Zacks Small-Cap Research

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Anita Dushyanth, PhD
312-265-9434/adushyanth@zacks.com
Brian Marckx, CFA
312-265-9474/bmarckx@zacks.com

scr.zacks.com
10 S. Riverside Plaza, Chicago, IL 60606

# Hamilton Thorne Ltd. (V.HTL -TSXV)

## V.HTL: Record Revenue for 2016, Accretive Strategic Acquisition of Gynemed; Expect Revenue Boost in 2017.

With a discount rate of 9%, a terminal growth rate of 1.5% and 129 million fully diluted shares, our DCF model values Hamilton Thorne at $140 million or $1.10 /share.

| | |
|---|---|
| Current Price(05/12/2017) | $0.83 |
| **Valuation** | **$1.10** |

## OUTLOOK

Hamilton Thorne (TSX: HTL.V) is headquartered in Beverly, MA. The company is a leading provider of laboratory instruments, consumables, software and services to the assisted reproductive technology (ART) and developmental biology research markets .

The company's quality control and production facilities are ISO certified and FDA registered GMP facilities. The firm has sales coverage through distributors in several global regions including Africa, Asia, Europe, the Middle East, the Americas and Oceania. Its newly acquired (April 2017) Gynemed subsidiary is a leading provider of a broad range of branded and distributed products into central Europe.

Based on the firm's financial and operational progress in the past two years, we believe there has been significant de-risking. We believe the shares trade cheaper than fair value.

## SUMMARY DATA

| | |
|---|---|
| **52-Week High** | **1.00** |
| **52-Week Low** | **0.17** |
| **One-Year Return (%)** | **N/A** |
| **Beta** | **2.84** |
| **Average Daily Volume (sh)** | **112,300** |
| **Shares Outstanding (mil)** | **107** |
| **Market Capitalization ($mil)** | **100** |
| **Short Interest Ratio (days)** | **N/A** |
| **Institutional Ownership (%)** | **27.1** |
| **Insider Ownership (%)** | **48.0** |
| **Annual Cash Dividend** | **N/A** |
| **Dividend Yield (%)** | **N/A** |
| **5-Yr. Historical Growth Rates** | |
| **Sales (%)** | **N/A** |
| **Earnings Per Share (%)** | **N/A** |
| **Dividend (%)** | **N/A** |
| **P/E using TTM EPS** | **N/A** |
| **P/E using 2015 Estimate** | **N/A** |
| **P/E using 2016 Estimate** | **N/A** |
| **Zacks Rank** | **N/A** |

| | |
|---|---|
| **Risk Level** | **N/A** |
| **Type of Stock** | **Large-Growth** |
| **Industry** | **Medical Equipment** |

## ZACKS ESTIMATES

**Revenue**
(in millions of $)

| | Q1 (Mar) | Q2 (Jun) | Q3 (Sep) | Q4 (Dec) | Year (Dec) |
|---|---|---|---|---|---|
| 2016 | $2.03A | $2.40A | $2.45A | $3.65A | $10.51A |
| 2017 | $3.50E | $5.80E | $6.15E | $6.38E | $21.83E |
| 2018 | | | | | $26.31E |
| 2019 | | | | | $30.52E |

**Price/Sales Ratio (Industry = 2.5x)**

| | Q1 (Mar) | Q2 (Jun) | Q3 (Sep) | Q4 (Dec) | Year (Dec) |
|---|---|---|---|---|---|
| 2016 | $0.00A | $0.00A | $0.00A | $0.01A | $0.01A |
| 2017 | $0.00E | $0.01E | $0.01E | $0.01E | $0.02E |
| 2018 | | | | | $0.03E |
| 2019 | | | | | $0.03E |

Zacks Projected EPS Growth Rate - Next 5 Years % **N/A**

## WHAT'S NEW

**HTL.V: Record Revenue for 2016, Accretive Strategic Acquisition of Gynemed; Expect Revenue Boost in 2017.**

***Financial Update***

On April 28, 2017 Hamilton Thorne reported financial results for Q4 2016 and annual 2016.

Revenue for Q4 2017 was $3.6 million and for fiscal 2016 amounted to $10.5 million. U.S. sales accounted for 34% of the quarter's revenue. The growth was fueled by sales of LYKOS® clinical laser systems, the addition of three and one-half months of sales from Embryotech Laboratories Inc., and after sales services. Gross margin improved by 150 basis points to 65.3% in 2016 as compared to the prior year – much of which is attributable to the recent Embryotech acquisition. As a reminder HTL acquired Embryotech, a provider of quality control products and services, in September – the acquisition not only expanded and diversified the company's product line, it also brought a recurring revenue stream and incremental gross margins – both of which showed up in the Q4 results. The continued success of growth is due to the diversity of product mix, the impact of higher Embryotech margins as well as tremendous execution by Hamilton Thorne's team.

Significant expenses amounting close to $6 million were incurred in 2016, of which approximately $270,000 of expenses was associated with the completion of Embryotech acquisition. In addition, there was an increase in interest expense due to increased borrowing to complete the Embryotech acquisition as well as added expenses associated with the extension of letters of credit to support the firm's previous bank line of credit. Q4 net income was $0.5 million and EBITDA was $0.8 million, improved from $0.4 million and $0.5 million – which, again, reflects positive contribution from Embryotech. For the year, the firm reported a net income of close to $0.7 million, EBITDA of over $1 million and an EPS of $0.01 per share. All numbers came very close to our estimates.

Cash flow from operations was close to $1 million, and the cash balance as of December 31, 2016 amounted close to $2 million. Assuming revenue growth continues and financial resources grow as per plan, we believe that the current cash position should be sufficient to support operations for the coming year.

Since our initiation (April 2016) and until May 3, 2017's close, the company's shares have risen 274% following two acquisitions.

***Business Update***

Hamilton Thorne, looking to follow-up with the success of their Embryotech acquisition, announced the acquisition of Gynemed GmbH & Co. KG in late April for approximately $15 million using cash, stock and seller debt. Gynemed is a Lensahn, Germany based leading manufacturer and distributor of premium equipment and consumables for the IVF clinic and laboratory markets in Germany, Austria and Switzerland. The acquisition was completed using $9.3 million cash, $2.3 million of stock as well as $3.5 million of unsecured convertible notes. The cash portion was funded by cash on hand, plus $4 million of new debt facility and $9.2 million private placement.

The firm had a $5.5 million five-year term loan at 4.25% maturing in September 2021 and a $2.5 million secured line of credit with a US bank which is scheduled to mature in September 2018 and is subject to renewal. The amended credit agreement will add to its existing credit facility, with two term loans of $4 million at 4.49% and $5.5 million at 4.25% and a $2.5 million line of credit at prime rate (currently 3.75%) which matures two years from the closing date and is renewable annually upon bank approval. Hamilton

Thorne will use the facility to strengthen its working capital position following the acquisition of Gynemed and to position the firm for future growth opportunities.

Service revenue had grown significantly in 2016 and since the strategic focus for their business going forward will be to grow consumable sales, thereby driving recurring revenue, the firm intends to focus their sales efforts on accessories, consumables, software and services. Hamilton Thorne's strategic acquisition of Gynemed, whose consumables segment is roughly 80% of their business, speeds along the company's strategy of diversifying via acquisitions.

Hamilton Thorne's acquisition is a specific, well-articulated value creation strategy that pursues international scale while filling portfolio gaps. Gynemed is a profitable and growing business that offers premium branded/OEM IVF cell culture media, consumables and devices, has an excellent reputation and proven sales channel in the well-established European ART market. Secondly, there is significant expansion in product offering with a highly complementary product portfolio. We think that the combined company can benefit from Hamilton Thorne's strong partnerships in global markets and Gynemed's strong presence in Europe. Working together, they can introduce their products into new territories much more rapidly. The expanded product portfolio allows the company to leverage the existing global distribution infrastructure in key markets not currently served by Gynemed, including the U.S. It positions Hamilton Thorne to better capture higher future growth in key global markets.

Management intends to focus on expanding primarily in territories that accept the CE Mark. The U.S. and Canada business will be the next focus going forward. The company had sales to three major distributors, which exceeded 10% of revenues in 2016. Hamilton Thorne has the second largest trading partnerships with China but Gynemed has not yet penetrated this large market which holds substantial upside potential.

**Valuation**

The past two years have been incredible in terms of growth and transformation as the company continues its rapid expansion through acquisitions. The acquisition of ELI and Gynemed will increase Hamilton Thorne's revenue base. For the year ended December 31, 2016, Gynemed had annual revenues of over $9 million, EBITDA of approximately $2.8 million (approximately $2.3 million after normalization adjustments) and net income of close to $2.5 million (approximately $2 million after normalization adjustments). This acquisition is expected to be immediately accretive to revenue and EBITDA.

We have updated our financial model following 2016 earnings and the recent acquisition. We expect modest increase in net income from Gynemed's product sales during Q2 2017. This is because the acquisition was completed during Q2 2017 (early May 2017) and therefore the net income recognized during this quarter (2 months) will be offset by the acquisition expenses. We expect operational expenses to increase with increased staffing compensation, increased trade show presence and business development expenses. The firm continues to face foreign exchange headwinds as much of its costs are in U.S. dollars and more than 60% of its instrument sales are outside the U.S. We think the effect of FX can be offset as Embryotech's services and consumables will be sold in the U.S. and Gynemed operates largely in Europe. The updated financial model suggests a price target of $1.10/share, over 33% above the current trading level.

## SNAPSHOT


- Hamilton Thorne (TSX: HTL.V), headquartered in Beverly, MA designs and develops laser devices and image analysis systems for assisted reproduction and developmental biology research applications.

- Currently, the company develops miniature lasers that attach to standard inverted microscopes for use in scientific applications and in vitro fertilization (IVF) procedures. The firm has five lasers that have been introduced: the legacy systems are the ZILOS-tk® and XYClone® while the newer systems are the XYRCOS® and LYKOS® as well as the Stiletto®. Hamilton Thorne's devices are used in fertility clinics for performing IVF procedures as well as in microsurgical procedures with stem cells and living cells in research laboratories.

- The company's image analysis systems are used to improve outcomes in human IVF clinics and in animal breeding facilities and provide high-end toxicology analyses. Hamilton Thorne also sells consumables, software and services.

- Hamilton Thorne's growing worldwide customer base consists of pharmaceutical companies, biotechnology companies, fertility clinics, university research centers, animal breeding companies, and other commercial and academic research establishments, including Harvard, MIT, Yale, McGill, Oxford, Cambridge, the Smithsonian Institution, Charles River Labs, Covance, ABS Global, Sexing Technologies, Merck, Novartis, Pfizer, and Dow Chemical.

- The company sells its products directly and through distributors to customers in the human fertility and animal breeding sectors worldwide.

- Traditionally, the firm has generated increasing revenues from a diversified offering of products to address the wider umbrella under Assisted Reproductive Technologies (ART). The ART market's growth is supported by strong demographic drivers such as increasing maternal age of first pregnancy and increasing wealth in emerging markets.

- Hamilton Thorne is planning to grow the company via a combination of product innovation, selective acquisitions of complimentary products and strategic execution.

- The firm's portfolio benefits from both product (multiple products) and geographic (more than sixty countries in developed and emerging markets) diversification.

- The company generated roughly $9 million in revenue and more than $1 million positive cash flow from operations in 2015.

- In April 2015, the company purchased the Oosight® product line from Perkin Elmer. The Oosight system allows the user to visualize and quantify structures within an unfertilized egg that are not visible with conventional microscopy. The acquisition was accretive to earnings in 2015.

- In September 2016, Hamilton Thorne acquired Embryotech Laboratories a Massachusetts based provider of quality control testing services and materials, for $7.25 million. The acquisition is expected to be accretive to earnings in 2016.

- In late April 2017, Hamilton Thorne announced the acquisition of Gynemed Gmbh & Co. KG, a Lensahn, Germany based leading manufacturer and distributor of premium equipment and consumables for the IVF clinic and laboratory markets in Germany, Austria and Switzerland, for $15 million using cash, stock and seller debt. The acquisition is expected to be accretive to earnings in 2017.

- With expectations of continued positive cash flow, HTL.V is well poised to continue its business operations in the near term.

## INVESTMENT THESIS

Hamilton Thorne (TSX: HTL.V) is headquartered in Beverly, MA. The company designs and develops laser devices and image analysis systems for assisted reproduction as well as for research applications in developmental biology.

Hamilton Thorne's marketed products are comprised of miniaturized lasers that attach to standard microscopes and are used for research, animal breeding and human clinical markets as well as image analysis systems, which are used in animal and human fertility, toxicology testing, breeding and research markets. Hamilton Thorne markets state-of-the-art innovative products for all phases of assisted reproductive procedures including fertility related testing, sperm and egg analysis and laser-assisted fertility procedures. The company's devices are used in in-vitro fertilization (IVF) clinics for performing microsurgical procedures on embryos prior to implantation. In animal breeding, Hamilton's products are used in sperm analysis for food production and for research with endangered species and other animals. In the developmental biology research market, Hamilton Thorne's laser systems are used in stem cell derivation, regenerative medical research and genetic engineering of animal models.

Hamilton Thorne provides a suite of post-sale services to support its instrument family and, with the recent acquisition of Embryotech, is now a leading provider of quality control testing services and materials to the ART market.

The devices are approved for sale in Europe (and other territories accepting CE Mark), the U.S., China, Canada as well as a number of other markets. The company's quality control and production facilities are ISO certified and FDA registered GMP facilities. The firm has sales coverage through distributors in several global regions including Africa, Asia, Europe, the Middle East, the Americas and Oceania.

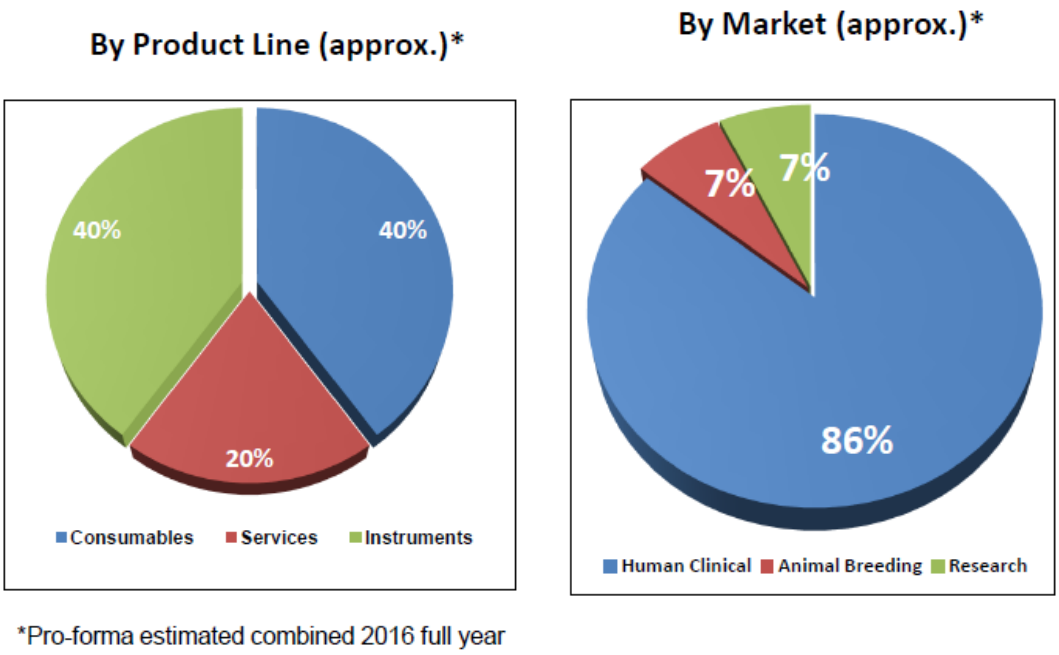
Hamilton Thorne, albeit being a small company, has shown organic revenue growth over the last few years and arrived at what appears may be a formula for long-term success. The key to their success has been the strategy to address assisted fertility procedures, which paralleled the need for such treatments due to low fertility rates and an increase in maternal age for the first pregnancy, especially in developed countries. Hamilton Thorne is a rare bird in the small cap category since it is cash flow positive. The company has demonstrated successful execution of its growth strategy and their focus continues to be in generating positive EBITDA, positive cash flow and net profit for fiscal 2016 and beyond. Management has proven the ability to generate free cash flow by controlling capital expenditures and utilizing cash resources intelligently to benefit shareholders. Going forward the company plans to expand via acquisitions which we believe will help keep R&D costs tempered and which we think will continue to result in positive cash flow generation.

For the current year (2017) and beyond, management expects an increase in R&D spend as a result of plans to invest resources in enhancing products and developing proprietary consumables. In addition, the company expects to increase sales and incentivize their distributors to build market share for their products. Further, management expects to continue to be involved in other business development activities including strategic acquisitions, all of which will result in an increase in sales and marketing expenses. Based on the firm's financial and operational progress in the past two years, we believe there has been significant de-risking. We believe the shares trade cheaper than fair value. Our target price for Hamilton Thorne is $1.10/share.

## INTRODUCTION

Since 2012, Hamilton Thorne has been operating in two healthcare sectors: fertility care and cellular and developmental biology research with products such as precision laser devices and advanced image analysis systems.

In general, the laser systems used in fertility and cellular biology studies are large and expensive. Hamilton Thorne's laser systems are miniaturized so that the unit fits into existing microscopes, provides high image resolution, offers improved working distance as well as controllable micromanipulation procedures. This design provides practical benefit to the medical community. Hamilton Thorne's instruments account for approximately 40% of revenues, consumables account for 40% and services account for the remaining 20%. While the firm does not break out revenues for all of its products, about 70% of the company's business involves human clinical procedures while animal breeding and biology research represent 15% each.




*Pro-forma estimated combined 2016 full year

(Source: http://www.hamiltonthorne.com)

We believe that the firm possesses multiple compelling characteristics that make it an attractive investment including:

- Diversified products, good product recognition, high quality
- Steady revenue stream
- Diversified global distribution of products
- Well-positioned for growth in U.S and global markets
- Attractive growth profile

Further, the company collaborates with well-known research establishments/clinics all over the world where physicians, lab personnel and embryologists are given the opportunity to use the products distributed by Hamilton Thorne. Feedback from these leading institutions helps the company enhance their products and in adapting their treatments to current research findings and advancements. Management has mentioned in the past that clinical research establishments and

other companies have shown interest in their products, which we believe represents a significant growth opportunity over the long-term.

Hamilton Thorne is well positioned to sell IVF laser technology along with its automated sperm analyzer because it is sold to the same customer base with a corresponding price range with an equivalent level of technical complexity. Management has extensive experience with regulatory authorities to handle the compliance for medical devices and industrial scale manufacturing at their ISO 13485 and FDA registered GMP manufacturing facility.

## MARKETED PRODUCTS

### LASER SYSTEMS

Hamilton Thorne's miniature laser systems help in performing robotic microsurgery on cells. In ART procedures, manipulation of stem cells/embryos using lasers has advanced in the past decade. Lasers are routinely used in assisted hatching and their use in embryo biopsy procedures is becoming more prevalent. In order to provide consistency, reproducibility and reliability, lasers are incorporated into microscopes to facilitate the application of rapid laser pulse firing, thereby allowing precise manipulation of embryos and cells. The power and pulse lengths of these infrared lasers are optimized to avoid damage to the DNA and the embryo as well as minimize mechanical strain. These user-friendly lasers help in reducing procedure times, which in turn reduces the duration the embryo/cells are exposed to non-ambient conditions. In addition to the utility in ART procedures, this laser technology is also used in life sciences research applications such as laser ablation for cell regeneration studies as well as cloning for genetic research and regenerative medicine.

The FDA classifies lasers for IVF as Class II medical devices. As per Occupational Safety & Health Administration (OSHA) safety standards, lasers used in IVF procedures are classified as a Class 1 laser product[1]. The company's objective lenses with laser sources can be screwed into the turret of most standard inverted or upright microscopes.

**Clinical Lasers**


LYKOS Laser


ZILOS-tk Laser

(Source: http://www.hamiltonthorne.com/)

***Clinical Lasers;*** The LYKOS and ZILOS-tk Class 1 lasers feature a 1460 nm, 300 mW laser and a pulse length as low as 1 microsecond. The LYKOS laser provides high image quality, improved working distance, multi-pulse software that allows rapid and repeated firing mode for fast and easy biopsy, and is compatible with all major microscope models with no laser

[1] https://www.osha.gov/dts/osta/otm/otm_iii/otm_iii_6.html

alignment required. The laser beam is not transmitted through the eyepiece thus making it safe for the eyes. The brightness of the Red-i LED indicator spot found in the LYKOS is adjustable and visible through the microscope's eyepiece. It can be installed on any inverted microscope. This model offers the flexibility of hands-free laser firing.

## Research Lasers


XYRCOS Laser


XYClone Laser


Stiletto Laser

(Source: http://www.hamiltonthorne.com/)

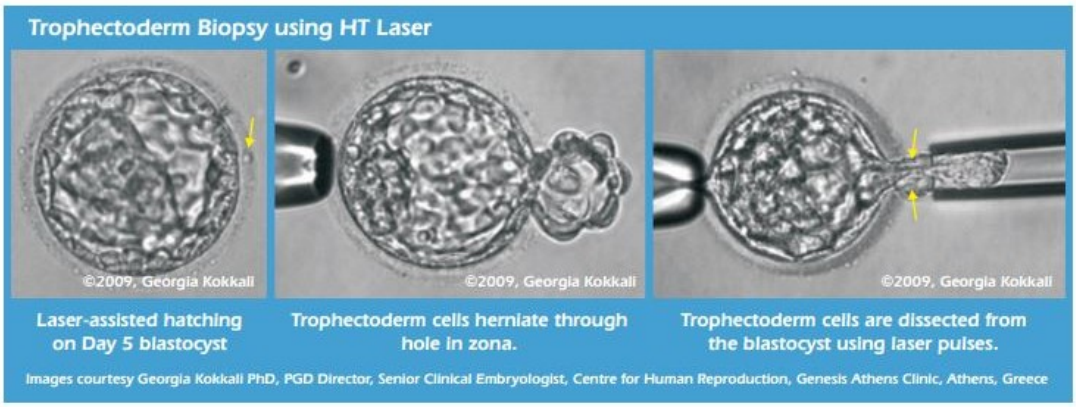
***Research Lasers:*** The firm offers the legacy system, XYClone and the newer XYRCOS laser systems for research applications. Both these systems are a high power, Class 1, 1460 nm infrared lasers with a specially designed 40x or 20x objective lens that functions in both visible and near infrared wavelengths. The lasers attach to the microscope just like any typical objective lens and allow the use of the microscope's standard features, such as fluorescence and Hoffman imaging. These systems are used for non-contact ablation of targeted membranes or structures.

The XYRCOS laser module comes with a RED-i target locator that is integrated into the objective lens. The patented Stiletto laser combines a proprietary laser, controller software and an automated stage for rapidly scoring of adherent stem cells. Unlike mechanical separation methods, the Stiletto allows isolation of multiple stem cell colonies for ablation in a streamlined fashion. Such non-contact laser-based elimination preserves the genetic integrity of the stem cell colony while removing unwanted cells. Such a system gives an opportunity for researchers to standardize a protocol easily so that the procedure is automated and the results are uniform across all users.

***Clinical Laser Applications***

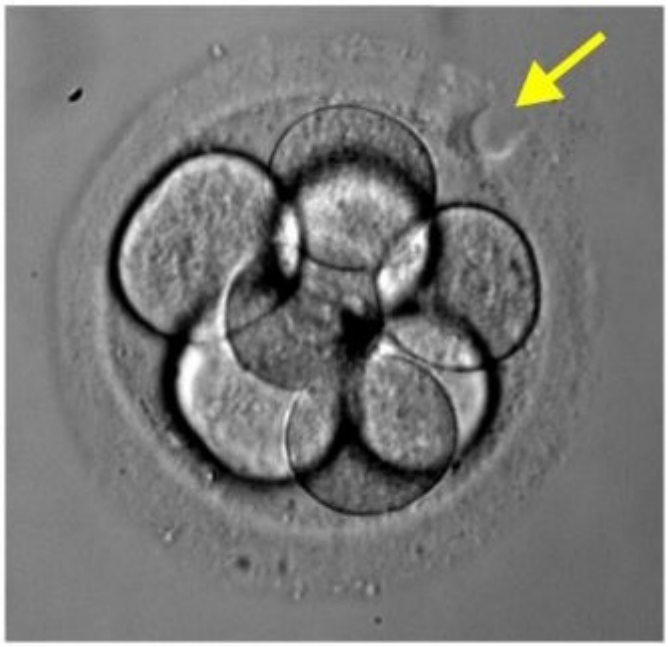
- ***Blastomere Biopsy (embryo biopsy)*** is a technique that is performed during an IVF procedure to obtain embryonic DNA for preimplantation genetic diagnosis (PGD). On the third day of an embryo's development, a single cell (blastomere) is removed and the developing embryo is then returned to the incubator for continued development.

- ***Trophectoderm Biopsy*** is an alternative method of embryo biopsy that is gaining rapid adoption, where the trophectoderm cells (extra-embryonic tissue) are removed. This method does not affect the inner cell mass, has less impact on the embryo and more cells can be obtained for analysis for improved detection. The LYKOS laser aids the trophectoderm biopsy procedure by breaching the outer layer of the embryo and dissecting these cells using the laser so that the cells may be quickly removed for biopsy, which limits the amount of time the embryo, spends outside the incubator.




(Source: www.hamiltonthorne.com)

- ***Laser-assisted Hatching (LAH):*** Assisted hatching is used to help the embryo hatch from its protective outer shell, and promote implantation in the uterine wall after embryo transfer. LAH with the LYKOS or ZILOS-tk uses a highly focused infrared laser beam to remove the outer shell in precise increments. LAH requires less handling of the embryo and is quicker than mechanical or chemical methods. Therefore, the embryo spends less time outside the incubator.



(Source: www.hamiltonthorne.com/)

***Research Laser Applications***

- *Transgenic Animal Production:* In the conventional procedure to produce a transgenic mouse, which lasts approximately nine months, gene targeted embryonic stems cells are injected into blastocyst of a mouse embryo. Breeding of the resulting chimeric mouse results in the transmission of the mutation required to obtain mutant mice for phenotypic studies. In the laser-assisted procedure, embryonic stem cells are injected beneath the outer shell of an early stage embryo. The resulting mice are entirely derived from the injected embryonic stem cells. These mice can be

phenotyped directly, which saves roughly six months of preparation time when compared with the conventional procedure.

- In blastomere and trophectoderm biopsy, the laser assists in the removal of targeted cells for genetic testing. The human embryonic stem cell lines serve as an important model of the genetic disorders that they carry. Laser-assisted isolation of the inner cell mass may be applied for the derivation of new stem cell lines in a xeno-free system for future clinical applications.

- The laser system speeds up the process of enucleation to a matter of seconds, without eliciting damage to the egg. In addition to facilitating the removal of nuclear material via aspiration, the laser has been used to deactivate the DNA in zebrafish eggs. The laser system ablates cellular structures for developmental biology studies on organisms such as zebrafish, C. elegans, planaria, and slipper snails.

- Laser-assisted IVF may be performed to increase breeding efficiency of laboratory animals. By opening the outer shell of oocytes with the laser, increased levels of fertilization can be realized with certain inbred mouse strains or with poor quality sperm.

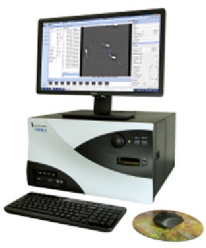
**IMAGING SYSTEMS**

The company also develops advanced image analysis systems, such as the Computer Aided Sperm Analysis (CASA) system and Oosight imaging system.

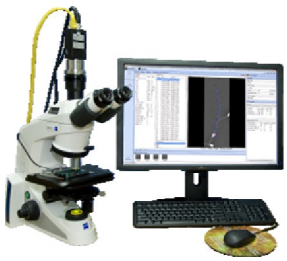
The CASA system measures sperm motility, concentration and motion characteristics, performs real-time morphometrics on live, motile images and records and saves video for later use. These systems provide image-based quantitative and objective analysis of the sperm to meet the needs of IVF clinics, toxicology testing and stem cell and regenerative medical research. Currently, the most popular method for evaluating sperm motility is using CASA.

The company's Oosight system allows the user to visualize and quantify structures within an unfertilized egg that are not visible with conventional microscopy.

**CASA Systems**



IVOS II



CEROS II

TOX IVOS II

(Source: http://www.hamiltonthorne.com/)

The CASA systems are comprised of an optical component and a computer installed with sperm motion analysis software. The CASA software has the capability to track cell motility, determine counts as well as analyze a cell's kinematics/functionality in a manner that is adequate for routine clinical applications. Analysis results include sperm counts, concentration, motility, progressive motility, curvilinear velocity (VCL), straight line velocity (VSL), average path velocity (VAP), linearity (LIN), straightness (STR), amplitude of lateral head displacement (ALH) and beat cross frequency (BCF).

The Integrated Visual Optical System (IVOS) integrates the optical system within the unit, thus eliminating the need for an external microscope. The CEROS Sperm Analyzer uses an external negative phase contrast microscope for image visualization. The newer IVOS II platform features a streamlined, ergonomic design, high resolution digital camera, new software interface and enhanced mechanical performance. The CEROS II platform also features a high resolution digital camera and new software interface. The systems utilize phase contrast optics, an imaging frequency of sixty images per second as well as several user-adjustable settings to control more aspects of cell detection and static/non-progressive/progressive sperm motility differentiation.

On October 13, 2016, Hamilton Thorne released a newer version (release version: 1.10) of their Computer Assisted Sperm Analysis (CASA) software that has been in use in the Assisted Reproductive Technologies (ART) market. The updated software contains various enhancements to the existing version with two entirely new modules.

The Remote Capture Station, which was originally released only for the human clinical market, is now available for all animal applications. The remote capture station is a cost-efficient, stand-alone video capture system that allows smaller establishments to process samples and save data for future analysis on an IVOS II or CEROS II analyzer at the main laboratory. These workstations have been designed for ease of use, remote review and analysis. This module is available for purchase by new as well as existing customers.

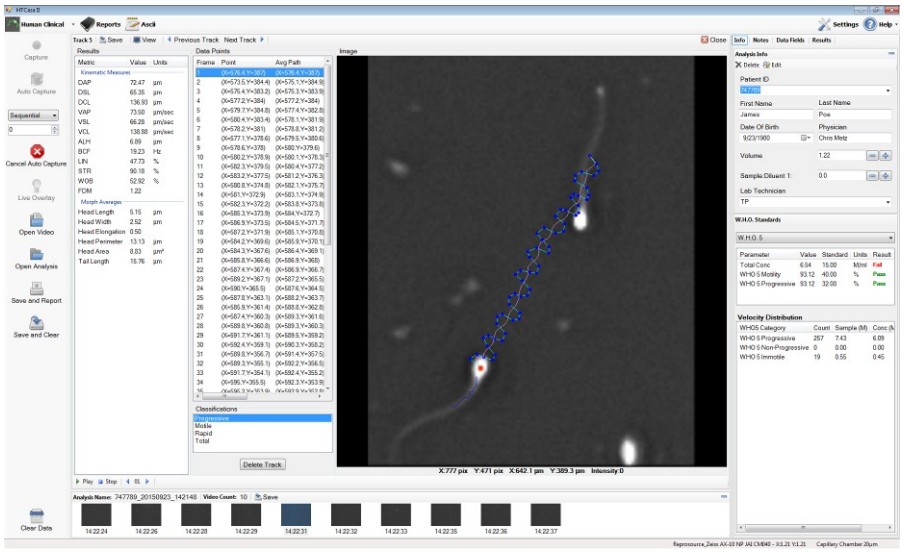
In order to minimize errors and improve standardization of the CASA software between systems and laboratories, internal quality control and standardization for technical accuracy seem mandatory. Hamilton Thorne has developed the Internal Quality Control (IQC) module for the human clinical market to enable daily internal quality control of the assays. The module provides a method of verifying microscope calibration and monitoring precision of quality control materials by referring to a historical database. The module also features custom report design, with Levey-Jennings chart and results based on Westgard rules. This module is available as an upgrade (no additional charge) for existing customers and as a standard for new customers.

Labs initially compared duplicate sperm suspension samples (two aliquots of the same sample) manually. Hamilton Thorne's Replicate analysis feature for the human clinical market now provides this comparison in an automated fashion. This allows easy compliance and standardization to meet World Health Organization (WHO) recommendations. Additional new features and enhancements of the CASA software include generating custom reports including both sperm motility and morphology analysis, improved non-progressive sperm analysis, improvements and updates to the IVOS II's unique auto illumination feature and IVOS II automated stage compatibility with analysis slides containing more than four chambers.

Unlike microscopes with continuous fluorescent light, the IVOS has stroboscopic light source; this is beneficial when utilizing the IDENT fluorescent option, which allows motile sperm analysis under fluorescent illumination without adverse effect on sperm motility. With the VIADENT option, the IVOS permits the analysis of motility and viability on a live sample by combining analysis under phase contrast and fluorescent illumination sources. The TOX

IVOS II system for sperm analysis has been validated in reproductive toxicology labs and is configured specifically for analyzing the intricacies of rat sperm.

The Dimensions II Strict morphology (human only), HT Morph (multi-species) and DNA Frag software are options available for either CASA II platform. The IDENT and VIADENT options require additional hardware and are available on the IVOS platform only.



(Source: http://www.hamiltonthorne.com/)

The ART process involves harvesting sperm and eggs, using in-vitro fertilization procedures to create viable embryos, monitoring embryo development, testing for genetic disease and transferring best quality embryos with the goal of achieving a successful pregnancy. The Oosight® imaging system is used to help determine which harvested oocytes are at a high risk for producing embryos with abnormal chromosomes. This method is noninvasive, quantitative and reproducible and determines whether oocytes undergoing cryopreservation have abnormal structural integrity and are viable.

An additional tool is the CIVA™ imaging software which captures images and video from any connected microscopic workstation in the laboratory.

***Imaging Applications***

- ***IMSI (Intracytoplasmic Morphologically Selected Sperm Injection)***

Couples who struggle with compromised sperm parameters may undergo a treatment called intracytoplasmic sperm injection (ICSI). More recently, a new technique called intracytoplasmic morphologically selected sperm injection (IMSI), wherein a morphologically better quality, normal sperm is selected under high magnification to be used in the ICSI. This treatment is believed to have the potential to improve reproductive outcomes among couples undergoing an ART procedure. The IMSI-Strict software combines the motile sperm organelle morphology examination (MSOME) and Kruger strict criteria (for analyzing sperm morphology) in one analysis.

- ***Sperm Analysis***

- ***Fertility Testing:*** The CASA system is used to measure sperm concentration, total sperm count, percent motility, percent progressive motility and morphology.
- ***Reproductive Toxicology:*** The TOX IVOS II system is used to study male reproductive toxicology in rat models and the CEROS II system is used in fish models.
- ***Animal Breeding:*** The animal breeding market is comprised of breeding boar for food, equine, wildlife, as well as companion animal breeding.
- ***Biological Research:*** Sperm analyzers are used in a variety of medical and veterinary research applications.

**QUALITY CONTROL PRODUCTS AND SERVICES**

The company's latest acquisition (September 2016) is Embryotech Laboratories Inc. (ELI), offers quality control testing services and products for ART labs in IVF clinics and research universities. ART labs require stringent quality control to ensure that products are nontoxic. Embryotech's facility has earned ISO 17025 certification and operates under strict GMP guidelines.

The acquisition bolts on additional revenue while providing the additional benefit of diversification of the product line and services offerings. Already a leader in precision laser devices and advanced imaging systems, Hamilton Thorne is also now a provider of biological testing for quality control of culture and support media, used for ART in fertility clinics.

***Services:*** ELI provides manufacturers of culture media, labware, disposables and other medical devices that may come into contact with gametes or embryos in the ART lab with a suite of quality control testing services for detecting toxicity.

MEA Assay - ELI's high-throughput embryology laboratory offers the mouse embryo assay (MEA), utilizing one and two-cell embryos, to provide manufacturers with the data they need to receive required regulatory clearances and to continually screen media and materials for toxicity prior to lot release. The MEA is currently the most widely used bioassay to test for toxicity and functionality of media and materials.

LAL Assay - Bacterial endotoxin may hinder the outcome of assisted reproductive technologies and therefore the potential presence of endotoxin must be addressed. Limulus Amebocyte Lysate (LAL) Assay is the most sensitive and specific test available to screen raw material and devices for the presence of harmful levels of endotoxin.

***Products:*** ELI also provides cryopreserved MEA's for ART laboratories that wish to do their own internal quality control testing as well as a range of fresh and frozen mouse and hamster embryo products for training and research purposes.

Hamilton Thorne announced on January 4, 2017 the signing of an agreement with Blood Cell Storage, Inc. (BCSI) that enables HTL.V to distribute BCSI's SAFE Sens TrakStation® and TrakPod® technology. Additionally, Hamilton Thorne will provide a service to retrofit benchtop incubators to monitor pH solutions.

In IVF labs, a consistent and stable incubator environment is required for the successful development of the embryo. Embryos are sensitive to disturbances that occur during routine laboratory handling. To prevent loss of embryos, critical equipment such as an incubator requires a monitoring system, which would register critical parameters such as pH shifts that are trending out of range. Although newer classes of incubators are equipped with pH monitoring capability, several labs having older equipment have no such monitoring system in place. For such labs, Hamilton Thorne offers its services to retrofit benchtop incubators with pH monitoring solutions.

TrakStation and TrakPod are the two latest systems from BCSI for continuous monitoring of pH non-invasively from multiple incubators in IVF labs. For the entire one-week period of the IVF cycle, the system (the TrakPod is attached to the TrakStation) has the capability to monitor and log pH data from as many as eight probes simultaneously. Calibration of the probe is not required. The disposable sensor is replaced once per week. Since this system can continuously monitor pH without opening/closing incubator doors, it promises an uninterrupted incubation cycle that eventually results in better outcomes for IVF procedures.

Management is planning to commence this service in the first quarter, initially retrofitting one brand of incubators. The adoption rate for a retrofit is mostly driven by the existing equipment's age and the economy. Although labs may purchase newer equipment as economy recovers, smaller facilities may still choose to implement retrofit kits for cost advantages.

Looking forward, we anticipate a modest growth from the sale of consumables and services in 2017. This growth should accelerate in 2018 and could become more significant if the company begins to provide retrofit services for other incubator brands.

Strategically, this initiative supports company's efforts to continue to diversify its offerings in the services segment by adding an incubator services offering and positions its service group to be able to offer a broader range of maintenance, service, calibration and QA services to the IVF lab.

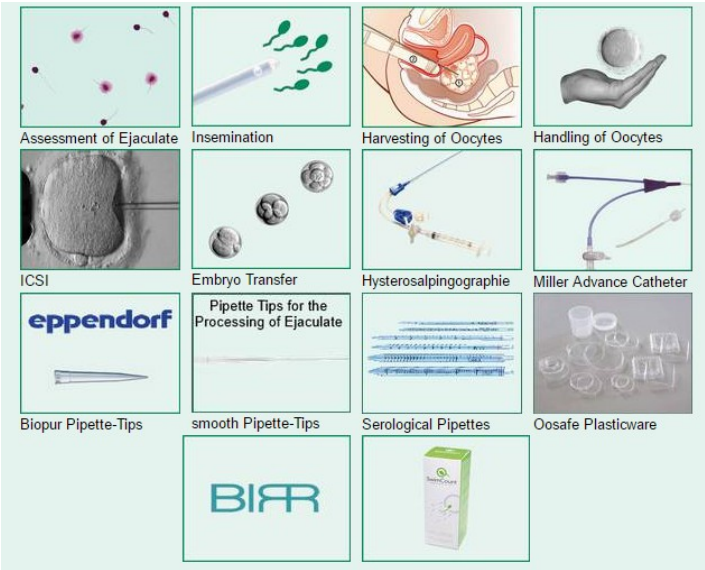
Hamilton Thorne, looking to follow-up with the success of their Embryotech acquisition, announced the acquisition of Gynemed GmbH & Co. KG in late April for approximately $15 million using cash, stock and seller debt. Gynemed is a Lensahn, Germany based leading manufacturer and distributor of premium equipment and consumables for the IVF clinic and laboratory markets in Germany, Austria and Switzerland.

Gynemed offers products for reproductive medicine, including clinical and laboratory equipment and disposables, as well as complete installations of ART clinics. Additionally, Gynemed offers a complete range of cell culture media for the embryology and andrology laboratory in the ART clinic. Founded in 1998, Gynemed's has, since inception, demonstrated a commitment to quality products and services and is expanding across other European markets and internationally.

***Cell culture media***


(Source: http://www.gynemed.de/)

***Consumables***




(Source: http://www.gynemed.de/)

***Equipment***


(Source: http://www.gynemed.de/)

## INTELLECTUAL PROPERTY

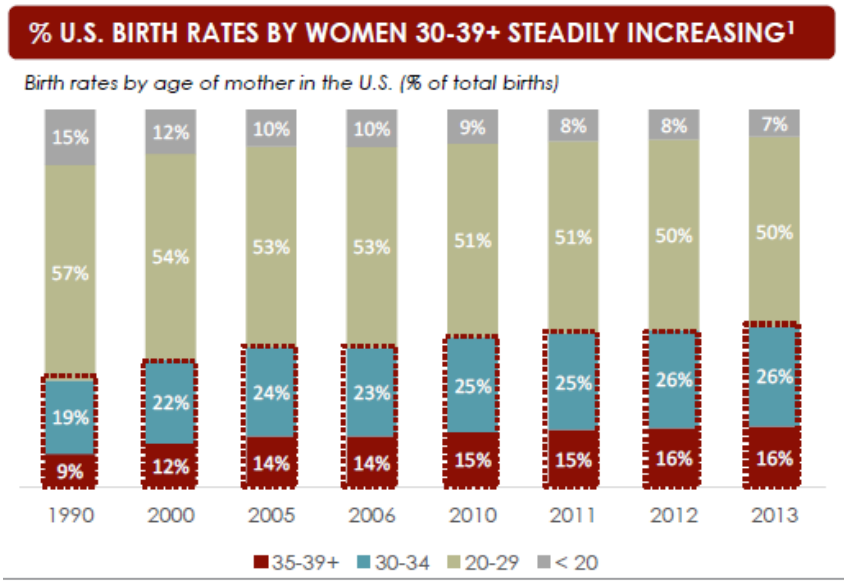
The table below shows the patent details for Hamilton Thorne's products. The firm has been issued six U.S. patents. There are several other patents, issued and pending in different parts of the globe. The commercial window for the products begin to expire from 2026 in the U.S.

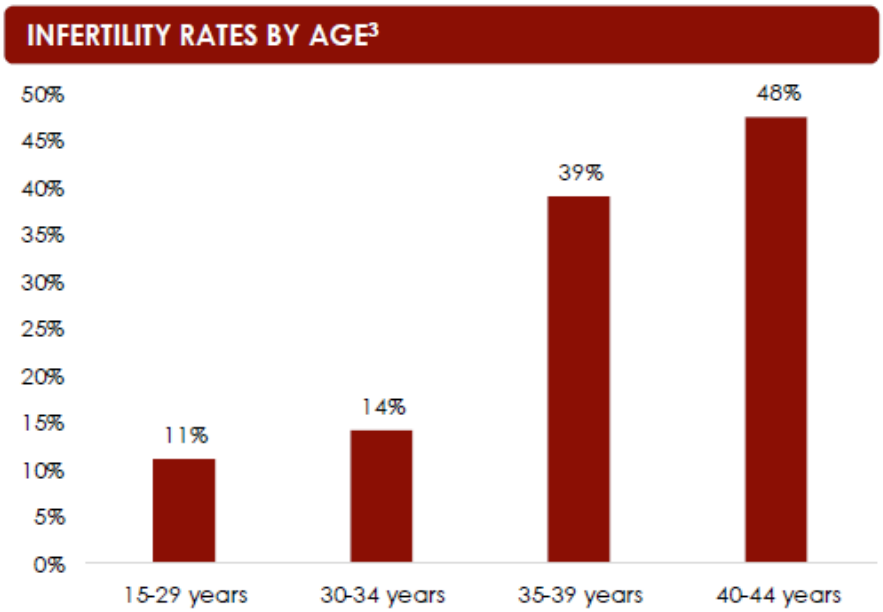
| COUNTRY | REFERENCE# | TYPEFILED | SERIAL# | ISSUED | PATENT# | STATUS |
|---|---|---|---|---|---|---|
| **MICROSCOPE TURRET MOUNTED LASER EPI-ILLUMINATION PORT (ZIloc)** | | | | | | |
| UNITED STATES | 251305/051 | FCA 10/15/2002 | 10/271,708 | 4/15/2008 | 7,358,116 | ISSUED |
| **METHOD FOR CALCULATING AND DISPLAYING THE ISOTHERMAL CONTOURS PRODUCED BY A LASER (Isotherm Ring)** | | | | | | |
| UNITED STATES | 251305/TBA | DIV 6/5/2003 | 10/635,672 | 7/4/2006 | 7,072,377 | ISSUED |
| **LASER ASSEMBLY FOR USE WITH A MICROSCOPE (Multi Wavelength Assembly)** | | | | | | |
| UNITED STATES | 251305/064 | CIP 6/15/2007 | 11/764,064 | 5/10/2016 | 9,395,532 | ISSUING |
| **DEVICE AND METHOD OF MAINTAINING SPERM MOTILITY IN A CAPILLARY-LOADED CHAMBER (Proprietary Slide)** | | | | | | |
| UNITED STATES | 251305/071 | CON 12/8/2008 | 12/330,228 | 10/5/2010 | 7,807,452 | ISSUED |
| **MODULAR OBJECTIVE ASSEMBLY (LYKOS)** | | | | | | |
| UNITED STATES | 251305/074 | FCA 11/6/2009 | 12/615,036 | 4/16/2013 | 8,422,128 | ISSUED |
| CANADA | 251305/082 | DCA 11/6/2009 | 2742847 | PUBLISHED | | |
| CHINA | 251305/084 | DCA 11/6/2009 | 200980154055.5 | 9/24/2014 | ZL200980154055.5 | ISSUED |
| GERMANY | 251305/080 | DCA 11/6/2009 | 09752847.9 | 2/1/2013 | 2370848 | ISSUED |
| FRANCE | 251305/069 | DCA 11/6/2009 | 09752847.9 | 2/1/2013 | 2370848 | ISSUED |
| UNITED KINGDOM | 251305/081 | DCA 11/6/2009 | 09752847.9 | 2/1/2013 | 2370848 | ISSUED |
| JAPAN | 251305/089 | DCA 11/6/2009 | 2011-535729 | 5/30/2014 | 5591179 | ISSUED |
| **OPTICAL INDICATOR FOR MICROSCOPIC LASER BEAM MANIPULATION (RED-I)** | | | | | | |
| UNITED STATES | 251305/072 | FCA 6/8/2009 | 12/481,383 | 4/3/2012 | 8,148,604 | ISSUED |
| JAPAN | 251305/079 | DCA 6/10/2009 | 2011-513852 | 1/24/2014 | 5481539 | ISSUED |
| CHINA | 251305/090 | DCA 6/10/2009 | 200980131210.1 | 3/12/2014 | ZL200980131210.1 | ISSUED |
| EUROPEAN PATENT | 251305/077 | DCA 6/10/2009 | 09763498.4 | PUBLISHED | | |
| **APPARATUS AND METHOD FOR LIVING CELL MANIPULATION (Shiloh)** | | | | | | |
| UNITED STATES | 251305/076 | FCA 6/13/2011 | 13/158,843 | 5/26/2015 | 9,040,272 | ISSUED |
| GERMANY | 251305/088 | DCA 6/13/2011 | 112011101987.1 | PUBLISHED | | |
| UNITED KINGDOM | 251305/099 | DCA 6/13/2011 | 1300653.1 | PUBLISHED | | |
| JAPAN | 251305/097 | DCA 6/13/2011 | 2013-515414 | PUBLISHED | | |

(Source: http://www.hamiltonthorne.com/)

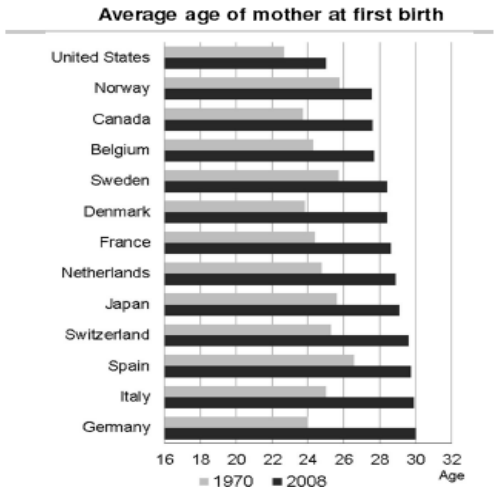
## MARKET

***Fertility Market:*** The average age when a woman bears her first child has risen over time. As per CDC, roughly 20% of women in the U.S. have their first child after thirty-five years of age. About one-third of couples where the woman is older than thirty-five years of age encounter issues related to conception. The delay associated with child bearing can be attributed to several factors including having greater emphasis on careers (in women more so than in men), financial feasibility and marrying later in life. Besides the aforementioned factors, lifestyle factors such as smoking, alcohol consumption, obesity and stress are known to affect conception and child-bearing capabilities.




(Source: Harris Williams & Co, Fertility Market Overview, 2015)




(Source: http://www.hamiltonthorne.com)

According to CDC, about 17% of women, married or otherwise, have trouble conceiving. The percentage of women, thirty years or older and who gave birth for the first time, increased from 5% in 1975 to 26% in 2010. Infertility seems to be positively correlated with age. The infertility rate increases to more than 35% for women aged thirty-five years and over.

In 2012, more than 480 ART specific fertility clinics were present in the U.S. IVF accounts for the majority of ART procedures. Current IVF treatments remain expensive (~$12,000) with relatively low success rates. Treatments over multiple cycles are often required to achieve a successful pregnancy. On average, the probability of having one or more children through an IVF procedure is ~30%. The increase in awareness of ART procedures as well as its acceptance socially has led to more couples seeking ART procedures.

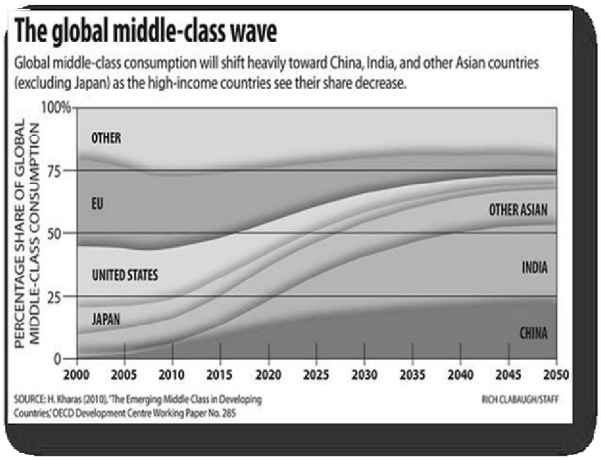
The CDC estimates that ART accounts for more than 1% of total U.S. births. At the same time, an increasing number of same-sex parents driven by greater social acceptance and improved legal rights are expanding the population for donor sperm and other fertility services. It is estimated that up to 6 million children in the U.S. are parented by same-sex parents.

Europe and North America together account for roughly 80% of the total fertility market due to widespread awareness, adoption of new technologies and favorable legal structures. As per a report by Harris and William, the U.S. fertility market is valued at roughly $4 billion, of which ART is valued at approximately $2.5 billion. This sector is forecasted to grow at a CAGR of 4% for the next couple of years due to an increase in aging couples and infertility.

According to Market Research Store, a market research firm, the global IVF market is expected to grow at a CAGR of 7.0% from 2015 to 2021and approach north of $10 billion by 2021. Several factors are expected to drive market growth such as delaying of pregnancy by women due to professional and financial constraints, changing lifestyle, fertility disorders, among many others.

Globally, in developing economies, the fertility market is seeing a robust growth. Recent research has shown that growth in the Asian-Pacific belt has outpaced the growth in Western countries. This could be attributed to infertility arising from infections such as STDs as well as an increase in male infertility diagnoses in developing countries. Accelerating demand for IVF is expected in emerging markets as wealth and the size of the middle class grows. Further, the laws surrounding the fertility treatments in these regions are liberal, thus making these regions an attractive target for these services. Additionally, the growing awareness in reproductive health and increasing access to fertility treatment options are driving growth in this area.

As China's one-child policy was scrapped since January 1, 2016 fertility clinics got a boost in the number of clients attempting to use IVF procedures. Women who had only one child under the old policy and are over the age of 35 are using the opportunity to have more children through ART procedures. However, stringent regulations are enforced in the Chinese IVF market; gender selection is forbidden, birth licenses and marriage certificates are required, and advanced procedures are prohibited. The tight control by the Chinese government has resulted in the IVF business booming in Thailand, Vietnam, Australia and the U.S. as affluent Chinese couples are willing to travel abroad for such procedures. Therefore, the rising demand for fertility treatments by Chinese couples is good news for global IVF clinics. With ~60% of Hamilton Thorne's revenues coming in from ex-U.S. sales, the global presence helps the company capitalize on the growing demand of IVF procedures in emerging markets.




(Source: http://www.hamiltonthorne.com/)

***Regenerative Medicine and Developmental Biology Research Market:*** Regenerative medicine is an arm of tissue engineering where cells are either regenerated, engineered or replaced in order to heal damaged tissues and organs. It offers hope for people who have conditions such as musculoskeletal, cardiovascular, neurological and orthopedic disorders that are beyond repair. Transparency Market Research values the annual regenerative medicine market at roughly $6.5 billion. Additionally, Hamilton Thorne's target market encompasses more than 25,000 research establishments involved in developmental biology and cancer research.

***Animal Breeding Market:*** There is an unprecedented increase in the demand for animal products including meat, and dairy in the U.S. as well as in global regions. Technologies that improve large-scale production efficiency, the quality of breeds and profitability are drivers of the animal genetics market. Research and Markets estimates this sector to grow at a CAGR of ~8% from 2014 to 2020. Hamilton Thorne's sperm analysis systems used in animal breeding applications make up for roughly 15% of the firm's business and stands to gain from this expanding market.

***Toxicity Testing Market:*** Quality control is a prerequisite in IVF labs. Testing for toxicity of media and consumables utilized is essential. With the growing concern in the safety of ART on human embryos, there is a growing demand for quality control and testing in IVF labs. With the recent acquisition of Embryotech, the company now has presence in the bioassay testing market.


(Source: http://www.hamiltonthorne.com)

## COMPETITORS

The infertility market is rapidly evolving. Competition across various markets is variable depending on the local demand and cost factors. The major competitors who have already gained a foothold in the developed economies include CooperSurgical, VitroLife, Cook, and Irvine Scientific, among many others, all of whom have products in the IVF landscape. The big players have substantially greater financial resources as well as larger established marketing teams, sales channels, distribution networks and support services. For instance, Vitrolife had expanded its market share to approximately 15% by broadening their product portfolio and focusing on marketing efforts.

While we think the competition could prove challenging to Hamilton Thorne, we also believe that the company offers novel devices that provide competitive differentiation. The first 1.48µm, non-contact laser to receive the FDA approval for clinical use in assisted hatching was the ZILOS-tk in 2004, followed by the Octax Laser Shot™ (MTG) in 2006 and the Saturn Active Laser System (Research Instruments) in 2008. Although assisted hatching has not been studied comparing different laser systems, Hamilton Thorne's lasers offer some characteristics that might be advantageous to specific applications. For example, Research Instruments' lasers are compatible with selected microscopes while Hamilton Thorne's are compatible with all major brands of microscopes. Hamilton Thorne's line of laser systems have a built-in collimated red indicator beam that provides a focused red light that aids in firing the laser while looking through the microscope eyepiece. ZILOS-tk and LYKOS lasers indicate the safe zones surrounding the embryo using patented software displaying color-coded rings (Isotherm rings) for different temperatures around the perforation where the operation can be performed without causing any harm to the embryo. The Stiletto laser with controller software and an automated stage provides high speed scoring and separation of adherent cells in culture. The firm's CASA software runs on their proprietary IVOS and its CEROS hardware platforms and calculates cell counts, cell concentrations, tracks and analyzes cell motion and provides data specific to individual

applications. The IVOS is the only CASA system that has an integrated optical system within the unit[2]. The IVOS sperm analyzer is equipped with an automated, built-in, heated stage for precise temperature control and sample positioning[3]. With a breakthrough technology backed by patents and strong market demand, Hamilton Thorne should be able to grow their revenue in the coming years.

In the fragmented U.S. IVF market, M&A deals are active. In August 2015, Longitude Venture Partners and NovaQuest Pharma Opportunities Fund acquired California Cryobank Inc., which provides fertility, cellular therapy, and other fertility related services. In order to maintain a competitive advantage, Hamilton Thorne is constantly on the lookout for new outlets for growth in emerging markets and in overcoming the regional disparities in insurance coverage for such procedures.

Additionally, the company is also on the lookout for strategic investments in companies offering complementary products. The company (April 2015) completed a relatively small and simple deal in their first acquisition of Oosight product line from Perkin Elmer. This acquisition has been accretive to earnings for fiscal year 2015. In mid-September 2016, they acquired Embryotech Labs, provider of quality control testing services and materials. The acquisition diversifies and broadens Hamilton Thorne's existing business. The company estimates a 40% increase in recurring revenue from the sales of services and consumables. The company anticipates more than a 50% increase in 2017 revenue and more than 100% increase in 2017 EBITDA. The company is currently having active discussions and is likely to do acquisitions in complementary areas such as cell culturing, consumables, cryopreservation, diagnostics, image analysis and labware, which may be profitable and provide revenues in the $2-$5 million range[4].

Hamilton Thorne has adopted the route to effectively target market niches where IVF and research is still growing. The company's products hold defendable patents in several regions globally. As the firm continues to acquire and further expand its business in the U.S. and global regions there is a possibility of seeing new complementary products being added to their portfolio.

## REIMBURSEMENT

In general, generous coverage from government or third party insurance reduces the out-of-pocket expense for couples seeking IVF procedures. Reimbursement coverage varies widely in global regions. Israel, the E.U., Latin America and Africa have expanded reimbursement rates as health awareness and access to infertility treatment has become more widespread. In some European countries, ART comes under a standard insurance-covered benefit, while in the U.S. it is affordable only by the affluent. Therefore, a general trend seen in European countries is that the utilization of ART procedures is twice that of the U.S. and probably could be attributed partly to insurance coverage.

In the U.S., several states have passed laws stating that insurance companies need to provide limited or comprehensive coverage for couples seeking infertility treatment. The states that have mandated insurance that covers at least one IVF cycle are Arkansas, Connecticut, Hawaii, Illinois, Maryland, Massachusetts, New Jersey, and Rhode Island. Despite the few states that have mandated insurance coverage for IVF, it is restrictive and is not available to everyone[5].

[2] Pai's Textbook of Intrauterine Insemination, CH3
[3] Equine Reproduction, Angus O. McKinnon, Edward L. Squires, Wendy E. Vaala, Dickson D. Varner John Wiley & Sons, Jul 5, 2011
[4] As per firm provided estimates

[5] Fertility and Sterility, Vol. 95, No. 3, March 1, 2011

This is because of the discrepancies in the legislation between the states based on the definition of infertility, the type of insurance plans under each mandate, and the treatments that are covered. Studies have shown an increase in the number of couples who opted for infertility treatment in states that mandated insurance for IVF procedures. We believe that the availability of mandated comprehensive insurance coverage could drive changes in utilization of such services in the U.S. and other global regions. Having said that, reimbursement alone is insufficient to assess the opportunity in the fertility space. This is because these couples have a strong desire to have children and are willing to pay out-of-pocket.

## FINANCIAL ANALYSIS

Hamilton Thorne has a cash balance of close to $2 million as of December 31, 2016 and has positive operating cash flow. Currently, the company has about $9 million in long-term debt. The firm has raised financing using equity and debt to finance their acquisition strategy, accelerate product development, support working capital needs and in some instances to reduce existing debt.

The company's revenue stems from diversified geographic regions. Roughly 30% of the business is concentrated in North America, 20% in Asia/Pacific region and the remaining 50% in Europe, the Middle East and African countries. The company's reach into sixty countries is primarily through a network of distributors who are responsible for 80% of revenues. The remaining 20% comes from direct sale of new products and applications.

On April 28, 2017 Hamilton Thorne reported financial results for Q4 2016 and annual 2016.

Revenue for Q4 2017 was $3.6 million and for fiscal 2016 amounted to $10.5 million. U.S. sales accounted for 34% of the quarter's revenue. The growth was fueled by sales of LYKOS® clinical laser systems, the addition of three and one-half months of sales from Embryotech Laboratories Inc., and after sales services. Gross margin improved by 150 basis points to 65.3% in 2016 as compared to the prior year – much of which is attributable to the recent Embryotech acquisition. As a reminder HTL acquired Embryotech, a provider of quality control products and services, in September 2016 – the acquisition not only expanded and diversified the company's product line, it also brought a recurring revenue stream and incremental gross margins – both of which showed up in the Q4 results. The continued success of growth is due to the diversity of product mix, the impact of higher Embryotech margins as well as tremendous execution by Hamilton Thorne's team.

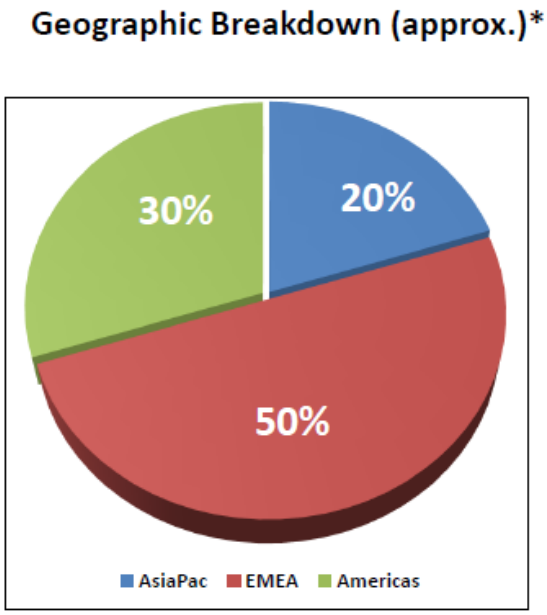
Significant expenses amounting close to $6 million were incurred in 2016, of which approximately $270,000 were associated with the completion of Embryotech acquisition. In addition, there was an increase in interest expense due to increased borrowing to complete the Embryotech acquisition as well as added expenses associated with the extension of letters of credit to support the firm's previous bank line of credit. Q4 net income was $0.5 million and EBITDA was $0.8 million, improved from $0.4 million and $0.5 million – which, again, reflects positive contribution from Embryotech. For the year, the firm reported a net income of close to $0.7 million, EBITDA of over $1 million and an EPS of $0.01 per share.

Cash flow from operations was close to $1 million, and the cash balance as of December 31, 2016 amounted close to $2 million. Assuming revenue growth continues and financial resources grow as per plan, we believe that the current cash position should be sufficient to support operations for the coming year.

As the firm continues to introduce additional hardware enhancements and new software modules to its CASA product line and focus its efforts on the sale of accessories, consumables and services, we expect to see organic growth from these lines of business in 2017. About 70% of the company's sales are outside the U.S., which is a significant source of revenue and net income. As a result, the company has faced foreign exchange headwinds as the U.S. dollar has strengthened recently. However, services and consumables from the recent Embryotech acquisition are sold primarily in the U.S., which should help immunize part of the company's revenue against foreign exchange fluctuations. The current cash position should be sufficient to support the firm's operations for the next twelve months if it continues to perform as anticipated.

Hamilton Thorne's net income and cash flow will continue to benefit from over $26 million of income tax Net Operating Losses (NOL's) incurred during its development phase, reducing the company's effective tax rate from 40% for the next several years.

We have modeled Hamilton Thorne's revenue to grow quickly based on historical trends and expected growth in IVF market[6]. In the past three years, for all quarters and for the full years 2014, 2015 and 2016 the company reported positive cash flows. We anticipate this trend to continue and expect Hamilton Thorne to generate positive net income going forward.




(Source: http://www.hamiltonthorne.com)

[6] See Valuation section for details

## LEADERSHIP TEAM

**David Wolf**
***Chief Executive Officer and President***
David Wolf is a senior level executive with over 20 years of success in solving complex business issues and building shareholder value in both public and private companies. Previously, Mr. Wolf was a member of the founding management team of Elcom International, Inc. (NASDAQ), where he played a key role in growing the business to $800 million in revenues in four years and orchestrating Elcom's successful IPO. As President of Elcom Systems, he transformed an internal development organization into a full-fledged software development, marketing and services company that successfully implemented electronic commerce systems for companies around the world. Prior to Elcom, Mr. Wolf was Chief Operating Officer of JWP Information Services, a subsidiary of JWP Inc. (NYSE) where he built the operational infrastructure to support its growth from $250 million to $1.4 billion in sales , and President and COO of NEECO, Inc. (NASDAQ), a $250 million business IT distribution and services business purchased by JWP. David has been involved in an operating or advisory role in over 40 M&A transactions.

**Diarmaid Douglas-Hamilton**
***Chief Technology Officer, Senior Vice President of Research & Development and Co-founder***
Diarmaid Douglas-Hamilton was formerly Principal Scientist and Project Director at Avco Everett Laboratories, and Technical Director at Eaton Corp. He is a physicist with broad specialties in optics and lasers, holding multiple patents in assorted fields. Mr. Douglas-Hamilton has extensive experience in effectively managing large and small research and development projects.

**Michael Bruns**
***Vice President of Finance and Chief Financial Officer***
Michael Bruns brings over 25 years of financial management experience in mid-sized organizations, most recently serving as CFO of Dover Saddlery Inc. (NASDAQ: DOVR) where he played a key role in Dover's successful $27 million IPO in 2005. In his role as CFO of Hamilton Thorne, Mr. Bruns will be responsible for the Company's financial management and control functions, as well as providing strategic support in the business planning, and corporate development of the Company. Prior to joining Dover, Mr. Bruns served as Vice President of Finance for CPS Direct, a communications marketing company and was the Controller for Northeast Mobile Communications, a specialty retailer.

**Keith F. Edwards**
***Senior Vice President and General Manager***
Keith F. Edwards is responsible for operational excellence in the sales, marketing, production, HR and QA/RA functions. Recently he was President of Biocoat, Inc. where he managed sales growth of 117% over 5 years. Mr. Edwards's experience in the IVF and orthopedic medical device markets include successful product launches, go to market strategies for innovations and a consistent focus on sales channel development. He is also the management representative for regulatory affairs and the Hamilton Thorne Quality Management System.

**Eric Dorman**
***President Embryotech Laboratories***
As co-founder and President of Embryotech Laboratories, Eric built Embryotech into the acknowledged US leader in providing quality control services and testing assays in the IVF market. Before founding Embryotech, Eric held a number of positions at Charles River Labs.

**Thomas Kenny**
***VP Engineering***
Thomas Kenny is a New England leader in the engineering and electronic fields, with multiple important products to his credit, including the ZILOS-tk and XYClone. Mr. Kenny has been with the Company since its inception and is a central figure in Hamilton Thorne's technical capabilities. In addition to his development duties, Mr. Kenny speaks at product symposia around the world.

## Scientific Advisory Board

**John J. Donovan**, Ph.D., Dr. Hon., has served as tenured Professor of Electrical Engineering and Management at M.I.T., as a Clinical Professor of Pediatrics at Tufts medical School, and presently as a fellow at Yale. In business, he has co-founded and served as Chairman of 15 companies, seven of which completed IPOs, including Cambridge Technology Partners, I-Cube, and OEC. He developed innovative solutions for some 200 institutions, including Boeing, American Airlines, Aegon, BP, IBM and HP. Dr. Donovan served on an advisory committee to Presidents Carter and Bush Sr.

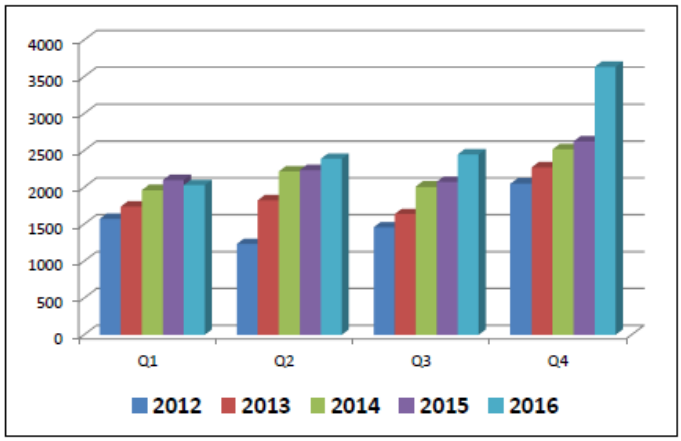
**Fred Russell Kramer**, Ph.D., Chairman, Department of Molecular Genetics, Public Health Research Institute and Professor, New York University School of Medicine. Dr. Kramer is the author of many distinguished papers and a recognized authority on nucleic acid probes, amplification techniques, oligonucleotide arrays and DNA/RNA diagnostic assays. Education: University of Michigan B.S., Rockefeller University, M.S and Ph.D.

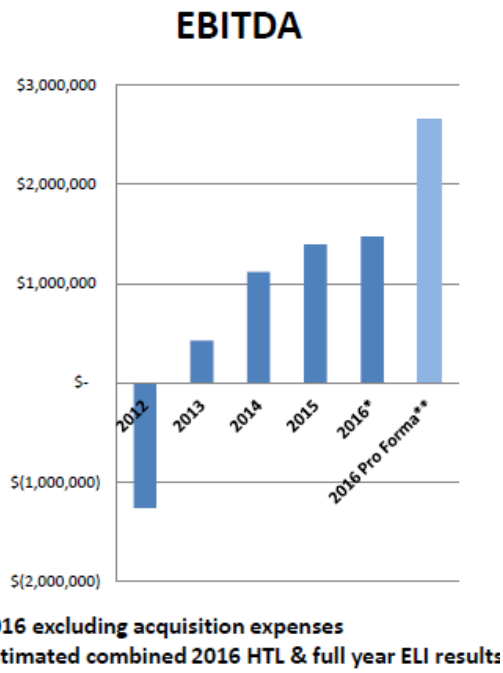
**Barbara Talamo**, Ph.D. - Professor of Neuroscience and Physiology; Chair, Department of Neuroscience, Tufts Medical School and a leader in understanding of neuronal functions and diseases.

**Alan Trounson**, Ph.D., Dr. Hon. Cau. FRCOG, FRACOG - President, California Institute for Regenerative Medicine (CIRM). Prior to joining CIRM in January 2008, Trounson was Professor of Stem Cell Sciences and Director of the Monash Immunology and Stem Cell Laboratories at Monash University, where he retains the title of Emeritus Professor. Dr. Trounson founded the National Biotechnology Centre of Excellence - Australian Stem Cell Centre. Dr. Trounson has been a pioneer of human in vitro fertilisation (IVF) and associated reproductive technologies; the diagnosis of inherited genetic disease in pre-implantation embryos; the discovery and production of human embryonic stem cells and of their ability to be directed into neurones, prostate tissue and respiratory tissue.

**David Y. Zhang**, M.D., Ph.D., Director Molecular Pathology Laboratory, Mount Sinai School of Medicine. Dr. Zhang is the co-inventor and developer of the RAM and HSAM technologies and continues to improve the technologies on a regular basis. He has filed patents for multiple CIPs and ancillary technologies that will greatly increase the capabilities of RAM and HSAM and make them attractive to the clinical laboratory.

## VALUATION/RECOMMENDATION




(Source: http://www.hamiltonthorne.com)

It is estimated that there are roughly 400 businesses involved in ART services (fertility clinics, donor banks, and reproductive endocrinologists) in the U.S. This is a ~$3 billion industry with 4% CAGR in the U.S. IVF and other interventional procedures fall under the higher end of the pricing spectrum. The 4% growth rate could be attributed to an expanding middle class that is postponing family planning due to an increased focus on careers. Market Research Reports expects the global IVF market to grow at a CAGR of about 12% and since ~ 60% of Hamilton Thorne's sales are from distributors in over 60 countries worldwide, we anticipate a greater than 4% growth in Hamilton Thorne's revenue. We also think sales of the firm's products could be bolstered by the rising prevalence of obesity, which could fuel future demand for fertility treatments.

Management expects that growth in the sales of clinical lasers will be positively influenced by the continued adoption of assistive reproductive procedures as well as by strong growth in emerging markets. Further, since the company has diversified its product offerings, there is a wider customer base. We think such a strategy has the added advantage of smoothing out revenues over time.

Hamilton Thorne plans to introduce new hardware and software to its CASA platform, which should help drive sales of its image analysis systems at a higher rate than its laser systems. The company also plans to market the recently acquired Oosight product. Hamilton Thorne uses both direct and distribution approach to sales. The company's sales to three major distributors account for roughly 10% of all revenues. Q4 2015 marked the twelfth straight quarter (since early 2013) of sequential revenue growth.

Currently Hamilton Thorne is operating in more than 60 countries. We like management's strategy, which is to diversify their current product range further so they can pursue expansion into new markets. Last year's (2015) addition of Oosight Imaging system was complementary to their laser offerings and could help in generating incremental sales by leveraging the firm's established, world-wide distribution channels. More recently, with the acquisition of Embryotech, the company is expecting ~40% increase in recurring revenue from the sales of services and consumables as well as more than 50% increase in 2017 revenue and more than 100% increase in 2017 EBITDA. Considering IVF is a rapidly-growing area and that there is increased adoption of IVF procedures in emerging markets we think there is potential for Hamilton Thorne to grow its sales internationally.

Hamilton Thorne's acquisition is a specific, well-articulated value creation strategy that pursues international scale while filling portfolio gaps. Gynemed is a profitable and growing business that offers premium branded/OEM IVF cell culture media, consumables and devices, has an excellent reputation and proven sales channel in the well-established European ART market. Secondly, there is significant expansion in product offering with a highly complementary product portfolio. We think that the combined company can benefit from Hamilton Thorne's strong partnerships in global markets and Gynemed's strong presence in Europe. Working together, they can introduce their products into new territories much more rapidly. The expanded product portfolio allows to leverage the existing global distribution infrastructure in key markets not currently served by Gynemed, including the U.S. It positions Hamilton Thorne to better capture higher future growth in key global markets. For the year ended December 31, 2016, Gynemed had annual revenues of over $9 million, EBITDA of approximately $2.8 million (approximately $2.3 million after normalization adjustments) and net income of close to $2.5 million (approximately $2 million after normalization adjustments). This acquisition is expected to be immediately accretive to revenue and EBITDA.

The revenue growth thus far has resulted in gross margin widening to ~65% from 59% in 2012. Simultaneously there has been an expansion of operating margins from 5% in 2013 to about 14% in 2015. Based on the aforementioned factors and growth trends, we forecast revenue of ~$22 million in fiscal 2017. We think this momentum could continue in the coming years and model revenue to double by 2022.

The federal legislation allows 20 years of net operating loss carryforwards which are applied to offset current/future taxable income. As of December 31, 2016, the company had a net operating loss carryforward of approximately $26 million, which begin to expire beginning 2020. Therefore, the company's taxable income continues to be offset by the accumulated deficit.

The firm's financial reserves are primarily used for business development. Management has been successful in controlling expenditures in the past. The firm's manufacturing operations generally consist of final assembly and QC of instruments from off the shelf products and components and subassemblies built to its specifications. Instead of committing to domestic manufacturing infrastructure which would put pressure on financial resources, the company contracts out component level manufacturing to third parties. Hence, it enjoys low CapEx, which allows for lower depreciation expense, less capital tied up in fixed assets and, potentially, higher net income. Should management require capital in the near term, we believe they have the ability to raise additional financing, considering they have been very successful in acquiring funds in the past.

With a discount rate of 9%, a terminal growth rate of 1.5% and 129 million fully diluted shares, our DCF model values the company at ~$140 million or $1.10 /share. The shares currently trade at 9x revenue multiple. Based on the firm's financial and operational progress in the past two years, we believe there has been significant de-risking. We believe the shares trade cheaper than fair value.

***Risks***

***Model-based assumptions are prone to large variations:*** Our projected revenue growth from the sales of Hamilton Thorne's products from the current year and beyond is largely best-guesses based on growth in the fertility sector. Revenue could underperform relative to our model if the customer base does not grow at our assumed forecast or is less correlated to revenue growth than what we are assuming. Achieving our price objective includes competitive, reimbursement and financial risks.

## FINANCIAL MODEL

### HAMILTON THORNE LTD.

| Hamilton Thorne Ltd. | 2016 A | 2017 E Q1 E | 2017 E Q2 E | 2017 E Q3 E | 2017 E Q4 E | 2017 E | 2018 E | 2019 E | 2020 E |
|---|---|---|---|---|---|---|---|---|---|
| **Revenues** | **$10.51** | **$3.50** | **$5.80** | **$6.15** | **$6.38** | **$21.83** | **$26.31** | **$30.52** | **$35.40** |
| *YOY Growth* | *16%* | *72%* | *143%* | *151%* | *75%* | *108%* | *21%* | *16%* | *16%* |
| COGS | $3.65 | $1.23 | $2.11 | $2.30 | $2.46 | $8.04 | $10.38 | $12.12 | $13.90 |
| **Gross Income** | **$6.86** | **$2.28** | **$3.69** | **$3.85** | **$3.92** | **$13.79** | **$15.93** | **$18.40** | **$21.50** |
| *Gross Margin* | *65.3%* | *65.0%* | *63.6%* | *62.6%* | *61.5%* | *63.2%* | *60.6%* | *60.3%* | *60.7%* |
| **R&D** | **$0.99** | **$0.28** | **$0.52** | **$0.49** | **$0.51** | **$1.80** | **$1.97** | **$2.07** | **$2.63** |
| *% R&D* | *9%* | *8%* | *9%* | *8%* | *8%* | *8%* | *7%* | *7%* | *7%* |
| **S&M** | **$2.76** | **$0.74** | **$1.04** | **$1.05** | **$1.21** | **$4.09** | **$4.74** | **$5.19** | **$5.66** |
| *%S&M* | *26%* | *21%* | *18%* | *17%* | *19%* | *19%* | *18%* | *17%* | *16%* |
| **G&A** | **$2.14** | **$0.67** | **$1.04** | **$1.11** | **$1.15** | **$3.98** | **$4.21** | **$4.88** | **$5.31** |
| *% G&A* | *20%* | *19%* | *18%* | *18%* | *18%* | *18%* | *16%* | *16%* | *15%* |
| **Operating Income** | **$0.98** | **$0.60** | **$1.08** | **$1.20** | **$1.05** | **$3.91** | **$5.02** | **$6.26** | **$7.90** |
| *Operating Margin* | *9%* | *17%* | *19%* | *20%* | *17%* | *18%* | *19%* | *21%* | *22%* |
| *Other Expenses* | ($0.26) | ($0.13) | ($0.13) | ($0.13) | ($0.13) | ($0.51) | ($0.51) | ($0.51) | ($0.51) |
| Taxes | ($0.024) | ($0.11) | ($0.20) | ($0.23) | ($0.20) | ($0.74) | ($0.95) | ($1.19) | ($1.50) |
| *Tax Rate* | *1.8%* | *19.0%* | *19.0%* | *19.0%* | *19.0%* | *19.0%* | *19.0%* | *19.0%* | *19.0%* |
| **Net Income** | **$0.70** | **$0.35** | **$0.74** | **$0.84** | **$0.72** | **$2.66** | **$3.56** | **$4.56** | **$5.89** |
| *Net Margin* | *7%* | *10%* | *13%* | *14%* | *11%* | *12%* | *14%* | *15%* | *17%* |
| **EPS** | **$0.01** | **$0.00** | **$0.01** | **$0.01** | **$0.01** | **$0.02** | **$0.03** | **$0.03** | **$0.04** |
| Shares (Fully Diluted) | 86 | 129 | 129 | 132 | 132 | 131 | 133 | 135 | 137 |

*Source: Zacks Investment Research* *Anita Dushyanth, PhD*

## HISTORICAL STOCK PRICE

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