

Forward Looking Statement

This corporate presentation contains forward-looking statements, which reflect the Company's current expectations regarding future events. The forward-looking statements involve risks and uncertainties. Actual events could differ materially from those projected herein and depend on a number of factors, including the successful and timely completion and the commercialization of the products herein. The reader of this document is forewarned concerning the inherent variability and risk associated in terms of strategies or deliverables stated herein by the Company and is cautioned prior to considering these forward-looking statements. The Company disclaims any obligation to update these forward-looking statements.

Opsens Overview



Opsens is an emerging player in the cardiovascular medical devices market with an innovative fibre optic pressure guidewire.

The OptoWire and OptoMonitor are new commercial products used to measure Fractional Flow Reserve (FFR) to assess coronary blockages. The OptoWire's FFR assessment helps in selecting an appropriate treatment. The OptoWire can also be used to deliver stents in the blockage treatment.

Opsens at a Glance

\$1B

Future market
opportunity

30,000

Patients treated in
30 + countries

85%

YOY revenue
growth

OptoWire
Performance
recognized in
medical
publications

Strong IP +
10 patents secured
Position for
partnerships with
companies interested
in FFR

Technology
may be used in
other
applications
e.g. Abiomed

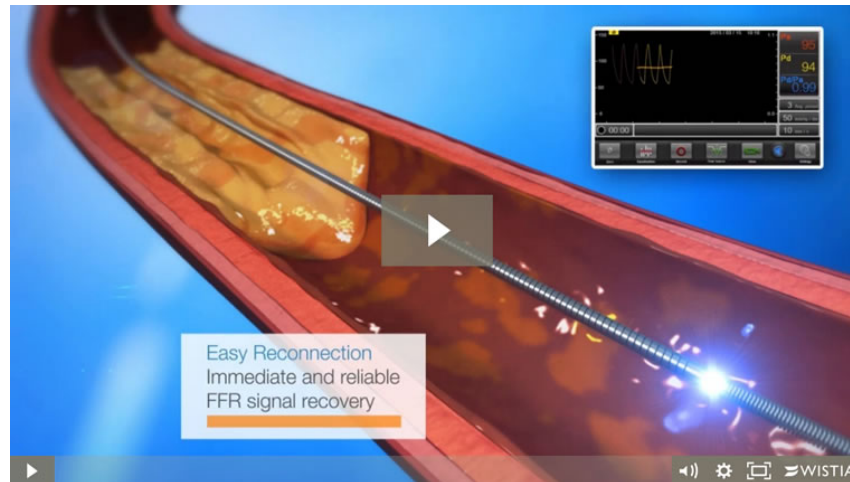
What is Fractional Flow Reserve (FFR)

- FFR is used for diagnosis of patients

Procedure to evaluate the severity of a coronary artery blockage. Cardiologists measure blood pressure before and after the blockage and obtain a ratio which will help in selecting treatment (angioplasty, stenting, bypass, etc.).

- FFR may be used for treatment of patients

Once the cardiologist has selected the treatment, he can treat the blockage immediately by stenting the lesion.



[Opsens Video](#)

Fractional Flow Reserve (FFR)

Max achievable blood flow in stenotic coronary artery divided by
Max blood flow in the same artery without stenosis



0.97 FFR (Non-ischemic)



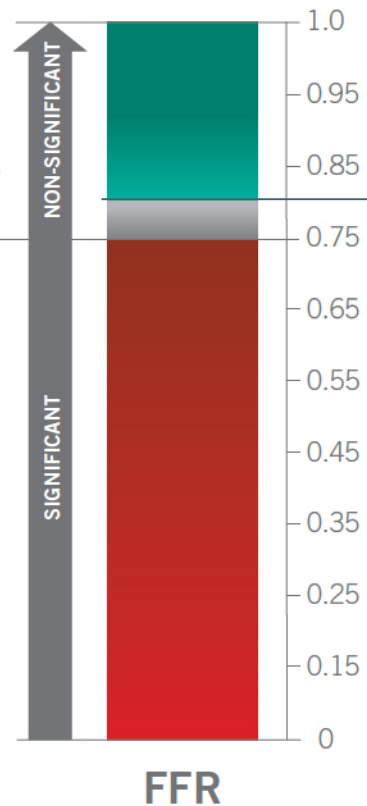
Intermediate (per angiography)
0.55 FFR (Ischemic)

Angiography: only about 65% accurate in diagnosing ischemia

FFR = 1.0
Normal Artery

FFR > 0.75
Ischemia very unlikely,
sensitivity 88%

FFR < 0.75
Ischemia
specificity 100%



>0.8 may be treated
without angioplasty

0.80

<0.80 inducible
ischemia –
interventional
treatment needed
i.e. stent

$$FFR = \frac{P_d}{P_a}$$

At maximum hyperemia

FAME Study – FFR-guided therapy improves clinical outcomes of patient resulting in significant decrease of major adverse cardiac events

OptoWire Advantage – One Wire from Start to Finish

Best-in-class technology overcomes limitations of conventional pressure guidewires

Current FFR Products Limitations

- Drift, steerability and connectivity issues **prevent current pressure guidewires from being used as workhorse wires** - used from start to end of procedures (diagnostic and treatment)
- **Current FFR guidewires are drift sensitive** resulting in inaccurate measurements or longer procedures
- **Unreliable connectivity** due to vulnerability and electric contact issues results in inability to quickly reconnect, loss of pressure signal and limited ability to perform FFR post Percutaneous Coronary intervention (PCI)

OptoWire Solution

- Nitinol based pressure guidewire design **delivers workhorse equivalent performance**
- Opsens patented optical sensor **eliminates drift and thermal shift**
- Worry-free reconnect

OptoWire Impact

- Performance more easily reaches all lesions of interest – **One-wire PCI**
- **True workhorse performance:** steerability, stability, connectivity that allows the use of a **single wire throughout the whole procedure** - **Faster and cheaper solution for doctors and hospitals**
- **Sensor stability and connection reliability** for a **more accurate diagnostic** - **Operator confidence**

"The arrival of an optical FFR guidewire such as the OptoWire on the market is positive for interventional cardiologists and will be helpful to promote the use of FFR."

—Dr. Nico Pijls, Catharina Hospital, Netherlands

FFR Market Overview

As FFR becomes more mainstream, the pressure guidewire market is poised for disruption

Backdrop

- Studies proved FFR superior to angiography to guide PCI
- 2017 - New Appropriate Use Criteria (AUC) shows patients with acute myocardial infarction (STEMI) benefit from FFR-guided treatment as it lowers incidence of Major Adverse Cardiovascular and Cerebrovascular Event (MACCE)
- FFR used to assess **increasingly complex lesions**
- Hospitals now **acutely sensitive to costs** and **appropriate PCI**
- FFR guidewire market - **large growing market** in the cath lab due to **improving patient outcomes** and possibility of **lowering costs**

Penetration

- Despite strong outcome data, **FFR guidewires are underutilized**
- **Performance** of conventional pressure guidewires is an **obstacle** to market penetration

FFR Market		
Year	Milestones	Outcome
2009	FAME I Study	Angiography + FFR + Stent <u>superior</u> to Angiography + Stent
2010	EU: ESC Class I Level of Evidence A	Highest class & level: Procedure beneficial, useful & effective
2011	US: ACC/AHA Class IIA Level of Evidence A	Benefits of FFR outweigh risks & can be useful as a tool
2012	FAME II Study	Angiography + FFR + Stent + OMT <u>superior</u> to Angiography + OMT
2012 cont'd	Reimbursement Code for FFR	Several countries have codes Japan, France, UK, Germany, etc.
2017	AUC Revision Compare-Acute Study	FFR growing use and importance (STEMI)

FFR: Growing Market with Upside

Potential for significant market share capture through product innovation and differentiation

Key Market Drivers

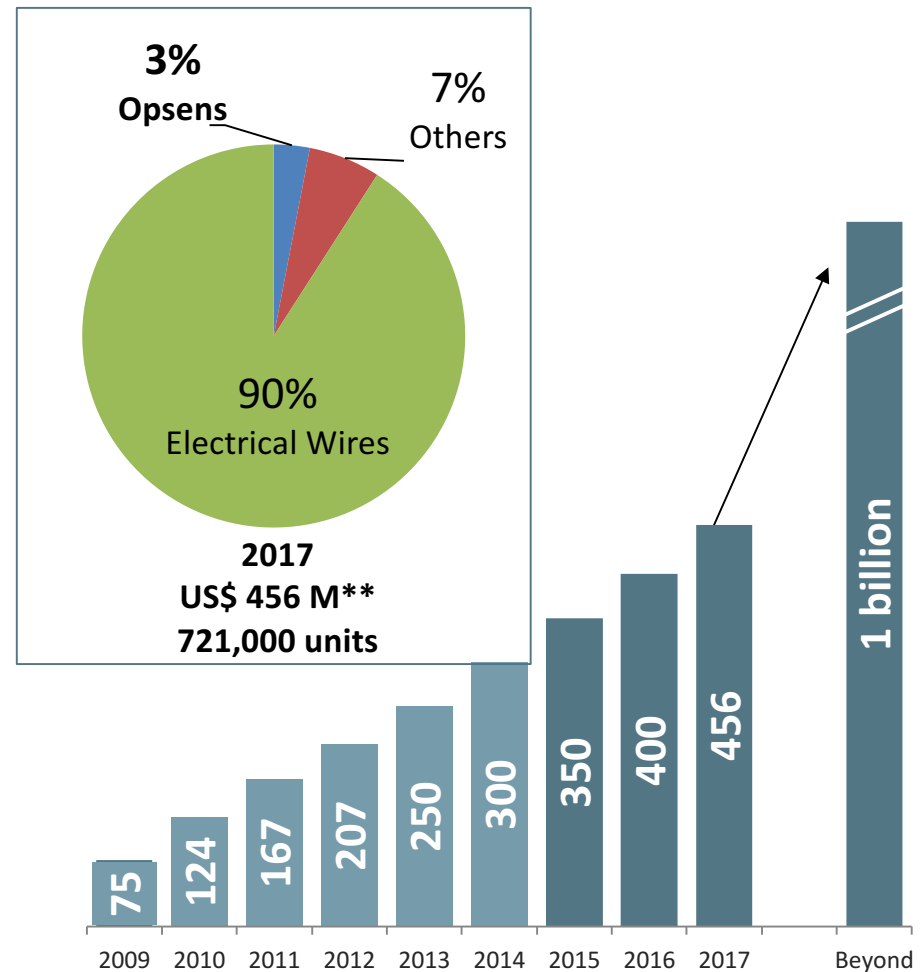
2014 FFR market: >US\$300 M**

- Current FFR procedure penetration: ~15%¹
- Industry players estimate potential procedure penetration closer to 45%²

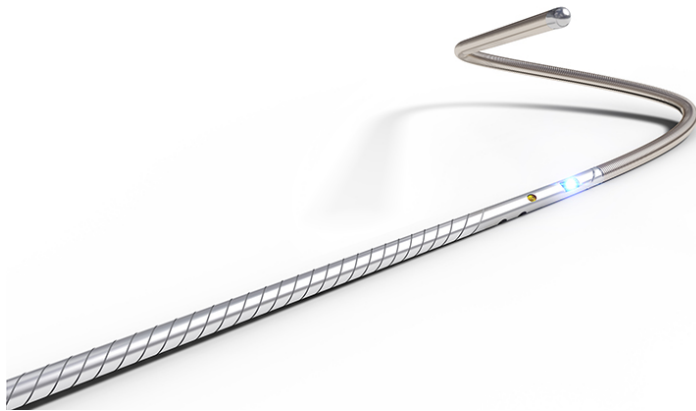
Drivers

- FFR-guided PCI improves patient outcomes
- Better FFR devices, easier to use
- Increased confidence procedure – AUC
- Increasing need to control costs
- FFR could facilitate reimbursement by hospitals and third-party payers
- Increased indications of use
 - Left-main, Bifurcation, Non-Stemi

FFR Market (US\$ M)*



Opsens' Products



OptoWire

- Exceptional handling
- Reliable strength and support
- Revolutionary consistency and accuracy
- Worry-free reconnect



OptoMonitor

- Seamless and simple integration
- Intuitive workflow
- Small footprint
- FFR data output options

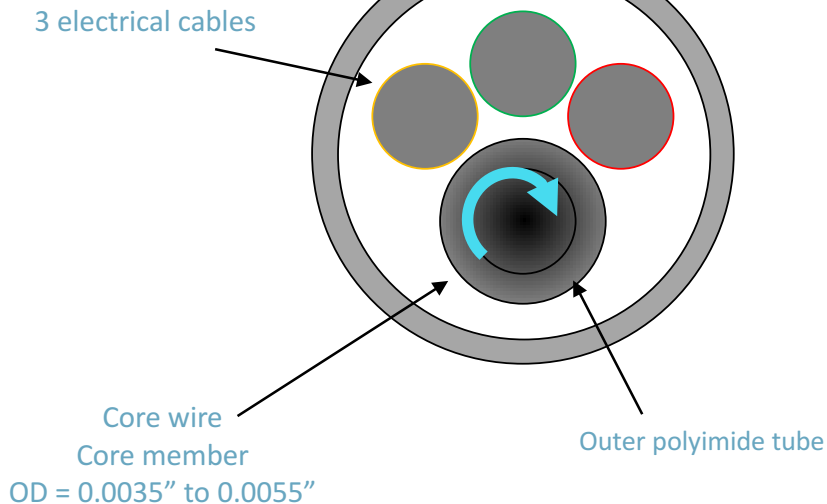
Sold in +30 countries including USA, Japan, Canada and European countries

OptoWire

Nitinol core significantly improves torqueability and kink resistance of the guidewire

Traditional FFR wire

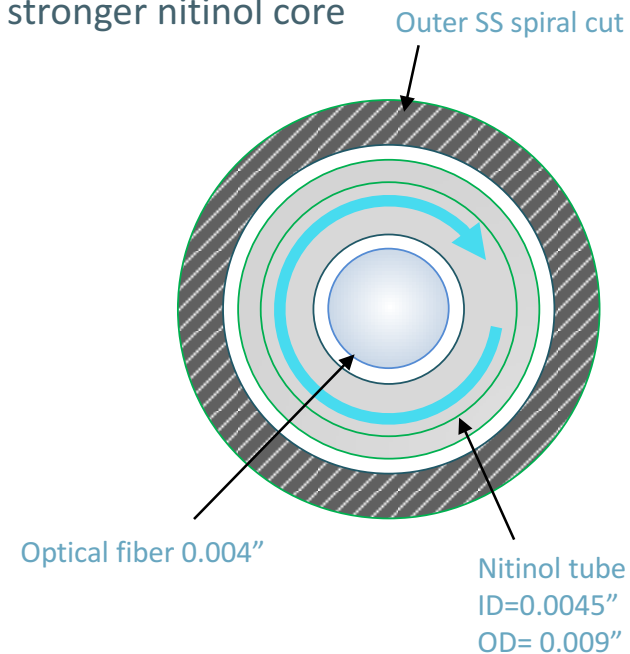
- Older piezoelectric technology requires three electrical wires that offset the corewire from the center, resulting in whipping and limited torqueability



- Electrical pressure sensors are sensitive to their environment
- Due to limited space inside the guidewire, the piezo-resistive pressure sensor must use a half bridge design to minimize the number of electrical wires that run the length of the wire

OptoWire


- Central fiber-optic eliminates electrical wires and associated whipping, yielding space for larger and stronger nitinol core



- Large nitinol core provides strength, flexibility and rotates independently of the exterior, allowing 1:1 transmission of torque, even when the exterior is engaged


OptoWire - Reliable Fiber Optic Sensing Technology

OptoWire - Reliable Measurement Throughout Procedure



Most common “technical” pitfalls :

- drift of the signal
- introducer
- pitfalls associated with guiding catheter
- knowledge of adequate hyperemic stimuli

	Next-Gen FFR	Traditional FFR			
		Boston Scientific COMET ²	St. Jude PressureWire Aeris ³	Acist Navvus Microcatheter ⁴	Volcano Verrata
Drift from zero (mmHg/h)	<1	<3	<7	<7	Not specified

1) Opsens Medical. Data on File
 12 2) Chambers, Jeff. Electric or Optical Fibers Based Pressure Measurements. Presentation sponsored by Boston Scientific, 19th Tremblant Interventional Cardiology Meeting. 2016
 3) St. Jude. PressureWire Aeris, Instructions for Use, 20828 Rev 0F
 4) Acist. Rapid Exchange (Rxi) System and Navvus Catheter. 510(k) Filing, K132474. Jan 2014

Opsens' OptoWire Reviewed in Medical Journals



Circulation Journal
Official Journal of the Japanese Circulation Society
<http://www.j-circ.or.jp>

EDITORIAL

Fractional Flow Reserve, Coronary Pressure Wires, and Drift

Nico HJ Pijls, MD, PhD; Bernard De Bruyne, MD, PhD

Drift in Coronary Pressure Measurement

Among all the diagnostic tests used in interventional cardiology, few have had the impact of fractional flow reserve (FFR).¹ Today, FFR is used as the standard of reference to decide if stenting of a coronary artery is appropriate. Especially in complex multivessel disease, its use is indispensable to guide the operator if and where coronary stents should be placed.

Article p1812

FFR was introduced more than 20 years ago^{2,3} and its value has been established in almost all subsets of coronary disease and clinical conditions and has been used clinically in millions of patients. There is incontrovertible proof that by using FFR, both the symptoms and outcome of patients with coronary artery disease are significantly improved and that its use is cost-saving.⁴⁻⁹

The practical value of FFR to guide coronary revascularization, the background of the concept, its practical set-up, and its importance for clinical outcome have been described in a myriad of papers, among others a review article in this Journal in 2013.¹⁰

However, measurement of coronary pressure by sensor tipped pressure wire has been associated with drift since the early days. Drift has always been considered as inevitable in electronic measurement equipment. Millar catheters and also the initial prototypes of the 0.018" and 0.014" electronic pressure wires showed considerable drift. Occurrence of drift is the most annoying problem that can occur during a procedure in a patient because it is often unnoticed before the wire is pulled back to the guiding catheter at the end of the procedure and if it is present, it may invalidate the measurement.

Over time, tremendous efforts have been made by the manufacturers of electronic pressure wires (Radi, St. Jude Medical; Volcano, Philips) to decrease drift and these attempts have been successful to a large degree. Nevertheless, some drift might still occur every now and then, and confuse operators.

In addition, it should be realized that, not infrequently, a difference between the pressure wire signal and the guiding catheter signal at the end of the procedure is not true drift associated with the pressure wire, but apparent drift related to inappropriate zeroing and equalizing, to the presence vs. absence of the introducer needle when checking for drift, to capillary forces in the guiding catheter affecting the signal of the guid-

ing catheter, or to drift occurring in the fluid-filled transducer.

Over the years, operators have learned how to deal with this, how to avoid drift as much as possible, how to correct for drift, and have accepted it as a minor annoyance during an otherwise satisfactory procedure.

Surprisingly, only a few systematic studies have been performed to assess the effect of drift on decision making and in this respect, the paper published in this issue of the Journal by Wakasa et al is a valuable contribution.^{11,12}

Impact of Drift on FFR-Based Decision Making

The study by Wakasa et al¹² is the largest study performed so far to assess the influence of pressure drift on decision making. In their study, 940 patients were included and a total of 1,218 coronary arteries were studied. Drift was meticulously assessed during state-of-the-art procedures with correct equalization at the beginning of the procedure and making a hyperemic pull-back recording at the end to confirm the presence or absence of drift. Recordings with pressure drift ≥ 4 mmHg (which is not easily overlooked and mandates new equalization and measurement) were excluded and those with a drift ≤ 3 mmHg were further analyzed and the influence on decision making was studied. Special attention was paid in the analysis to values close to the presently used binary cut-off value of 0.80 and the grey zone of 0.76–0.80.

Importantly, the study population was adequate, as more than 70% of the patients had FFR values in the range of 0.60–0.90. In almost normal or extremely depressed values of FFR, drift will have negligible importance.

As can be expected, with FFR values close enough to the binary cut-off value of 0.80, considerable crossover occurred because of drift. But it should be realized that this is not surprising but merely a statistical phenomenon. Whatever the cut-off value might be, no matter how accurate the measurement, no matter how small the drift, if one approaches close enough to the binary cut-off value, the number of cases in which a crossover of the cut-off value occurs will always be 50%. That is a statistical phenomenon and has nothing to do with the value of an index, the variability, or magnitude of drift. Important, however, is that the range of ambiguity should be narrow, as indicated in Figure 4 (green bars) in their report.¹² And fortunately, drift was limited enough to create confusion in less than 20% of the patients with FFR values between 0.76 and 0.82, a rather limited interval. Even more important, only

Cardiovasc Interv and Ther
DOI 10.1007/s12928-017-0481-x



CrossMark

ORIGINAL ARTICLE

Frequency of a large drift caused by pressure wire using optical fibers

Yoshiaki Kawase¹ · Toru Tanigaki¹ · Akihiro Hirakawa² · Hiroyuki Omori¹ · Tetsuo Hirata¹ · Syuuichi Okamoto¹ · Hideaki Ota¹ · Jun Kikuchi¹ · Munenori Okubo¹ · Hiroki Kamiya¹ · Masanori Kawasaki³ · Takahiko Suzuki¹ · Hitoshi Matsuo¹

Received: 26 April 2017 / Accepted: 21 June 2017

© Japanese Association of Cardiovascular Intervention and Therapeutics 2017

The opinions expressed in this article are not necessarily those of the editors or of the Japanese Circulation Society.

Received June 26, 2016; accepted June 27, 2016; released online July 12, 2016

Department of Cardiology, Catharina Hospital, Eindhoven (N.H.J.P.), The Netherlands; OLV Cardiovascular Center, Aalst (B.d.B.), Belgium

Mailing address: Nico HJ Pijls, MD, PhD, Department of Cardiology, Catharina Hospital, PO Box 1350, 5602 ZA Eindhoven, The Netherlands. E-mail: nico.pijls@inter.nl.net

ISSN-1346-9843 doi:10.1253/circj.CJ-16-0623

All rights are reserved to the Japanese Circulation Society. For permissions, please e-mail: cj@j-circ.or.jp

OptoWire Performance – Worry-Free Reconnect

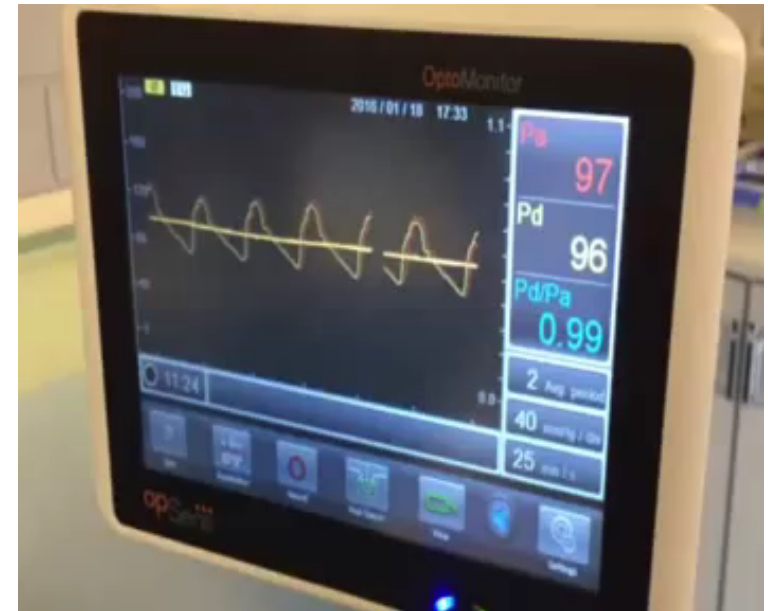
Strong Distinction Between Optical and Electrical Technology

Optical contact not affected by procedural contact contaminant

- Competitor's electrical technology sensitive to contact resistance

Workflow freedom with FFR reliability

- Disconnect, handle FFR wire like standard PCI wire
- Reconnect and perform post-PCI FFR
- May save time and money with improved effectiveness



"It was a pleasure to use the OptoWire in several patients, some of them with complex disease. It allowed me to appreciate its **impressive zero drift performance** during all cases performed while also acknowledging the **constant connection reliability** as well as its **support** during percutaneous coronary intervention."

—Dr. Bernard de Bruyne, Cardiovascular Center Aalst, Belgium

Strong IP (10 patents) – Strategic in Creation of Partnerships

- Freedom to operate is challenging to obtain in FFR and significantly limits potential for newcomers
 - **Electrical pressure sensing:** Extensive IP owned by Phillips / Volcano and Abbott / St. Jude
 - **Optical pressure sensing:** Opsens is the first-comer and IP leader
- Opsens' IP may prohibit FTO and any other companies using optical pressure sensing



Guidewire - 1 patent

- Guidewire with internal pressure sensor



Optical Sensor - 3 patents

- Optical sensor using low-coherence interferometry
- Fiber-optic pressure sensor for catheter use
- Miniature high sensitivity pressure sensor



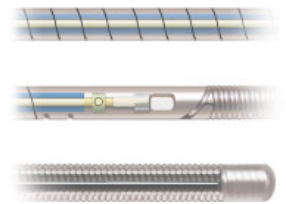
Optical Connector - 4 patents

- Method for disposable guidewire optical connection



Microcatheter / Equalization - 2 patents

- Eccentric pressure catheter with guidewire compatibility
- Method for pressure guidewire equalization



opSens

Protected by 10 Patents

Opsens Commercial Operations

Operations & finance

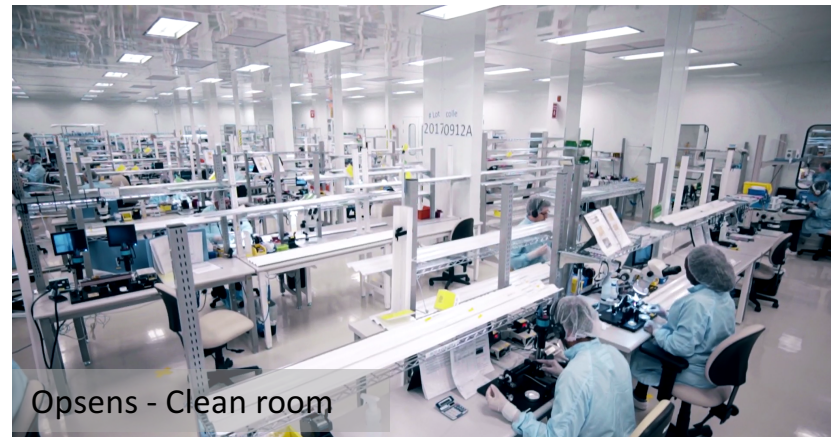
- 130 employees
- Revenue growth of 85% in fiscal year 2017 over 2016
- Lean manufacturing approach to increase gross margin
- Cash position of 12,6 M\$ as at Aug 31st, 2017

Sales & Marketing

- Sales channels around the world
- US market penetration to increase drastically as adoption rates grow
- Opsens' technology used in other exciting applications bringing additional revenue sources and credibility – e.g. licensing agreement with Abiomed (NASDAQ:ABMD).



Opsens, QC Canada

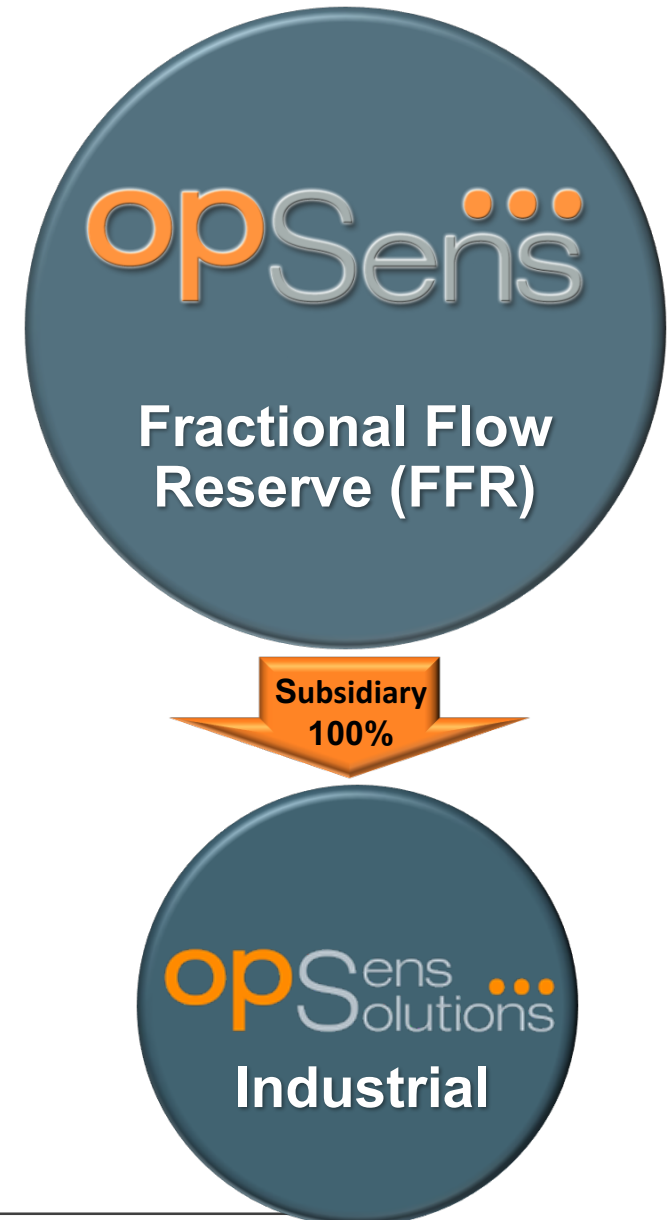


Opsens - Clean room

Applications Beyond the Medical Industry

Currently, Opsens is focusing on the medical device industry.

Other industry applications include: semiconductors, aerospace and other industries.



Industrial: Large Growing Markets, Recuring Revenues

Opsens' Versatile WLPI Technology: To meet the needs of industrial markets

Unique and differentiated product capabilities

- Positive buzz around our technology that may be customized for applications in strategic markets

Full range of sensing solutions

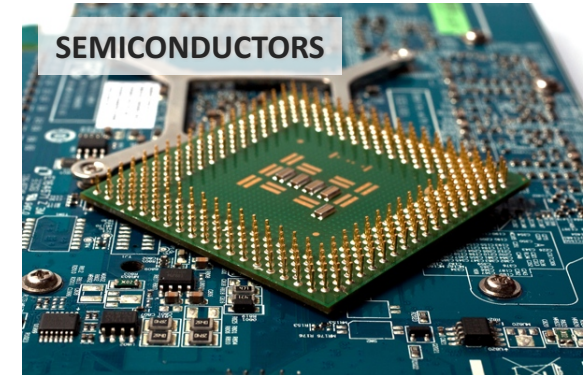
- Pressure
- Temperature
- Displacement
- Strain

Lead markets

- Laboratories, aerospace, semiconductors

Strategy

- Capitalize on technologies and on product range to expand commercial network and increase sales and internal marketing resources.



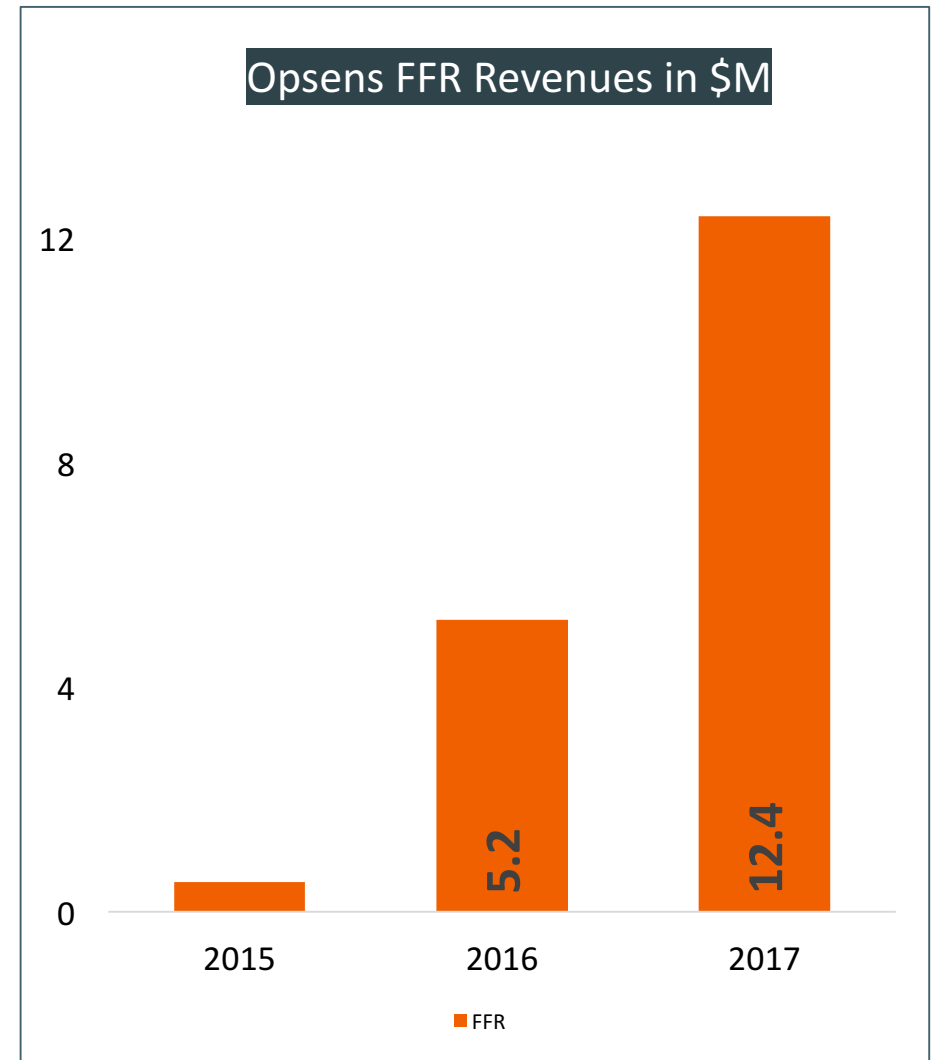
Creating Value for Shareholders

Key Considerations

- Product performance recognized by key opinion leaders
- Growing markets: US, EU, JPN, CAN
- Building clinical data
- 30,000 cases performed*
- Improvement of production processes
- Sales channels in >30 countries

Value Drivers

- Market share gain
- Clinical data
- Innovation
- Technology allows for applications to be used in various exciting markets



Management Team



Louis Laflamme, CA, CFA

President and CEO

Previously: Management and leadership roles at DEQ systems, TGN Biotech, St. Raymond Forest Prod., Samson Bélair / Deloitte & Touche LLP



Robin Villeneuve, CA, CFA

CFO

Previously: CFO Federal Fleet Services, Virginia Mines; Financial positions at AbitibiBowater, PWC



Claude Belleville

VP, Opsens Medical - Co-founder

Previously co-founded FISO, manufacturer of fiber optic sensors; managed corp., contributed to dev. of prod. and tech.



Gaétan Duplain

President, Opsens Solutions - Co-founder

Previously co-founded FISO, manufacturer of fiber optic sensors; managed corp., contributed to dev. of prod. and tech.



Tony Gibbons

VP, Sales and Mktg

Previously VP, International Operations Thoratec, Regional President and VP, International Sales Boston Sc.

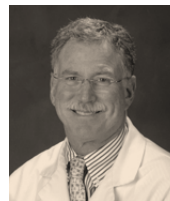


Jon Ruais

VP, Global Mktg

Previously Diadexus, Senior Dir. of Global Strategic Mktg Thoratec and Dir. of Chronic Pain Therapy Mktg, St. Jude Med.

Scientific Advisory Board



Dr. Morton Kern

Chairman of the Scientific Advisor board
University of California, Irvine



Dr. Nico Pijls

Catharina Hospital, Eindhoven, Netherlands
IP of FAME I and II studies



Dr. Bernard de Bruyne

Cardiovascular Center Aalst, Belgium
IP of Fame I and II studies



Dr. Olivier Bertrand

Institut universitaire de cardiologie et de
pneumologie de Québec (IUCPQ)

Exchanges : Tickers	TSX : OPS OTCQX : OPSSF	
Headquarters	Quebec City, Canada	
Shares / Diluted	86 M / 97 M	
52-week High / Low	\$1.73 - \$1.07	
Number of Employees	130	
Market Capitalization Nov 7	\$100 M	
Revenues	2017 \$17,8 M	2016 \$9,6 M