Lithium Ion Battery Manufacturer

Enabling Technology:

Climate Change Mitigation, Energy Transformation and E-commerce

electrovaya
electrification of things™

Toronto Stock Exchange (TSX-EFL)&(OTCQB:EFLVF): Oct 21st, 2020

Disclaimer

This presentation contains forward-looking statements, including statements that relate to, among other things, revenue forecasts and in particular the revenue forecasts for the fiscal year ending September 2020, continuation of anticipated positive EBITDA, anticipated further sequential revenue growth in fiscal 2020, the ability to satisfy the Company's order backlog, the Company's ability to satisfy its ongoing debt obligations, anticipated increased collaboration with OEMs and OEM channels constituting a source of sales growth for the Company, anticipated continued increase in sales momentum in fiscal 2020 through OEMs and directly to large global companies, including Fortune 500 companies, the future direction of the Company's business and products, the effect of the ongoing global COVID-19 public health emergency on the Company's operations, its employees and other stake holders, including on customer demand, supply chain, and delivery schedule, the Company's ability to source supply to satisfy demand for its products and satisfy current order volume, technology development progress, pre-launch plans, plans for product development, plans for shipment using the Company's technology, production plans, the Company's markets, objectives, goals, strategies, intentions, beliefs, expectations and estimates, and can generally be identified by the use of words such as "may", "will", "could", "should", "would", "likely", "possible", "expect", "intend", "estimate", "anticipate", "believe", "plan", "objective" and "continue" (or the negative thereof) and words and expressions of similar import. Although the Company believes that the expectations reflected in such forward-looking statements are reasonable, such statements involve risks and uncertainties, and undue reliance should not be placed on such statements. Certain material factors or assumptions are applied in making forward-looking statements, and actual results may differ materially from those expressed or implied in such statements. Important factors that could cause actual results to differ materially from expectations include but are not limited to: that current customers will continue to make and increase orders for the Company's products, and in accordance with communicated intentions, that the Company's alternate supply chain will be adequate to replace material supply and manufacturing, that the Company's interpretation of the effect of any comfort given to Litarion's auditors of the Company's financial support for Litarion's operations is correct, and that Litarion's insolvency process will proceed in an orderly fashion that will satisfy Litarion's debt without a significant negative effect on the Company or its assets, actions taken by creditors and remedies granted by German courts in the Litarion insolvency proceedings and their effect on the Company's business and assets, negative reactions of the Company's existing customers to Litarion's insolvency process, general business and economic conditions (including but not limited to currency rates and creditworthiness of customers), Company liquidity and capital resources, including the availability of additional capital resources to fund its activities, level of competition, changes in laws and regulations, legal and regulatory proceedings, the ability to adapt products and services to the changing market, the ability to attract and retain key executives, the granting of additional intellectual property protection, and the ability to execute strategic plans. Additional information about material factors that could cause actual results to differ materially from expectations and about material factors or assumptions applied in making forward-looking statements may be found in the Company's Annual Information Form for the year ended September 30, 2019 under "Risk Factors", and in the Company's most recent annual and interim Management's Discussion and Analysis under "Qualitative And Quantitative Disclosures about Risk and Uncertainties" as well as in other public disclosure documents filed with Canadian securities regulatory authorities. The Company does not undertake any obligation to update publicly or to revise any of the forward-looking statements contained in this document, whether as a result of new information, future events or otherwise, except as required by law.

Revenue forecasts herein constitute future-oriented financial information and financial outlooks (collectively, "FOFI"), and generally, are, without limitation, based on the assumptions and subject to the risks set out above under "Forward-Looking Statements". Although management believes such assumption to be reasonable, a number of such assumptions are beyond the Company's control and there can be no assurance that the assumptions made in preparing the FOFI will prove accurate. FOFI is provided for the purpose of providing information about management's current expectations and plans relating to the Company's future performance, and may not be appropriate for other purposes.

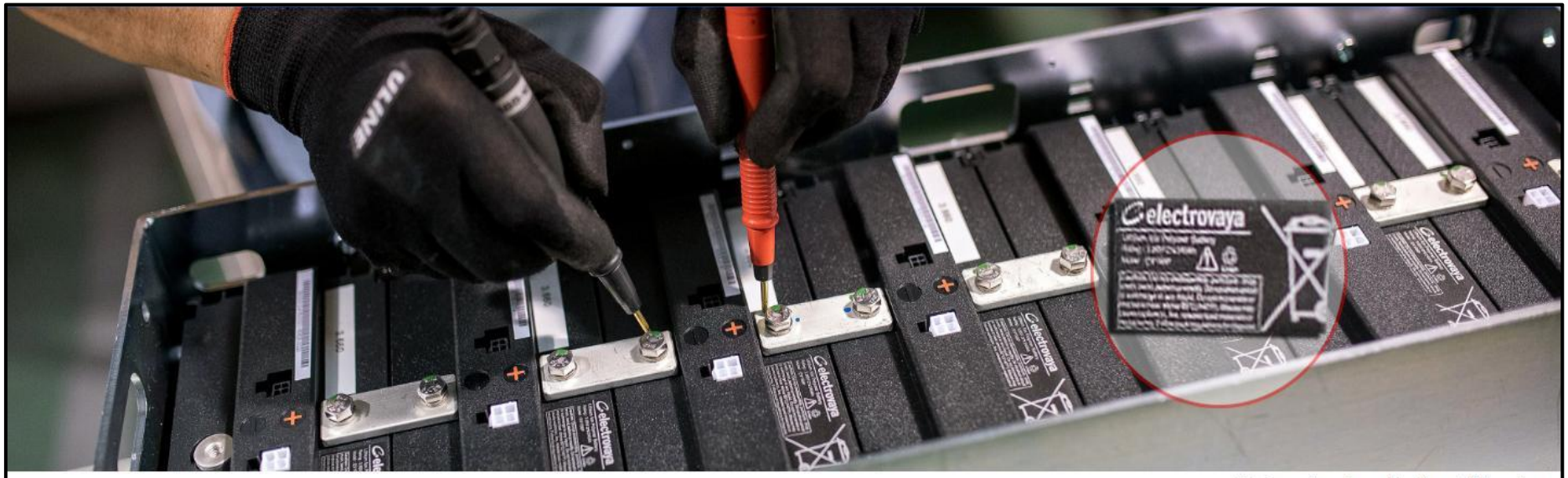
The FOFI does not purport to present the Company's financial condition in accordance with IFRS, and it is expected that there may be differences between actual and forecasted results, and the differences may be material. The inclusion of the FOFI in this news release disclosure should not be regarded as an indication that the Company considers the FOFI to be a reliable prediction of future events, and the FOFI should not be relied upon as such.

The Trillion Dollar Transformation

Batteries, Energy, Fossil Fuel and Electric Vehicles: Bloomberg (BNEF)

Electrovaya's battery photo, illustrates Bloomberg article:

https://www.bloomberg.com/news/articles/2018-06-19/how-big-will-the-battery-boom-get-try-548-billion-bnef-says



Photographer: James MacDonald/Bloomberg

Climate Changed

How Big Will the Battery Boom Get? Try $548 Billion, BNEF Says

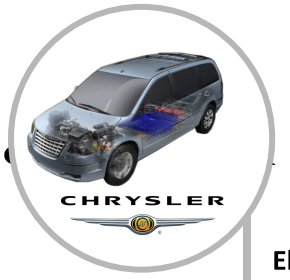
Electrovaya History 1996-2017

1996 — Electrovaya was founded in 1996, focusing on Lithium ion technologies

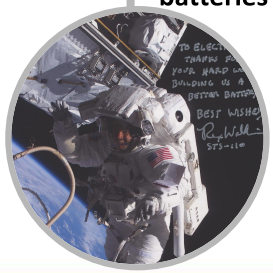
2000 — The company listed on the Toronto Stock Exchange

2002 — Electrovaya developed Zero Emission Vehicles partnering with a joint venture company between General Motors and Suzuk.

GM Canada



2003 — Electrovaya announced the launch of the Microsoft Scribbler® SC4000 series, a tablet PC



2004 — NASA: a mini aerocam power system and additional lithium ion batteries

2010 — Electrovaya conducted a research and demonstration program with Chrysler which was partially funded by the US Department of Energy and SDTC Canada

sse

2013 — Electrovaya partnered with the SSE that led to the installation of multiple energy Storage Systems

2016 — Development of the LC/EV40 and LC/EV44 lithium ion cells with the highest cycle life in the industry for

2016 — Electrovaya Acquires Germany's largest Lithium Ion manufacturer and begins deliveries for Daimler's electric smart car

2017 — Elivate Forklift battery products launch. First order with Mondelez in 2017

2017 — Electrovaya delivered a 1.5MWh containerized battery

Electrovaya History 2018-Present

Electrovaya completes deliveries of ~160 batteries for a Walmart Distribution Center. This represents the largest single installation of lithium ion batteries at a

Walmart

Electrovaya batteries on display in Raymond trucks at CEMAT 2018

Electrovaya selected by Jabil for supply of batteries for Badger's AGVs

Electrovaya signs sales agreement with Raymond Corp

RAYMOND

Multiple DC site orders from Walmart including cold storage, HVDC sites

Walmart

Electrovaya moves into new HQ facility in Mississauga.

2018 > **2019** > **2020**

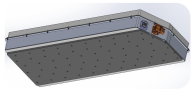
Launch of Electrovaya's 24V and 36V battery products

Delivery to first Cold Storage facility with a $1.5M project

350th battery delivery Milestone

Advanced high temperature features added to Electrovaya's EV44 cells.

Electrovaya receives first Ebus battery order.



Electrovaya acquires remaining ceramic separator IP from Evonik, bringing total patent count to over 100 .

Electrovaya: A Pure Play in Li-Ion Battery

- 2015-2018: Acquired largest Li-Ion plant in Germany/EU; Plant built by Evonik Degussa and Daimler; for Daimler's electric Smart Car; heavy asset model
- Market did not emerge for e-Smart Car; production at ~15% of target
- EU: market for e-vehicles and Li-Ion batteries did not emerge;

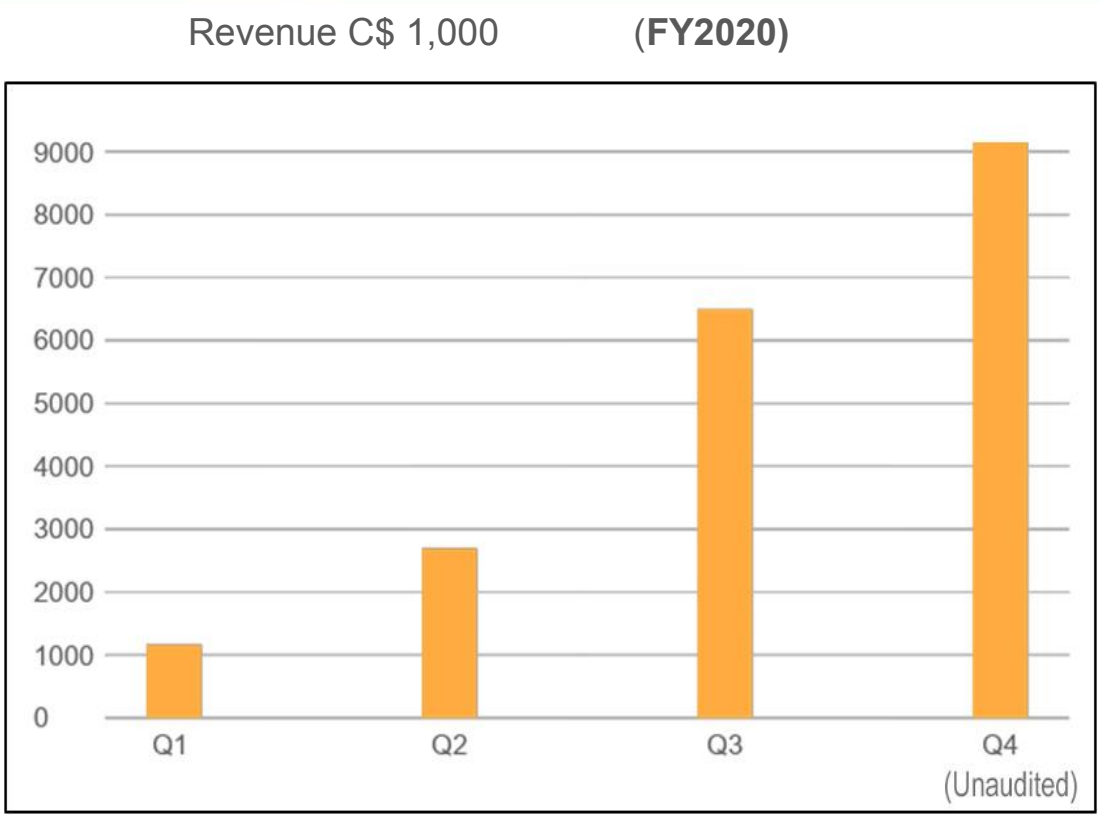
2017-2019 PIVOT to Mission Critical electric Lift Trucks in North America

- Pivot: 2017-2019: Technology Development & Validation; light asset model
- Validation with ~largest user: Walmart; took 20 months
- Validation: largest OEM: Raymond the e-brand of Toyota; ~18 months
- FY2020: move to new location and Production Growth
- Gaining quickly leadership position of Li-Ion in e-lift trucks
- Exceptional Technology: Cycle-life; Safety, Energy & Power
- FY2020: $19.1m (unaudited); and FY2019: $6.5m
- Focus: e-lift-truck; e-bus; e-truck

Electrovaya Pivots to the Electric Forklift Market

Emerging into new e-lift truck market: 2020

- Revenue CAD$6.5 Million (Q3, FY2020, June)
- EBITDA* positive CAD$0.7 Million (Q3, FY2020)
- Revenue CAD$9.1 Million (Q4, Sept FY2020-Unaudited)
- Revenue CAD$19.2 Million (FY2020 Unaudited) vs CAD$6.5 Million (FY2019), ~200% increase YoY



Positive EBITDA* of $0.7m in Q3

*Non-IFRS Measure: EBITDA (net earnings added back interest, taxes,depreciation, amortization and stock base compensation) does not have a standardized meaning under IFRS. Therefore it is unlikely to be comparable to similar measures presented by other issuers

Capital Share Structure

Ticker: TSX:EFL / OTCQB:EFLVF

Shares Outstanding : 129,615,284

Share Price : CAD$0.92

Market Cap : CAD$119,246,062

Insider ownership: ~ 45%

Unique Game-Changer

Why Electrovaya Lithium Ion solutions succeed when others fail?

- **Cell Technology:** exceptionally **high cycle life**; proprietary technology
- **Superior Safety with Ceramic Separator**
- Excellent **energy, power, fast charging**
- **BMS Technology:** All hardware and software developed in-house
- **Battery System Design:** specifically to withstand high levels of vibration and to operate in most environment including cold storage
- **Over** 100 International Patents & IP

Breakthrough Technologies: Safety & Cycle Life

US 20160365568A1

(19) United States

(12) Patent Application Publication

Haugseter et al.

(10) Pub. No.: US 2016/0365568 A1

(43) Pub. Date: Dec. 15, 2016

(54) METHOD FOR MANUFACTURING OF SLURRY FOR PRODUCTION OF BATTERY FILM

(71) Applicants: MILJOBIL GRENLAND AS, PORSGRUNN (NO); ELECTROVAYA INC., MISSISSAUGA (CA)

(72) Inventors: Bjorn Haugseter, Skien (NO); Tom Henriksen, Skien (NO); Lars Ole Valoen, Porsgrunn (NO); Akhilesh Kumar Srivastava, Skien (NO)

(21) Appl. No.: 15/138,797

(22) Filed: Apr. 26, 2016

Related U.S. Application Data

(63) Continuation of application No. 13/882,501, filed on Apr. 29, 2013, now Pat. No. 9,324,998, filed as application No. PCT/IB2011/054738 on Oct. 24, 2011.

(30) Foreign Application Priority Data

Oct. 28, 2010 (NO) 2010 1514

Publication Classification

(51) Int. Cl.

H01M 4/36 (2006.01)

H01M 4/485 (2006.01)

H01M 4/505 (2006.01)

H01M 4/1391 (2006.01)

H01M 4/131 (2006.01)

H01M 4/58 (2006.01)

H01M 10/0525 (2006.01)

H01M 4/525 (2006.01)

(52) U.S. Cl.

CPC *H01M 4/364* (2013.01); *H01M 10/0525* (2013.01); *H01M 4/485* (2013.01); *H01M 4/623* (2013.01); *H01M 4/0404* (2013.01); *H01M 4/0435* (2013.01); *H01M 4/0471* (2013.01); *H01M 4/525* (2013.01); *H01M 4/505* (2013.01); *H01M 4/62* (2013.01); *H01M 4/1391* (2013.01); *H01M 4/131* (2013.01); *H01M 4/5825* (2013.01); *H01M 4/136* (2013.01)

(57) ABSTRACT

The present invention relates to a method for manufacturing slurry for coating of electrodes for use in lithium ion batteries, wherein the method comprises mixing active materials with a binder into a binder solution, and adding an organic carbonate to the binder solution to generate the slurry. The present invention also relates to a method for manufacturing electrodes for a lithium battery cell, wherein the method comprises mixing active materials with a binder into a binder solution, adding an organic carbonate to the binder solution to generate slurry, wherein the above adding step is carried out at temperature above melting temperature of the organic carbonate, coating electrode material with the slurry, drying the coating on the electrode material by drying

US005547782A

United States Patent [19]

Dasgupta et al.

[11] Patent Number: 5,54

[45] Date of Patent: Aug. 2

[54] CURRENT COLLECTOR FOR LITHIUM ION BATTERY

[76] Inventors: Sankar Dasgupta, c/o Electrofuels Manufacturing Co. 21 Hanna Ave., Toronto, Ont., Canada, M6K 1W8; James K. Jacobs, c/o Electrofuel Manufacturing Co. Unit 10, 21 Hanna Ave., Toronto, Canada, M6K 1W8

[21] Appl. No.: 402,359

[22] Filed: Mar. 13, 1995

Related U.S. Application Data

[62] Division of Ser. No. 204,439, Mar. 2, 1994, Pat. No. 5,464,706.

[51] Int. Cl.[6] H01M 4/66

[52] U.S. Cl. 429/194; 429/235; 429/237; 429/245

[58] Field of Search 429/245, 235, 429/237, 233, 194, 209

[56] References Cited

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5,368,959 11/1994 Kokkbang et al. .....

5,441,830 8/1995 Moulton et al. .....

Primary Examiner—John S. Maples

[57] ABSTRACT

An improved lithium ion battery is described wh rosion of the current collector in contact with the face is greatly reduced. In one embodiment an e conductive, ceramic layer is inserted between t collector and the corresponding major face of the li battery. In another embodiment the metallic curren plate is replaced by an electrically conductive organic polymer having electrically conductive dispersed therein.

5 Claims, 2 Drawing Sheets

US006080508A

United States Patent [19]

Dasgupta et al.

[11] Patent Number: 6,080,508

[45] Date of Patent: Jun. 27, 2000

[54] PACKAGING ASSEMBLY FOR A LITHIUM BATTERY

[75] Inventors: Sankar Dasgupta; James K. Jacobs, both of Toronto, Canada

[73] Assignee: Electrofuel Inc., Toronto, Canada

[21] Appl. No.: 09/032,780

[22] Filed: Mar. 6, 1998

[51] Int. Cl.[7] H01M 2/06

[52] U.S. Cl. 429/127; 429/163; 429/211

[58] Field of Search 429/162, 163, 429/211, 127, 100, 231.95

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5,326,653 7/1994 Chang 429/162

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5,591,540 1/1997 Louie et al. 429/163

FOREIGN PATENT DOCUMENTS

60-211763 10/1985 Japan .

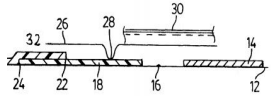
Primary Examiner—Maria Nuzzolillo

Assistant Examiner—Susy Tsang

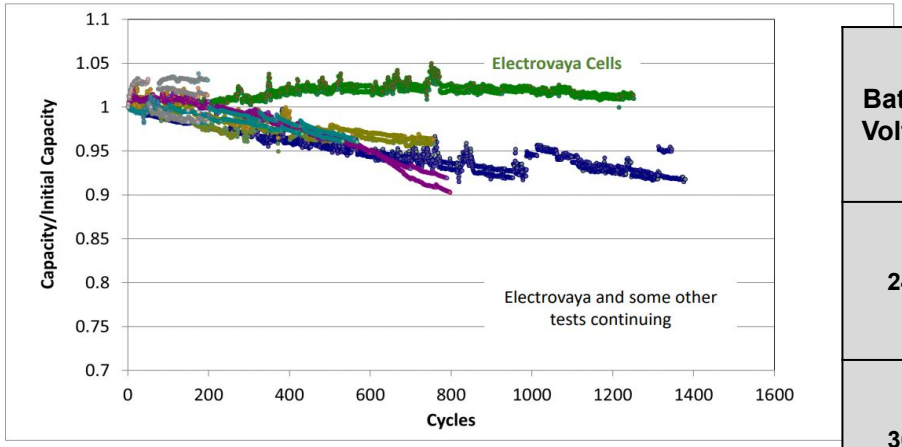
[57] ABSTRACT

The terminals of a thin plate rechargeable lithium battery are coated with a heat-sealable polymer. The coating forms a band on each face of the terminals and the band is heat-sealed to the inner insulator layers of a multi-layered polymer laminate enclosing the thin plate rechargeable lithium battery at a location close to an open edge of the insulator layer. Small sheets of rigid, high melting point, polymeric materials are inserted between the bands of coating carried by the terminals and the edge of the multi-layered laminate enclosing the lithium battery. A portion of the sheets of polymeric material is adhesively attached to the face of the terminal adjacent the bands of coating. The open edges of the multi-layered polymer laminate enclosure are subsequently sealed to enclose completely the thin plate lithium battery.

14 Claims, 1 Drawing Sheet



Conditions: 22°C ambient, 0.5C charge rate, 4.0V end-point
6 cell types, tested in duplicate



Battery Voltage	Timeline	Capacity (Tested Range)	Capacity Retention
24V	After 1 year (~200,000 equivalent miles) (Measured over 85% usage range)	~ 8.76 kWh	> 99% *
36V	After 1 year (~200,000 equivalent miles) (Measured over 75% usage range)	~ 22.19 kWh	> 99% *

Exceptional cycle life results at RT and 45 °C compared to other competitors with NMC chemistry (Third Party Testing at DNV.GL 2020)

Data from Walmart following 1 year 24/7 operation

Target Markets: Mission Critical

APPLICATION	TYPICAL DAILY USE	FOCUS	MARKET
	ACTIVE: 2 hours STATIONARY: 22 hours	Capital Cost Safety Energy Density	Rapidly Expanding Multi-Billion Dollar
 	ACTIVE: 12-20 hours STATIONARY: 4-8 hours	Efficiency Safety Lowest Cost of Ownership	Early Stages in North America/Europe; Massive Potential
	ACTIVE: 22 hours STATIONARY: 2 hours	Efficiency Safety Lowest Cost of Ownership	Existing and growing Multi-Billion Dollar

Typical cycle equivalent is 1.5- 2.5 per day. That's like driving your Tesla Model S **600 miles every day, 220,000 miles per year or 2,200,000 miles over its life.**

E-Lift Truck Focus: OEM Sales Channel

RAYMOND

- **OEM partner:** Largest electric forklift OEM: Raymond Corp (100% subsidiary & the electric brand of Toyota)
- **Raymond Corp,** after intense testing, signs sales agreement in April 2019
- **Raymond**'s distribution starts selling Electrovaya Lithium Ion Battery
- **Total Sales of e-forklifts:** ~150,000/year in the USA[1]

1. https://www.mmh.com/article/top_20_lift_truck_suppliers_in_2019

Toyota and Raymond Corp showcased Electrovaya's ELivate battery systems in their lift trucks at CEMAT, Hanover Germany.

Toyota Material Handling showcased two Electrovaya's ELivate battery systems in their lift trucks at ProMat, Chicago..

E-forklift: Replacement Market Sales Channel

- **Replacement Market:** a multi-billion dollar addressable market, with ~1.5 million forklifts (lead acid, fuel cell & ICE) in North America
- **Heavy usage:** Long Life Lithium Ion battery with superior safety and fast charging capabilities should replace Lead Acid, Propane and Hydrogen
- **Electrovaya** working with major users & compatible with most e-forklifts
- **Sales to Fortune 500 companies like Mondelez and Walmart**
- **Rapid growth: operating in over 30 locations in USA, Canada….**

Electrovaya batteries on the factory floor

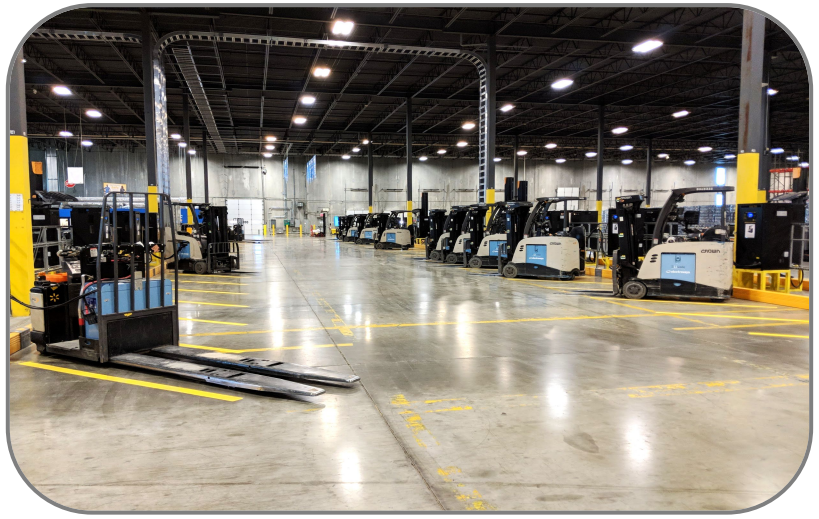
Electrovaya batteries at a major furniture distribution center

Walmart

Mondelēz International

Walmart Experience- Largest End User

- Largest single end user has been Walmart Canada who has operated 170 batteries since 2018.
- Validation over 20 months.
- Reliability and Productivity, was found to be substantially better
- 2019 to award Electrovaya with another 2 DC sites, now commissioned.
- Walmart is currently operating about 500 e-lift trucks with Electrovaya batteries



Electrovaya batteries powering a Walmart Distribution Center

Operating Sites

Over 30 sites

Types of sites:

- ❑ E-Commerce
- ❑ High velocity distribution centers
- ❑ Cold/freezer storage
- ❑ Manufacturing
- ❑ Food processing
- ❑ Furniture
- ❑ Logistics
- ❑ Recycling

E-Bus Battery Pack

- Electrovaya has completed a set of prototype watercooled battery packs for an eBus application
- Development is supported through a C$3.8M STDC project

Electrovaya 670V battery packs under assembly

Automated Guided Vehicle Battery Systems

- Electrovaya worked with Jabil closely during the development of their Robotic systems (later branded Badger Technologies) in mid 2017.
- Badger's Systems went into production 2019. Since then Electrovaya has delivered over 1000 battery systems (each robot uses one battery)

Electrovaya battery is placed in the base of the robot

Mississauga Assembly Facility

Board of Directors and Key Management

- Prof. Alex McLean: **Chair of the Board** ,distinguished scientist in Material Science; Visiting Prof at MIT, Kyoto U and Prof. Emeritus at UofT; tech startup, 6 books,.
- Dr. James Jacobs; Director, Co-Founder Electrovaya; BA Oberlin College, Ph.D. UofT.
- Dr. Bejoy Das Gupta; Director; Chief Economist e-Currency; B.Sc. LSE, Ph.D. Oxford U
- Prof. Carolyn Hansson: Director; Order of Canada, Ph.D. Imperial Coll.
- John MacDonald, EE UofT, Nortel and CEO Enercare, sold to Brookfield for $4.3B

- Dr. Sankar DasGupta: CEO, Director & Co-founder: Ph.D. Imperial;
- Richard Halka: EVP-CFO over 20 years experience ; TSX and Nasdaq listed companies
- Dr. Raj DasGupta; COO and VP Tech: 10+ years w/ EV, Imperial, MIT and Cambridge U.
- Jason Roy; Director IR and Communications: over 15 years experience
- Murray Pickrem: Director Sales: 20+ years exp in Materials Handling Industry in US
- Keith Baker: System Eng. Lead; B.ASc. UofT, M.ASc. EE Waterloo; 12 years RIM,
- Dr. Jeremy Dang; Director Business Development and Projects; Ph.D. UofT
- Leonid Borshchak ; Director Software: 30 years firmware design
- Dr. Elmira Memarzadeh: Manager Electrochemistry; Ph.D. Alberta U;

Conclusion

- **Technology: Unique, Path-breaking, a differentiator for us & our partners**
- **Game-changer: cycle-life, safety along with excellent energy & power**
- **Substantial IP with over 100 patents**
- **Large Addressable & Mission-Critical Market:** ~150,000 new electric lift trucks into US market; ~1.5 million e-lift trucks in operation, may need upgrading
- **Direct Channel/Upgrade Market:** eg: Walmart in multiple distribution sites
- **OEM Channel:** Raymond Corp, the electric brand of Toyota and a 100% subsidiary, has started distributing Electrovaya batteries
- **Revenue growth:** FY2020 C$19.2m; FY2019 C$6.5m; Q4 FY2020 C$9.1m
- **EBITDA positive:** C$0.7m in Q3 with C$6.5m revenue
- **Other markets** which need exceptional batteries: include electric bus, electric trucks, e-AGV
- **Climate Change** Mitigation & Greenhouse gas reduction
  - Important contribution; 12-16X more than e-cars

TSX:EFL - OTCQB:EFLVF

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