

SECURITIES AND EXCHANGE COMMISSION

Washington, D.C. 20549

FORM S-8

REGISTRATION STATEMENT

UNDER

THE SECURITIES ACT OF 1933

SENESCO TECHNOLOGIES, INC.

(Exact name of registrant as specified in its charter)

Delaware

(State or other jurisdiction of incorporation or organization)

84-1368850

(I.R.S. Employer Identification Number)

**303 George Street, Suite 420, New Brunswick, New Jersey 08901
(732) 296-8400**

(Address, including zip code, and telephone number, including area code, of registrant's principal executive offices)

Amended and Restated 2008 Incentive Compensation Plan

(Full title of the plan)

**Leslie J. Browne, Ph.D, President and Chief Executive Officer
303 George Street, Suite 420, New Brunswick, New Jersey 08901
(732) 296-8400**

(Name, address, including zip code, and telephone number, including area code, of agent for service)

Copies of all communications, including all communications sent to the agent for service, should be sent to:

**Emilio Ragosa, Esq.
Morgan Lewis & Bockius, LLP
502 Carnegie Center
Princeton, New Jersey 08540
(609) 919-6600**

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer or a smaller reporting company. See definitions of "large accelerated filer", "accelerated filer", and "smaller reporting company" in Rule 12b-2 of the Exchange Act:

Large accelerated filer ☐

Accelerated filer ☐

Non-accelerated filer ☐
(Do not check if a smaller reporting company)

Smaller reporting company ☒

CALCULATION OF REGISTRATION FEE

Title of Securities to be Registered	Amount to be Registered ^{(1) (2)}	Proposed Maximum Offering Price Per Share ⁽³⁾	Proposed Maximum Aggregate Offering Price ⁽³⁾	Amount of Registration Fee
Common Stock, \$0.01 par value per share	5,000,000 shares	\$ 0.49	\$ 2,450,000	\$ 174.69

(1) On May 25, 2010, an additional 5,000,000 shares of common stock became available for issuance under the Senesco Technologies, Inc. 2008 Incentive Compensation Plan, as amended and restated in accordance with the provisions of the plan.

(2) Pursuant to Rule 416 of the Securities Act of 1933, as amended, this registration statement shall also cover any additional shares of common stock which become issuable under the Senesco Technologies, Inc. 2008 Incentive Compensation Plan, as amended and restated, by reason of any stock split, stock dividend, recapitalization, combination of shares, exchange of shares, spin-off transaction or other change affecting the outstanding Common Stock as a class without the Company's receipt of consideration, or should the value of outstanding shares of Common Stock be substantially reduced as a result of a spin-off transaction or an extraordinary dividend or distribution, or should there occur any merger, consolidation or other reorganization.

(3) Estimated solely for the purposes of calculating the registration fee pursuant to Rules 457(c) and 457(h) of the Securities Act of 1933, as amended, and based upon the average of the reported high and low sales prices per share of the common stock of Senesco Technologies, Inc. on June 3, 2010, as reported by the NYSE Amex. Pursuant to Rule 457(h)(2) of the Securities Act of 1933, as amended, no separate registration fee is required with respect to the plan interests.

PART I

Information Required in the Section 10(a) Prospectus

As permitted by the rules of the Securities and Exchange Commission, referred to herein as the Commission, under the Securities Act of 1933, as amended, this Registration Statement on Form S-8 omits the information specified in Part I of Form S-8.

PART II

Information Required in the Registration Statement

Item 3. Incorporation of Documents by Reference

Senesco Technologies, Inc. (the “Registrant”) hereby incorporates by reference into this Registration Statement on Form S-8 (the “Registration Statement”) the following documents previously filed with the Securities and Exchange Commission (the “Commission”):

- (a) Our Annual Report on Form 10-K, as amended and restated on Form 10-K/A, for the fiscal year ended June 30, 2009 (Commission File No. 001-31326), filed on September 28, 2009, with such amended and restated 10-K/A filed on October 28, 2009, pursuant to Section 13(a) or 15(d) of the Securities Exchange Act of 1934, as amended (the “Exchange Act”), in which there is set forth the audited financial statements for the Registrant’s fiscal year ended June 30, 2009;
- (b) Our Quarterly Report on Form 10-Q for each of the quarters ended September 30, 2009 and December 31, 2009 and March 31, 2010;
- (c) Our Current Reports on Form 8-K, filed with the Commission on July 10, 2009, July 10, 2009, July 30, 2009, November 4, 2009, November 9, 2009, November 16, 2009, November 25, 2009, January 11, 2010, January 19, 2010, February 4, 2010, February 22, 2010, February 22, 2010, February 22, 2010, March 4, 2010, March 5, 2010, March 29, 2010, April 5, 2010, April 8, 2010 (as amended by Form 8-K/A on April 8, 2010), May 5, 2010, May 25, 2010, May 28, 2010; and
- (d) Our registration statement on Form 8-A filed with the Commission on May 14, 2002, in which there is described the terms, rights and provisions applicable to the Registrant’s outstanding common stock.

All reports and definitive proxy or information statements filed pursuant to Section 13(a), 13(c), 14 and 15(d) of the Exchange Act after the date of this registration statement and prior to the filing of a post-effective amendment which indicates that all securities offered hereby have been sold or which de-registers all securities then remaining unsold, shall be deemed to be incorporated by reference into this registration statement and to be a part hereof from the date of filing of such documents. Unless expressly incorporated into this registration statement, a report furnished on Form 8-K under the Exchange Act shall not be incorporated by reference into this registration statement. Any statement contained in a document incorporated or deemed to be incorporated by reference herein shall be deemed to be modified or superseded for purposes of this registration statement to the extent that a statement contained herein or in any subsequently filed document which also is deemed to be incorporated by reference herein modifies or supersedes such statement. Any such statement so modified or superseded shall not be deemed, except as so modified or superseded, to constitute a part of this registration statement.

Item 4. Description of Securities

Not applicable.

Item 5. Interests of Named Experts and Counsel

Not applicable.

Item 6. Indemnification of Directors and Officers

Section 145 of the Delaware General Corporation Law empowers a Delaware corporation to indemnify any person who was or is a party or is threatened to be made a party to any threatened, pending or completed action, suit or proceeding, whether civil, criminal, administrative or investigative (other than an action by or in the right of such corporation) by reason of the fact that such person is or was a director, officer, employee or agent of such corporation, or is or was serving at the request of such corporation as a director, officer, employee or agent of another corporation or enterprise. A corporation may, in advance of the final disposition of any civil, criminal, administrative or investigative action, suit or proceeding, pay the expenses (including attorneys' fees) incurred by any officer, director, employee or agent in defending such action, provided that the director or officer undertakes to repay such amount if it shall ultimately be determined that he is not entitled to be indemnified by the corporation. A corporation may indemnify such person against expenses (including attorneys' fees), judgments, fines and amounts paid in settlement actually and reasonably incurred by such person in connection with such action, suit or proceeding if he acted in good faith and in a manner he reasonably believed to be in or not opposed to the best interests of the corporation, and, with respect to any criminal action or proceeding, had no reasonable cause to believe his conduct was unlawful.

A Delaware corporation may indemnify officers and directors in an action by or in the right of the corporation to procure a judgment in its favor under the same conditions, except that no indemnification is permitted without judicial approval if the officer or director is adjudged to be liable to the corporation. Where an officer or director is successful on the merits or otherwise in the defense of any action referred to above, the corporation must indemnify him against the expenses (including attorneys fees) which he actually and reasonably incurred in connection therewith. The indemnification provided is not deemed to be exclusive of any other rights to which an officer or director may be entitled under any corporation's by-law, agreement, vote or otherwise.

Our certificate of incorporation includes a provision that eliminates the personal liability of our directors to us or our stockholders for monetary damages for breach of their fiduciary duty to the maximum extent permitted by the DGCL. The DGCL does not permit liability to be eliminated (i) for any breach of a director's duty of loyalty to us or our stockholders, (ii) for acts or omissions not in good faith or that involve intentional misconduct or a knowing violation of law, (iii) for unlawful payments of dividends or unlawful stock repurchases or redemptions, as provided in Section 174 of the DGCL, or (iv) for any transaction from which the director derived an improper personal benefit. In addition, as permitted in Section 145 of the DGCL, our certificate of incorporation and by-laws provide that we shall indemnify our directors and officers to the fullest extent permitted by the DGCL, including those circumstances in which indemnification would otherwise be discretionary, subject to certain exceptions. Our by-laws also provide that we shall advance expenses to directors and officers incurred in connection with an action or proceeding as to which they may be entitled to indemnification, subject to certain exceptions.

Each of our indemnification agreements with each of our executive officers and directors provides for indemnification to the maximum extent permitted by applicable law. We also indemnify each of our directors and executive officers with the maximum indemnification allowed to directors and executive officers by the DGCL, subject to certain exceptions, as well as certain additional procedural protections. In addition, we will generally advance expenses incurred by directors and executive officers in any action or proceeding as to which they may be entitled to indemnification, subject to certain exceptions.

The indemnification provisions in our certificate of incorporation and by-laws also permit indemnification for liabilities arising under the Securities Act of 1933. Insofar as indemnification for liabilities arising under the Securities Act of 1933 may be permitted to directors, officers and controlling persons pursuant to the foregoing provisions, or otherwise, we have been advised that in the opinion of the SEC such indemnification is against public policy as expressed in the Securities Act of 1933 and is, therefore, unenforceable.

We currently carry director and officer liability insurance in the amount of \$10,000,000.

Item 7. Exemption from Registration Claimed

Not applicable.

Item 8. Exhibits

Exhibit Number	Exhibit
5.1*	Opinion of Morgan, Lewis & Bockius LLP, counsel to Registrant.
23.1*	Consent of Goldstein Golub Kessler LLP.
23.2*	Consent of McGladrey & Pullen, LLP.
23.3*	Consent of Morgan, Lewis & Bockius LLP (included in Exhibit 5.1).
24*	Power of Attorney (included on the signature pages of this Registration Statement).
99.1	2008 Incentive Compensation Plan, as amended and restated (Incorporated by reference to exhibit 10.1 to Form 8-K filed on May 28, 2010).

* Filed herewith

Item 9. Undertakings

A. The undersigned Registrant hereby undertakes:

(i) To file, during any period in which offers or sales are being made, a post-effective amendment to this Registration Statement:

(a) To include any prospectus required by Section 10(a)(3) of the Securities Act;

(b) To reflect in the prospectus any facts or events arising after the effective date of this Registration Statement (or the most recent post-effective amendment thereof) which, individually or in the aggregate, represent a fundamental change in the information set forth in this Registration Statement. Notwithstanding the foregoing, any increase or decrease in volume of securities offered (if the total dollar value of securities offered would not exceed that which was registered) and any deviation from the low or high end of the estimated maximum offering range may be reflected in the form of prospectus filed with the Commission pursuant to Rule 424(b) if, in the aggregate, the changes in volume and price represent no more than 20 percent change in the maximum aggregate offering price set forth in the "Calculation of Registration Fee" table in the effective registration statement; and

(c) To include any material information with respect to the plan of distribution not previously disclosed in this Registration Statement or any material change to such information in this Registration Statement; *provided, however*, that paragraphs (i) and (ii) of this section do not apply if the Registration Statement is on Form S-8 and the information required to be included in a post-effective amendment by those paragraphs is contained in reports filed with or furnished to the Commission by the Registrant pursuant to Section 13 or Section 15(d) of the Exchange Act that are incorporated by reference in this Registration Statement.

(ii) That, for the purpose of determining any liability under the Securities Act, each such post-effective amendment shall be deemed to be a new registration statement relating to the securities offered therein, and the offering of such securities at that time shall be deemed to be the initial *bona fide* offering thereof.

(iii) To remove from registration by means of a post-effective amendment any of the securities being registered which remain unsold at the termination of the offering.

B. The undersigned Registrant hereby undertakes that, for purposes of determining any liability under the Securities Act, each filing of the Registrant's annual report pursuant to Section 13(a) or Section 15(d) of the Exchange Act that is incorporated by reference in this Registration Statement shall be deemed to be a new registration statement relating to the securities offered therein, and the offering of such securities at that time shall be deemed to be the initial *bona fide* offering thereof.

C. Insofar as indemnification for liabilities arising under the Securities Act may be permitted to directors, officers and controlling persons of the Registrant pursuant to the foregoing provisions, or otherwise, the Registrant has been advised that in the opinion of the Securities and Exchange Commission such indemnification is against public policy as expressed in the Securities Act and is, therefore, unenforceable. In the event that a claim for indemnification against such liabilities (other than the payment by the Registrant of expenses incurred or paid by a director, officer or controlling person of the Registrant in the successful defense of any action, suit or proceeding) is asserted by such director, officer or controlling person in connection with the securities being registered, the Registrant will, unless in the opinion of its counsel the matter has been settled by controlling precedent, submit to a court of appropriate jurisdiction the question whether such indemnification by it is against public policy as expressed in the Securities Act and will be governed by the final adjudication of such issue.

Signatures

Pursuant to the requirements of the Securities Act of 1933, the registrant certifies that it has reasonable grounds to believe that it meets all of the requirements for filing on Form S-8 and has duly caused this registration statement to be signed on its behalf by the undersigned, thereunto duly authorized, in the City of New Brunswick, State of New Jersey, on this 8th day of June, 2010.

SENESCO TECHNOLOGIES, INC.

By: /s/ Leslie J. Browne

Name: Leslie J. Browne

Title: President and Chief Executive Officer

Power of Attorney

KNOW ALL MEN BY THESE PRESENTS, that each person whose signature appears below constitutes and appoints Leslie J. Browne and Joel Brooks, jointly and severally, his true and lawful attorneys-in-fact and agents, each with full power of substitution and resubstitution, for him and in his name, place and stead, in any and all capacities, to sign any and all amendments to this registration statement, and to file the same, with exhibits thereto, and other documents in connection therewith, with the Securities and Exchange Commission, granting unto said attorneys-in-fact and agents, and each of them, full power and authority to do and perform each and every act and thing requisite or necessary to be done in and about the premises, as fully to all intents and purposes as he might or could do in person, hereby ratifying and confirming all that each of said attorneys-in-fact and agents, or his substitute or substitutes, may lawfully do or cause to be done by virtue hereof.

Pursuant to the requirements of the Securities Act of 1933, this registration statement has been signed below by the following persons in the capacities and on the dates indicated.

Signature	Title	Date
<u>/s/ Leslie J. Browne</u> Leslie J. Browne, Ph.D.	President, Chief Executive Officer and Director (Principal Executive Officer)	June 8, 2010
<u>/s/ Joel Brooks</u> Joel Brooks	Chief Financial Officer, Secretary and Treasurer (Principal Financial and Accounting Officer)	June 8, 2010
<u>/s/ Harlan W. Waksal, M.D.</u> Harlan W. Waksal, M.D.	Chairman of the Board and Director	June 8, 2010
<u>/s/ John E. Thompson</u> John E. Thompson, Ph.D.	Executive Vice President of Research and Development and Director	June 8, 2010
<u>/s/ John N. Braca</u> John N. Braca	Director	June 8, 2010
<u>/s/ Christopher Forbes</u> Christopher Forbes	Director	June 8, 2010
<u>/s/ Jack Van Hulst</u> Jack Van Hulst	Director	June 8, 2010
<u>/s/ Warren J. Isabelle</u> Warren J. Isabelle	Director	June 8, 2010
<u>/s/ Thomas C. Quick</u> Thomas C. Quick	Director	June 8, 2010
<u>/s/ David Rector</u> David Rector	Director	June 8, 2010
<u>/s/ Rudolf Stalder</u> Rudolf Stalder	Director	June 8, 2010

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* Filed herewith

June 8, 2010

Senesco Technologies, Inc.
303 George Street, Suite 420
New Brunswick, New Jersey 08901

Re: Senesco Technologies, Inc. – Registration Statement on Form S-8

Dear Ladies and Gentlemen:

We have acted as counsel to Senesco Technologies, Inc., a Delaware corporation (the “Company”), in connection with the preparation of a Registration Statement on Form S-8 (the “Registration Statement”) under the Securities Act of 1933, as amended (the “Act”). The Registration Statement relates to the registration of up to 5,000,000 shares of the Company’s common stock, par value \$0.01, issuable under the Company’s 2008 Incentive Compensation Plan, as amended and restated (collectively, the “Shares”).

In connection with this opinion letter, we have examined the Registration Statement and originals, or copies certified or otherwise identified to our satisfaction, of the Certificate of Incorporation and Bylaws of the Company and such other documents, records and other instruments as we have deemed appropriate for purposes of the opinion set forth herein.

We have assumed the genuineness of all signatures, the legal capacity of all natural persons, the authenticity of the documents submitted to us as originals, the conformity with the originals of all documents submitted to us as certified, facsimile or photostatic copies and the authenticity of the originals of all document submitted to us as copies.

Based upon the foregoing, we are of the opinion that the Shares have been duly authorized by the Company and, when issued and sold by the Company and delivered by the Company against receipt of the purchase price therefor, in the manner contemplated by the Company’s 2008 Incentive Compensation Plan, as amended and restated, as the case may be, will be validly issued, fully paid and non-assessable.

The opinions expressed herein are limited to the Delaware General Corporation Law.

We hereby consent to the use of this opinion as Exhibit 5.1 to the Registration Statement. In giving such consent, we do not hereby admit that we are acting within the category of persons whose consent is required under Section 7 of the Act or the rules or regulations of the Securities and Exchange Commission thereunder.

Very truly yours,

/s/ Morgan, Lewis & Bockius LLP

CONSENT OF INDEPENDENT PUBLIC ACCOUNTING FIRM

To the Board of Directors
Senesco Technologies, Inc.

We consent to the incorporation by reference in this Registration Statement on Form S-8 of Senesco Technologies, Inc. of our report dated September 26, 2007 on the consolidated statements of operations, stockholders' equity and cash flows of Senesco Technologies, Inc and Subsidiary for the year ended June 30, 2007 and the cumulative amounts from July 1, 1998 (inception) to June 30, 2007, which appears in the June 30, 2009 Annual Report on Form 10-K of Senesco Technologies, Inc. Our report dated September 26, 2007 relating to the consolidated financial statements includes an emphasis paragraph relating to the uncertainty as to the Company's ability to continue as a going concern.

/S/ Goldstein Golub Kessler LLP

GOLDSTEIN GOLUB KESSLER LLP

New York, New York

June 8, 2010

Consent of Independent Registered Public Accounting Firm

We consent to the incorporation by reference in this Registration Statement on Form S-8 of Senesco Technologies, Inc. of our report dated September 25, 2009, relating to our audit of the consolidated financial statements as of June 30, 2009 and 2008 and for the years then ended, which appear in the Annual Report on Form 10-K of Senesco Technologies, Inc. for the year ended June 30, 2009. Our report dated September 25, 2009, relating to the consolidated financial statements includes an emphasis paragraph relating to an uncertainty as to the Company's ability to continue as a going concern.

/S/ McGladrey & Pullen, LLP

New York, New York
June 8, 2010
