MATERIAL TECHNOLOGIES INC /CA/
Form 10-K
March 30, 2001

UNITED STATES
SECURITIES AND EXCHANGE COMMISSION

Washington, D.C. 20549

FORM 10K

[X] ANNUAL REPORT PURSUANT TO SECTION13 OR 15(d) OF THE
SECURITIES EXCHANGE ACT OF 1934

For the fiscal year ended December 31, 2000

Commission file number - 33-23617

MATERIAL TECHNOLOGIES, INC.
(Exact name of registrant as specified in its charter)

Delaware	95-4622822
State or other jurisdiction of incorporation or organization	(I.R.S. Employer Identification No.)
Suite 707, 11661 San Vicente Boulevard, Los Angeles, California (Address of principal executive offices)	90049 (Zip Code)

Registrant's telephone number, including area code (310) 208-5589

Securities Registered pursuant to Section12(b) of the Act:

Title of each class	Name of each exchange on which registered
None	

Securities Registered pursuant to Section12(g) of the Act:
Common Stock
(Title of Class)

Indicate by check mark whether the registrant (1) has filed all reports required to be filed by Section13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days. Yes /X/ No / /.

Indicate by check mark if disclosure of delinquent filers pursuant to Item 405 of Regulation S-K (Section 229.405 of this chapter) is not contained herein, and will not be contained, to the best of registrant's knowledge, in definitive proxy or information statements incorporated by reference in Part III of this Form 10-K or any amendment to this Form 10-K. [ ]

State the aggregate market value of the voting stock and non-voting common equity held by non-affiliates computed by reference to the price at which the common equity was sold, or the average bid and asked price of such common equity as of a specified date within the past 60 days. (See definition of affiliate in Rule 12b-2 of the Exchange Act.)

The aggregate market value of the common stock held by non-affiliates of the registrant as of March 20, 2001, was $1,428,890 based on the average of the bid and asked price of $.12 as reported by the OTC electronic bulletin board on such date.

Indicate the number of shares outstanding of each of the registrant's classes of common stock, as of the last practicable date.

1

As of March 20, 2001, there were 31,168,167 shares of Common Stock, $.001 Par Value issued and outstanding.

As of March 20, 2001, there were 100,000 shares of Class B Common Stock, $.001 Par Value issued and outstanding.

DOCUMENTS INCORPORATED BY REFERENCE

List hereunder the following documents incorporated by reference and the part of the Form 10-K (e.g., Part I, Part II, etc.) into which the document is incorporated: (1) Any annual report to security holders; (2) Any proxy or information statement; and (3) Any prospectus filed pursuant to Rule 424(b) or (c) under the Securities Act of 1933. The listed documents should be clearly described for identification purposes (e.g., annual report to security holders for fiscal year ended December 24, 1980).

There is no annual report, proxy statement, or prospectus to incorporate by reference.

The S-1 Registration Statement for Material Technologies, Inc., effective July 31, 1997 with exhibits is incorporated by reference.

PART I
MATERIAL TECHNOLOGIES, INC.

ITEM 1. BUSINESS

Material Technologies, Inc. ("Matech"), is engaged in research and development of metal fatigue detection, measurement, and monitoring technologies. As such, the Company is developing a comprehensive system of monitoring devices for detecting structural stress and metal fatigue measurement, and monitoring technologies. Matech is a development stage company doing business as Tensiodyne Scientific Corporation.

The Company's efforts are dedicated to developing devices and systems that indicate the true fatigue status of a metal component. The Company has developed two products. The first is a small, extremely simple device that continuously monitors fatigue life in a structural member. It is called a Fatigue Fuse (FFTM). The second is an instrument that is intended to measure the amount of fatigue life remaining in an existing structural member. Nothing like it currently exists in materials technology. Further it has the ability to determine the presence of cracks. The crack detection modality has a resolution of a few microns, exceeding the current state of the art by fifty times or more. It is called an Electrochemical Fatigue Sensor (EFSTM). Both devices are pioneering technology in the fatigue field that stands as cutting-edge solutions. They are both well patented.

Future products under development are a smart Bridge Management System, a Clamp Load Sensor for aerospace products, and a partnering relationship for development of a Borescope for remote EFS delivery, and a combined Fatigue Fuse and Electrochemical Fatigue Sensor.

The Company believes the Fatigue Fuse, in its present state, is ready for commercialization in certain specified markets, but requires significant additional research and development for commercialization in other markets.

Matech is also the exclusive licensee of the Electrochemical Fatigue Sensor ("EFS"), which like the Fatigue Fuse is ready for commercialization in certain specified markets, but requires significant additional research and development for commercialization in other markets. The Fatigue Fuse and the Electrochemical Fatigue Sensor are intended to measure the progression of fatigue and the status of fatigue respectively in metal structures.

The Company was formed as a Delaware corporation on March 4, 1997. It is the successor to the business of Material Technology, Inc., a Delaware corporation, also doing business as Tensiodyne Scientific, Inc., ("Matech 1") and Matech 1 was the successor to the business of Tensiodyne Corporation that began developing the Fatigue Fuse in 1983. The Company's two predecessors, Tensiodyne Corporation and Matech 1 were engaged in developing and testing the Fatigue Fuse and, beginning in 1993, developing the EFS.

DESCRIPTION OF TECHNOLOGIES

BACKGROUND

Fatigue is a consequence of a metal object undergoing repeated cyclic strain. In a commercial context this strain and concomitant stress comes about as a result of a large number of cycles of loading and unloading. Sudden fracture can result. Fatigue damage and the resulting compromise of stability and integrity of the member experiencing fatigue presents the potential for structural failure and extreme danger. Objects such as bridges and airplane wings are subject to fatigue, and it is obvious that sudden fracture of such structures would have disastrous results. It is presently not possible, under any generally acceptable theory of fatigue phenomena, to predict by analysis alone when the limit is reached and when a fracture may occur. Further, in normal usage, damage occurs cumulatively, at microscopic levels, and can only be detected in the early stages at a time when dire results can be avoided by examining the microscopic structure.

This difficulty has caused designers of structures subject to fatigue to be extremely conservative by designing structures in a manner which maintains the stresses presented in critical areas of a structure at a level well below the known endurance limits of the material employed. In many instances this results in extreme expense. In spite of this "over designing", catastrophic fatigue failures still occur. Thus there is a need for a means of measuring the state of fatigue life since the best available methods of analysis are very inadequate.

THE FATIGUE FUSE

The Fatigue Fuse is designed to be affixed to a structure to give warnings as preselected portions of the fatigue life have been used up (i.e., how far to failure the structure has progressed). It warns against a condition of widespread generalized cracking due to fatigue.

The Fatigue Fuse is a thin piece of metal similar to the material being monitored. It consists of a series of parallel metal strips connected to a common base, much as fingers are attached to a hand. Each "finger" has a different geometric pattern called "notches" defining its boundaries. Each finger incorporates a design specific notch near the base. By applying the laws of physics to determine the geometric contour of each notch, the fatigue life of each finger is finite and predictable. When the fatigue life of a finger (Fuse) is reached, the Fuse breaks.

By implementing different geometry for each finger in the array, different increments of fatigue life are observable. Typically, notches will be designed to facilitate observing increments of fatigue life of 10% to 20%. By mechanically attaching or bonding these devices to different areas of the structural member of concern, the Fuse undergoes the same fatigue history (strain cycles) as the structural member. Therefore, breakage of a Fuse indicates that an increment of fatigue life has been reached for the structural member. The notch and the size and shape of the notch concentrate energy on each finger. The Fuse is intimately attached to the structural member of interest. Therefore, the Fuse experiences the same load and wear history as the member.

Management believes that the Fatigue Fuse will be of value in monitoring aircraft, ships, bridges, conveyor systems, mining equipment, cranes, etc. No special training will be needed to qualify individuals to report any broken segments of the Fatigue Fuse to the appropriate engineering authority for necessary action. The success of the device is contingent upon Matech's successful development and marketing of the Fatigue Fuse, and no assurance can be given that Matech will be able to overcome the obstacles relating to introducing a new product to the market. To determine its ability to produce and market the Fatigue Fuse, Matech needs substantial additional capital and no assurance can be given that needed capital will be available.

In a new structure we can generally assume there is no fatigue and can thus design the fatigue fuse for 100% of its life potential. But in an existing structure, one that experienced loading and wear, we must determine the fatigue status of that structural member so we can design the Fatigue Fuse to monitor the remaining fatigue life potential. The EFS is dedicated to that purpose.

ELECTROCHEMICAL FATIGUE SENSOR ("EFS")

In August 1993, Tensiodyne, a predecessor of the Company, entered into two agreements, a license agreement and a development agreement, with the University of Pennsylvania regarding a new invention designed to measure electrochemically the status of fatigue of a structure without knowing the structure's past loading history. Under the license agreement, 12,500 shares of Tensiodyne's common stock were issued, a 5% royalty on sales of this product was granted, and under the development agreement Tensiodyne agreed to pay $11,112 per month for 18 months, for a total payment of $200,000. As of this date, no payments have been made on this obligation. On December 17, 1997, the company and the University modified the terms of the licensing agreement and related obligation. The terms of the modified agreements include an increase in the University's royalty to 7% of the sale of related products, additional shares of the Common Stock to equal 5% of the Company's outstanding stock until the Company receives an additional $2,000,000 in paid in capital, and to pay to the University 30% of any amounts the Company raises in excess of $150,000 (excluding amounts received on government grants or contracts) up to $200,000 plus interest at 1.5% per month from June 30, 1997.

The EFS is a device that employs the principle of electrochemical/mechanical interaction to measure the state of fatigue damage in a metal structural member. It is expected to provide a means for determining the fatigue age of that member so that appropriate action (monitor, replacement, or repair) can be taken before structural failure occurs.

The EFS functions by treating the location of interest (the target) associated with the structural member as an electrode of an electrochemical cell. To complete the electro-cellular reaction an electrolyte, in the form of a low

corrosion gel, is placed in contact with the target. By imposing a constant voltage-equivalent circuit as the control mechanism for the electrochemical reaction - at the target surface - current flows as a function of stress action. The EFS is always a dynamic process; therefore stress action is required, e.g.: to measure a bridge structural member it is necessary that cyclic loads be imposed, as normal traffic on the bridge would do. The results are a specific set of current waveforms and amplitudes that is expected to characterize and report fatigue damage (age).

Stress points are very often located in difficult-to-get-at places for humans. Therefore, it has become desirable to miniaturize the process and develop a means for delivery to inaccessible areas. The answer is borescope technology, that is currently unproven and being developed. The Company is highly dependent on this technology for much of its potential market.

DEVELOPMENT OF TECHNOLOGIES

STATUS OF THE FATIGUE FUSE

The development and application sequence for the Fatigue Fuse and EFS is (a) Basic Research, (b) Exploratory Development, (c) Advanced Development, (d) Prototype Evaluation, (e) Application Demonstration, and (f) Commercial Sales and Service. The Fatigue Fuse came first. The inventor, Professor Maurice Brull, conducted the Basic Research at the University of Pennsylvania. Matech conducted the Advanced Development, including variations of the adhesive bonding

process, and fabricating a laboratory-grade remote recorder for finger separation events that constitute proper functioning of the Fatigue Fuse. The next step, Prototype Evaluation encompassing empirical tailoring of Fuse parameters to fit the actual spectrum loading expected in specific applications, needs to be done. The associated tests include both coupon specimens and full-scale structural tests with attached Fuses. A prototype of a flight qualifiable operational separation event recorder was designed, fabricated, and successfully demonstrated. The next tasks will be to prepare a mathematical analysis for more efficient selection of Fuse parameters and to conduct a comprehensive test program to prove the ability of the Fatigue Fuse to accurately indicate fatigue damage when subjected to realistically large variations in spectrum loading. The final tasks prior to marketing will be an even larger group of demonstration tests.

The Fatigue Fuse is at its final stages of testing and development. To begin marketing the Fuse will take from 6 to 12 months and cost approximately $600,000, including technical and beta testing and final development. If testing, development, and marketing are successful, management estimates Matech should begin receiving revenue from the sale of the Fatigue Fuse within a year of receiving the $600,000. Management cannot estimate the amount of revenue that may be realized from sales of the Fuse.

To date, certain organizations have included Matech's Fatigue Fuse in test programs. Already completed are tests for welded steel civil bridge members conducted at the University of Rhode Island. In 1996, Westland Helicopter, a British firm, tested the Fatigue Fuse on Helicopters. That test was successful with the legs of the Fuses failing in sequence as predicted.

STATUS OF THE EFS

The EFS currently has certain limitations. To obtain meaningful measurements,

the process requires that at least 50% of the fatigue life has occurred. Also, the process has only been perfected for commercial use with mild and soft steels. This limits the use of EFS presently to such applications as bridges, ships, cranes, etc. Use in more exotic structures such as aircraft and turbine engines is currently precluded. Although there is a vast body of testing supporting successful use of this methodology, for selected aluminum alloys, to date, there has not been any confirmed success in aircraft and turbine engines. Management cannot assure that the method will work in the field.

GOVERNMENT FUNDING

In August 1996, the Company executed a teaming agreement with Southwest Research Institute (SWRI) and the University of Pennsylvania (the Team) for research and development efforts. On February 25, 1997, the team was awarded a $2.5 million Phase I contract to "determine the feasibility of the EFS to improve the U. S. Air Force capability to perform durability assessments of military aircraft, including air frames and engines through the application of the EFS to specific military aircraft alloys." Matech's share of this award was approximately $550,000. On June 18, 1998 the team was awarded a second contract in the amount of $2,061,642 to "determine the applicability of the EFS to improve the U. S. Air Force capability to perform durability assessments of military aircraft, including both air frames and engines through the application of the EFS to specific military aircraft alloys." Matech's share of this award is approximately $350,000. On February 5, 1999_a third contract in the amount of $2,000,000 was awarded to Matech to continue and expand the efforts for turbine engines. Matech's share is approximately $400,000. A fourth contract was awarded on November 3rd, 2000 to continue the borescope and EFS technologies, as well as alternate means of fatigue sensing. Matech's share of this contract is approximately $500,000.

Accordingly, over the last 4 years approximately $8.5 million was awarded to research and develop the EFS. The results of this research are encouraging and provide a basis for the Company and its research partners to obtain additional funding. No assurance can be given, however, that such funding will be received.

The Company continues in its efforts to raise funds from numerous sources, including various state and federal governmental agencies and/or private or public offerings of securities. At this time, however, the Company has no firm agreements.

COMMERCIAL APPLICATIONS OF THE COMPANY'S TECHNOLOGIES

No commercial application of Matech's products has been arranged to date, but the technology has matured to a point where it can, in the opinion of management, be applied to certain markets. Matech's technology is applicable to many market sectors such as bridges and aerospace as well as ships, cranes, power plants, nuclear facilities, chemical plants, mining equipment, piping systems, and "heavy iron." Matech has chosen to begin commercialization, in an alliance with another party, in the bridge market. Preliminary discussions are underway. The second market sector that will be pursued is aerospace. The aerospace industry is concerned with aluminum alloys and titanium alloys. This market opportunity will follow a different time line, budget, and market model. There can be no assurance of success until the technology is successfully installed in the field and passed required testing and validation.

THE BRIDGE MARKET

In the U.S. alone there are over 610,000 bridges of which over 260,000 are rated

by the Federal Highway Administration as requiring major repair, rehabilitation, or replacement. Although there are normal business imperatives, the market is essentially macro-economically and government policy driven. In the opinion of management, "only technology can provide the solution". The need for increased spending accelerates significantly each year as infrastructure ages. Analysis by infrastructure economic experts, including the Federal Highway Administration, confirms that $9 billion per year, for bridges alone, is the minimum required to maintain the status quo. Since that amount has not been available, and a backlogged repair bill of more than $358 billion has already accrued, greater efficiencies in the management of current budgets are the only solution. In the 1991 ISTEA initiative (Intermodal Surface Transportation and Efficiency Act) and recently in the $200 billion 1998 TEA-21 initiative (Transportation Equity Act) Bridge Management Systems have been mandated as a matter of policy.

MANUFACTURING

Certain manufacturers are capable of producing the Fatigue Fuse and EFS at reasonable cost. No assurance can be given, however, that these devices will be successfully manufactured, that they can be commercially produced, that they will perform to Management's expectations, or that they will be successfully marketed. Moreover, significant competition may develop.

PATENTS

Matech is the assignee of four patents originally issued to Tensiodyne Corporation. The first was issued on May 27, 1986, and expires on May 27, 2003. It is titled "Device for Monitoring Fatigue Life" and bears United States Patent Office Numbers 4,590,804. The second patent, titled "Method of Making a Device for Monitoring Fatigue Life" was issued on February 3, 1987 and expires February 3, 2004, United States Patent Office Number 4,639,997. The third patent, titled "Metal Fatigue Detector" was issued on August 24, 1993 and expires on August 24, 2010, United States Patent Number 5,237,875. The fourth patent, titled "Device for Monitoring the Fatigue Life of a Structural Member and a Method of Making Same," was issued on June 14, 1994 and expires on June 14, 2011, United States Patent Number 5,319,982. In addition, the Company owns a fifth patent titled "Device for Monitoring the Fatigue Life of a Structural Member and a Method of Making Same" with United States Patent Number 5,425,274.

PRODUCT DISTRIBUTION METHODS

Provided there are funds to support such activities, as to which no assurance can be given, Matech intends to exhibit the Fatigue Fuse and the Electrochemical Fatigue Sensor at various aerospace trade shows and will also market its products directly to end users, including aircraft manufacturing and aircraft maintenance companies, crane manufactures and operators, certain state regulatory agencies charged with overseeing bridge maintenance, companies engaged in manufacturing and maintaining large ships and tankers, and the military. Although management intends to undertake marketing, dependent on the availability of funds, within and with out the United States, no assurance can be given that any such marketing activities will be implemented.

COMPETITION

Other technologies exist which indicate fatigue damage. Single cracks larger than a minimum size can be found by nondestructive inspection methods such as dye penetrant, radiography, eddy current, acoustic emission, and ultrasonics. Tracking of load and strain history, to subsequently estimate fatigue damage by computer processing, is possible with recording instruments such as strain

gauges and counting accelerometers. These methods have been used for 40 years and also offer the advantage of having been accepted in the market, whereas Matech's products remain largely unproven for some currently indeterminable period. Companies marketing these alternate technologies include Magnaflux Corporation, Kraut-Kermer-Branson, Dunegan-Endevco, and MicroMeasurements. These companies have more substantial assets, greater experience, and more resources than Matech, including but not limited to established distribution channels and an established computer base. The familiarity and loyalty to these technologies may be difficult to dislodge. Because Matech is still in its development stage, it is unable to predict whether its technologies will be successfully developed and commercially attractive in potential markets.

EMPLOYEES

The Company has three employees, Robert M. Bernstein, President and Chief Executive Officer, a Secretary, and one part time engineer. In addition, the Company retains consultants for specialized work such as an accountant who oversees the Company's government contracts.

ITEM 2. PROPERTIES

The Company leases an office at 11661 San Vicente Blvd., Suite 707, Los Angeles, California, 90049. The space consists of 830 square feet and will be adequate for the Company's current and foreseeable needs. The total rent is payable at $2,137 per month through May 31, 2001, and increases to $2,348 on June 1, 2001, and expires on June 1, 2002.

Matech owns a remote monitoring system and certain equipment that was being used by the University of Pennsylvania for instructional and testing purposes. The Company determined that the system has no future use and probably cannot be sold. Therefore, the Company charged its full costs of $97,160 to operations, which are included in general and administrative expenses.

ITEM 3. LEGAL PROCEEDINGS

The Company is not presently involved in any legal proceedings that in management's opinion might have a material effect on the Company.

ITEM 4. SUBMISSION OF MATTERS TO A VOTE OF SECURITY HOLDERS.

NONE

PART II

ITEM 5. MARKET FOR REGISTRANT'S COMMON EQUITY AND RELATED STOCKHOLDER MATTERS

The Company's common stock is traded on the NASDAQ Bulletin Board. Its symbol is MTEY.

From January 1999 through December 31, 2000, Matech's Common Stock was quoted between a low bid of $.10 per share and a high bid of $2.875 per share on the NASDAQ Bulletin Board. Such over-the-counter quotations reflect inter-dealer prices, without retail markup, markdown, or commission and may not necessarily represent actual transactions. The following chart shows the high and low bid prices per share per calendar quarter from January 1999 to December 2000.

	High Bid Price (1)	Low Bid Price (1)

First Quarter 1999	$ .625	$ .218
Second Quarter 1999	$ .625	$ .37
Third Quarter 1999	$ .625	$ .32
Fourth Quarter 1999	$ 1.75	$ .375
First Quarter 2000	$ 2.875	$ .343
Second Quarter 2000	$ 1.437	$ .42
Third Quarter 2000	$ .54	$ .22
Fourth Quarter 2000	$ .312	$ .13