AVICENNE PROFILE

Information for Growth - Powering your company’s market strategy with in-depth research

- Creation: 1992, by Ali MADANI
- Headquarter: Paris
- Liaison Office: Japan, USA, China
- AVICENNE Energy Director: Christophe Pillot
- 4 consultants
  - A Madani
  - C Pillot
  - JP Salvat
  - A Yassari
- 2 Senior advisors
  - X Zhang
  - M. Sanders
- Database: >20 000 contacts in the battery value chain
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- Headquarter: Paris
- AVICENNE Energy Director
  Christophe Pillot
- 2 Senior Advisors
  M Sanders (US Market)
  X Zhang (Chinese Market)
- 2 Analysts
  JP Salvat
  A Yassari

Worldwide expert for the battery value chain

SEPTEMBER 2017

CONTACT
Christophe PILLOT
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c.pillot@avicenne.com

The Rechargeable Battery market
25th Edition

Customized survey
<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
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</thead>
<tbody>
<tr>
<td>1992</td>
<td>AVICENNE Creation</td>
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</table>
| 1994 | AVICENNE advised French Industry Ministry on the European battery business  
      | AVICENNE open its office in JAPAN |
| 1999 | « BATTERIES » congress 1st edition in Paris |
| 2003 | AVICENNE work on the due diligence process for the sales of SAFT by ALCATEL |
| 2008 | AVICENNE: expert witness in the NTT-Hydro Quebec conflict |
| 2009 | AVICENNE presented its market forecasts to industrials in Asia: CIAPS in Beijing – China, Battery Japan in Tokyo |
| 2010 | Avicenne developed partnership with BATTERY JAPAN  
      | 20th Edition of “The rechargeable battery market worldwide 2010-2020 |
| 2011 | AVICENNE Energy division is created  
      | 13th Edition of BATTERIES Congress |
| 2014 | 16th Edition of BATTERIES Congress in NICE, France  
      | 1 month mission in China: Qinghai EV Rally, CIBF, 50 companies visited |
      | 18th Edition of BATTERIES Congress in NICE, France, Sept 2016  
      | European Community Project ALISE: Dissemination & Exploitation Work Package leader |
      | 19th Edition of BATTERIES Congress in NICE, France, Oct 2017 |
OUR METHODOLOGY

INFORMATION COLLECTION

Primary Research
- Executive Interviews (> 20,000 contacts in the battery value chain)
- Vendor Briefings
- Product Demos and Tours

Secondary Research
- Company News & Financials
- Technology & Product Specs
- Government Data
- Economic, Demographic Data

INFORMATION COLLECTION

Market & Strategic Analysis

Qualitative
- Business Models & Trends
- Technology Issues
- Policy & Regulatory Factors
- Competitive Landscape
- Profiles of Key Players

Quantitative
- Company News & Financials
- Technology & Product Specs
- Government Data
- Economic, Demographic Data

Strategic
- SWOT Analysis
- Gap Analysis
- Business Plan
- Value Proposition
- Due Diligence
- Merger & Acquisition

Track valuable Information's

Strategic Analysis

Presentation of the results

Q&A with customers

Customer Evaluation

Supply side

Demand side
METHODOLOGY: EXTENSIVE FIELD RESEARCH TO RETRIEVE & CROSS CHECK INFORMATION

- **Top management contact network**
  > 20,000 contacts

- **In Depth analysis**
  Of applications

- **Conferences & Exhibitions**

- **Cross Check Analysis**

- **Battery Makers**
- **OEM**
- **Substitution technologies**
- **Raw materials suppliers**
- **BMS Electronics**
- **Environment & recycling**
CUSTOMIZED & MULTICLIENT SURVEY
FOR ALL THE VALUE CHAIN

Raw Materials | Materials | Cells | Pack | OEM
---|---|---|---|---
BMS & Electronics | Batteries | Cooling Systems | Power Electronics

Source: Photo from BASF

2015-2025 STRATEGIC REPORT
Worldwide Rechargeable Battery Market
MORE THAN 200 REFERENCES

3M  A123  AHLSTROM  AIR LIQUIDE  AIR PRODUCT  ALCATEL  ANDREWS KURTH  APPLIED MATERIALS  ARC  ARKEMA  ARMOR  AROS SECURITIES  ASHLAND  AT KEEARNEY  ATLAMPEREX  AUSTRIAN INSTITUTE OF TECHNOLOGY  AEXON  BAIN  BASF  BATTERY ASSOCIATION OF KOREA  BAYER  BLACK & DECKER  BHP BILLITON  BRAND LICENCING PARTNERS (BLP)  BLUE ENERGY  BOURNS  BOSCH  BOOZ  BRUCKNER  BUHLER  BYD  CABOT  CALL2RECYCLE  CAP X  CARBONE LORRAINE  CARLYLE  CATELLA  CATERPILLAR INC.  CDN COBALT  CEUYTEN  CELGARD  CHEMETALL  CHEMISHE FABRIK BUDENHEIM  CIAPS CHINA  CIBA  CGEMA  COMPASS LEXECON  CONOCO PHILIPS  CRU GROUP  CSC CHALLENGE STRATEGY CHANGE  DARTON COMMODITIES  DCE  DELTA  DGA  DIALOG SEMICONDUCTOR  DOW CHEMICAL  DOW CORNING  DRAHLMAIER  DSM  DYPONT  DURACELL  DYSON  ECM GREENTECH  EDF  ELECTRO ENERGY  ELKEM  ENER 1  ENERGIZER  EVENATE  EVOLTE  EPCOS OHG  ERAMET  ESI  ETC AB  EUROPEAN COMMUNITY  FACOM  FAIRSCHILD SEMICONDUCTOR  FALCON BRIDGE  FAMEART  FISH & RICHARDSON  FIST  FLORIDIENNE DE CHIMIE  FMC  FORTU POWER CELL  FRANCE TELECOM  FRAUNHOFER IPA  FRAUNHOFER ISI  FREUDENBERG VIESSTOFFE SE & CO  FULTON INNOVATION  GAIA  GM  GIL IMPORT BATTERIES LTD.  GRAPHIT KROPFMUHL  GS MELCOTEC  HALDOR TOPSOE  HC STARCK  HERAEUS QUARZGLAS  HIGH POWER LITHIUM  HILTI  HITACHI MAXELL  HOLLINGSWORTH & VOSE CIE  HONEYWELL  HUTCHINSON  ICC NEXERGY  IER  IGL EXPORT.  INCO  INNOVIA FILMS  INTEL  INTERNATIONAL COMPONENT CORP.  INTERNATIONAL RECTIFIER  INTERSIL  ISRAEL CONSULTING  ITEMM  ITRI  ITS  JBC  JETRO  JOHNSON CONTROLS  JOHNSON MATTHEY  KISTI GII  KNOWLEDGE FOUNDATION  KODAK  KOSMO MAROC  KRUGER  LAZARD  LECLANCHÉ  LEDGRAND  LG CHEMICAL  LION CELLS  LITTLE FUSE  LILIPUICAN  LYNAS CORP  MATSUSHITA  MICROSOFT  MINDBRANCH  MTI MICRO FUEL CELLS  MOLTECH  MOLYCORP  MOMENTIVE  MOSAID TECHNOLOGIES  MOTOROLA  MUNSTER UNIVERSITY  NANOCLY  NCCP – RUSSIA  NEC  NILAR AB  NISSAN  NITECH  NKKPC  NORILSK NICKEL  NOVALED  NTK POWERDEX  OLIVER WYMAN  OMG INC  ORANGE  OSKR  PANASONIC  PHILIPS  PHOTON  PK & WISE  PLEXTRONICS  POSCO  POWER GENIX  PRAXAIR  PRAYON  PRISMARK  PSA  RAYOVAC  RECHARGE  RENAULT  RHODIA  ROCKWOOD LITHIUM  ROLAND BERGER  ROSKILL INFORMATION SERVICES  RSR CORP  RUSNANO  SABIC  SAE GETTERS  SAFT  SAGENTIA  SAINT GOBAIN  SAKTI  SAMSUNG SDI  SANIK  SCHOTT  SCHRODER VENTURE  SCOTENT ENTREPRISE  SEB  SEPCELL  SFJP  SHARP  SHENZHEN HIGH POWER TECHNOLOGY  SILATRONIX  SKC  SOLWAY  SONY  SQM  STIBAT  STORCK  STRATEGY ANALYSIS  SVE – DASSAULT  SWM  TERRAROSA CAPITAL  TIGER GLOBAL  TIMCAL  TODA KOGYO  TOTAL  TOTAL WIRELESS SOLUTION  TOYO  TOYOTA  TRENFOAN  TYCO  UMICORE  UNIROSS  URALELEMENT  US NAVY  VARTA  VOLTRACK  WACKER CHEMIE AG  WARBURGPINCUS  WILDCAT  WINSTON & STRAWN  WOR GRACE & CIE  XGSCIENCES  YASLAMEN  ZEBRA  ZPOWER
SPEAKER, CHAIRMAN OR WORKSHOP MODERATOR

Tens of INTERNATIONAL CONFERENCES per year


- ILMB 2016, Chicago “The Li-ion battery market 2015-2025”

- INTERNATIONAL Li-ion BATTERY SUMMIT – Dec 2015, Shenzhen, China “The Li-ion battery raw materials market 2012-2020”


- THE INTERNATIONAL BATTERY SEMINAR - FLORIDA Fort Lauderdale, Florida, March 2013, 2014, 2015, 2016, 2017– 2h tutorial “HEV, PHEV & EV market 2016-2025; Battery is the key” (From 2004 to 2017)

- EVER 2009, 2011, MONACO “Challenges for EV market in Europe”

- EVS 2011, 2013, 2015 “Battery market for automotive industry”


- And many more…
AVICENNE ENERGY: RENOWNED TO HAVE REALISTIC FORECASTS

HEV powered by Lithium ion battery forecasts from 2008 to 2016

EV sold, in million units, worldwide, 2010 - 2020

Source: International Battery Conference, Fort Lauderdale 2007-2016
BATTERIES 2016

www.batteriesevent.com

<header>
3 days congress in France (Paris, Nice, Cannes)
September 27th – 30th, 2016
500 attendees
40 Booths
Battery makers, raw materials suppliers, IC & BMS suppliers, tests, machining, coating,
80 international experts:
Researchers, industrial process, marketing, financials,
SUMMARY

- A small team dedicated on the battery industry since almost 20 years

- Working with large group worldwide: BASF, Dupont, Panasonic, Samsung, LG, Sony, Bosch, Siemens, Toyota, Renault, Eramet,…

- Synthetic presentation to management & CEO of major groups

We will help and support your growth

- Knowledge
- Methodology
- Expert Network
- Flexibility
THANK YOU

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Christophe PILLOT, Partner – AVICENNE ENERGY Director, Battery and xEV expert

Christophe has built up considerable expertise in the area of battery market. He joined AVICENNE 20 years ago and spent 3 years in Japan making analysis on the Electronic, Mobile & Japanese battery market. Christophe gained large experience in marketing, strategy analysis, technology and financial studies for the battery and power management fields. He developed the Battery market analysis for AVICENNE which counts more than 200 customers worldwide. Christophe published several annual surveys like “The rechargeable battery market and trends 2025”. He is also the founder & chairman of Batteries congress in France since 1999. He is now Director at AVICENNE ENERGY.

He has recently lead or participated in missions such as:
- Lithium carbonate & hydroxide market, 2015
- xEV and E-bus battery market in China, 2017
- Lithium ion battery Cathode market and value chain analysis, 2016
- Lithium ion battery market beyond electronic devices & automotive: industrial batteries (UPS, Telecom, Back-up, Energy Storage systems...), 2016
- Analysis of the flow battery suppliers worldwide: large group & start-up analysis
- Industrial battery market worldwide 2015-2025
- TESLA, BOLLORE analysis: battery choice, battery pack, cost curve, partnership, business model, 2016
- Lithium iron phosphate cathode market details and forecast – China Focus, 2016
- Detail profile of anode, cathode, electrolyte and separator makers, 2016
- Gel and solid electrolyte market and forecasts, 2014
- Automotive battery market related opportunities, 2014
- Opportunities in Lithium ion batteries for an US Speciality Chemical company
- SWOT analysis of 20 separator makers
- Li-ion pack makers market and business plan
- Expert Witness in the NTT DoCoMo Vs. Hydro-Quebec IP dispute negotiations
- Expert Witness in the UMICORE Vs. BASF IP dispute negotiations
- Battery pack analysis – Opportunities to integrate power electronics & chargers in the pack

Christophe is Speaker, chairman or workshop moderator at +20 international conferences worldwide each year (BATTERIES France, IBS Florida, AABC US and Europe, CIBF China, LBIS Shenzhen, BATTERY JAPAN, INTERTEK KOREA).

Globally, he has been involved in more than 300 projects for +200 customers in the Battery Value Chain. Before joining AVICENNE, Christophe PILLOT held key position in FRANCE TELECOM innovation division.

Degree in Chemistry & MBA in Innovation Management from Paris IX Dauphine.

His mother tongue is French, and he speaks fluent English.
AVICENNE Team – Project steering

Ali MADANI, Director- Battery, power electronics, automotive expert

Ali MADANI is founder and Director of AVICENNE.

He will bring a strategic vision to the project. He will discuss the project with the team and ask strategic questions during the project to bring an “out of the box” vision and perspective.

He has recently led missions such as:
- Due diligence for a key battery player
- Lithium carbonate & hydroxide market, 2015
- Development of AVICENNE Automotive market studies
- Lithium ion battery market beyond electronic devices & automotive: industrial batteries (UPS, Telecom, Back-up, Energy Storage systems...), 2015
- Participation to the recent AVICENNE study: The rechargeable battery market 2014-2025
- Li-ion pack makers market and business plan
- Battery pack analysis – Opportunities to integrate power electronics & chargers in the pack
- Battery market analysis for Automotive applications
- ...


Degree from École Normale Supérieure de Cachan, MBA in Innovation Management from Paris IX Dauphine University. 20 years Experience in conducting, strategic and financial studies, technology watch projects for large corporations and small companies.

He is fluent in French and English.
Mike is our US expert in Batteries and Materials. He is working at Sanders Group Enterprises, AVICENNE US Agent. He is responsible for proprietary projects supporting customers growth efforts, completing the interviews, writing the reports and mainly solicited for his knowledge on the US market. He has recently participated in missions such as:

- Battery Show 2016 Market Presentation
- Strategy Workshop for potential entrance into Lithium Ion Battery materials
- Market connections and validation of opportunities in Lithium ion batteries for a US Speciality Chemical company
- LIB Cathode, anode analysis
- Business development for new clients based on his network

Before forming the Sanders Group and becoming an agent for Avicenne, he had a long career with DuPont in multiple roles. Mike has significant energy storage materials value chain understanding with an emphasis on lithium ion batteries and systems with 10 years of market knowledge and relationships. Successful program leadership experience with significant business growth in ventures and existing businesses with a proven track record leading mergers and acquisition team to enter the lithium ion battery materials market. Most recent role with DuPont was the Global Marketing Director – Energy Storage Venture where he developed significant understanding and insights for the energy storage materials market, device manufacturing and systems while leading global marketing and customer interface efforts to establish programs to enter the $20B energy storage materials market. Executed strategic and market planning for opportunity evaluation, research, and choices for entry into rapidly growing new market.

**EDUCATION**

Bachelor - Chemistry, University of Delaware, Newark, Delaware

**AFFILIATIONS**

Society of Automobile Engineers, Electrochemical Society
Xiaoyu is our Chinese expert in Batteries. He is working at REAL LI, AVICENNE Chinese Partner. He is responsible for completing the interviews, writing the reports and mainly solicited for his knowledge on the Chinese market.

He has recently participated in missions such as:
- Lithium carbonate & hydroxide market, 2015
- Lithium ion battery market beyond electronic devices & automotive: industrial batteries (UPS, Telecom, Back-up, Energy Storage systems...), 2015
- Opportunities in Lithium ion batteries for a US Speciality Chemical company
- The Chinese raw materials market for Rechargeable batteries
- xEV market & developments in China
- LIB Cathode, anode, electrolyte & separator cost analysis
- The rechargeable battery market 2012-2025
- Partner research in China for European Companies involved in the Battery Industry

Before joining REAL LI, he held technical position in SAINT GOBAIN R&D Quality Division.

PhD in Electrochemistry in Beijing University. PhD in Material Science Université Pierre et Marie Curie, Paris, France. His mother tongue is Chinese, and he speaks fluent English and French.
Jean Philippe is our expert in the field of electrochemistry. He is responsible for completing the interviews, writing the reports and mainly solicited for his technical input. He joined AVICENNE 20 years ago. He has recently participated in missions such as:

- Lithium carbonate & hydroxide market, 2015
- xEV and E-bus battery market in China, 2017
- Lithium ion battery Cathode market and value chain analysis, 2016
- The rechargeable battery market 2016-2025
- Lithium ion battery market beyond electronic devices & automotive: industrial batteries (UPS, Telecom, Back-up, Energy Storage systems...), 2015
- Opportunities in Lithium ion batteries for a US Speciality Chemical company
- LIB Cathode, anode, electrolyte & separator cost analysis
- SWOT analysis of 20 separator makers
- Li-ion pack security needs: PPTC
- Li-ion pack makers market and business plan
- Battery pack analysis – Opportunities to integrate power electronics & chargers in the pack

Before joining AVICENNE, Jean Philippe held Analyst position in DL See Consultant (3 Years) and Research Center Pont à Mousson SAINT GOBAIN (2 Years)

Degree in Material Science.

His mother tongue is French, and he speaks fluent English.