target; with the price affected by the buyers perceived level of need plays a significant role in driving the price. How one or more specific buyers plan to use a particular group of assets will help determine the price it eventually sells for, as well as perceived need, cash position, and strength of their current patent coverage.

IP Approach's team of analysts develop a consensus approach that reflects the actual anticipated market conditions.



Appendix II: Definitions

Citations may be made by the author (**Backward Citations**) or by the examiner (**Backward Citations by Examiner**). They comprise a list of references that are believed to be relevant prior art and which may have contributed to the "narrowing" of the original application. The examiner can also cite references (**Non-Patent Citations**) from technical journals, textbooks, handbooks and sources.

Forward Citations are US patents or applications that cite this patent as a reference.

Claim(s)

The definition of the monopoly rights that the applicant is trying to obtain for the invention. The claims become the actual monopoly that is given when the patent is granted. A patent consists of a specification and one or more claims. A claim in the patent consist of a preamble and one or more claim elements. The claims define, in technical terms, the extent of the protection conferred by a patent, or the protection sought in a patent application.

A valid claim is one which on the invention described in the specification but does not read on any prior art.

There are two basic types of claims:

- the **independent claims**, which stand on their own, and
- the **dependent claims**, which depend on a single claim or on several claims and generally express particular embodiments as fall-back positions.

Patent Evaluation Index Factors Scoring:

Applies a numeric score to each individual index from 0 to 4. Each index definition starts at zero (0) for the lowest possible value thru four (4) for the highest possible value.

- 0 = Not Used or Poor
- 1 = Low
- 2 = Average
- 3 = Very Good
- 4 = Excellent