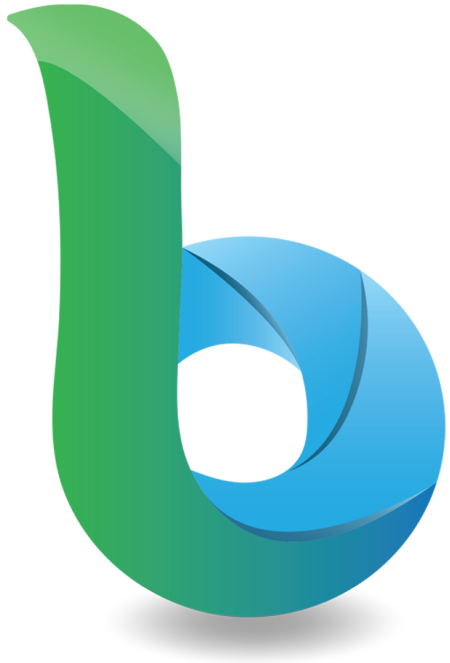

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OVERVIEW

- Market for Purified Oxygen
- Air Separation
- Zeolites
- Proposed Use of Technology
- Hospital Design
- Business Plan
- Risk
- Recommendations

OXYGEN IN MEDICINE

- Inhalation therapy
- During surgery to maintain tissue oxygenation under anesthesia
- Resuscitation of patients
- The treatment of such diseases as chronic obstructive pulmonary disease, pneumonia, and pulmonary embolism
- For the newborn experiencing respiratory distress syndrome
- The treatment of respiratory burns or poisoning by carbon monoxide and other chemical substances

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MARKET FOR 93% OXYGEN

- Oxygen is the third most widely used chemical in the world
- Annual worldwide market of over $9 bilion.

Main Applications:

- Medical oxygen for hospitals and individual use.
- Industrial applications for refineries and processing plants.

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HOSPITAL UNIT

- Large hospitals spend an estimated $170,000 per year on oxygen
- Approximately 350 large hospitals in United States
- On-site unit allows for:
  - Unlimited supply of Oxygen
  - Annual savings

HOSPITALS IN THE USA

Large hospital information

- Approximately 350 large hospitals in the United States (500-1000 beds).
- At any time have 150 users using 5L/min.

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GOALS

- **Use PSA technology to produce 93% oxygen with all specifications.**
- **Provide for maximum capacity of 300 users at 5 L/min of oxygen to adjust for fluctuation in demands.**
- **Determine if product is profitable and a plausible option for large hospitals.**

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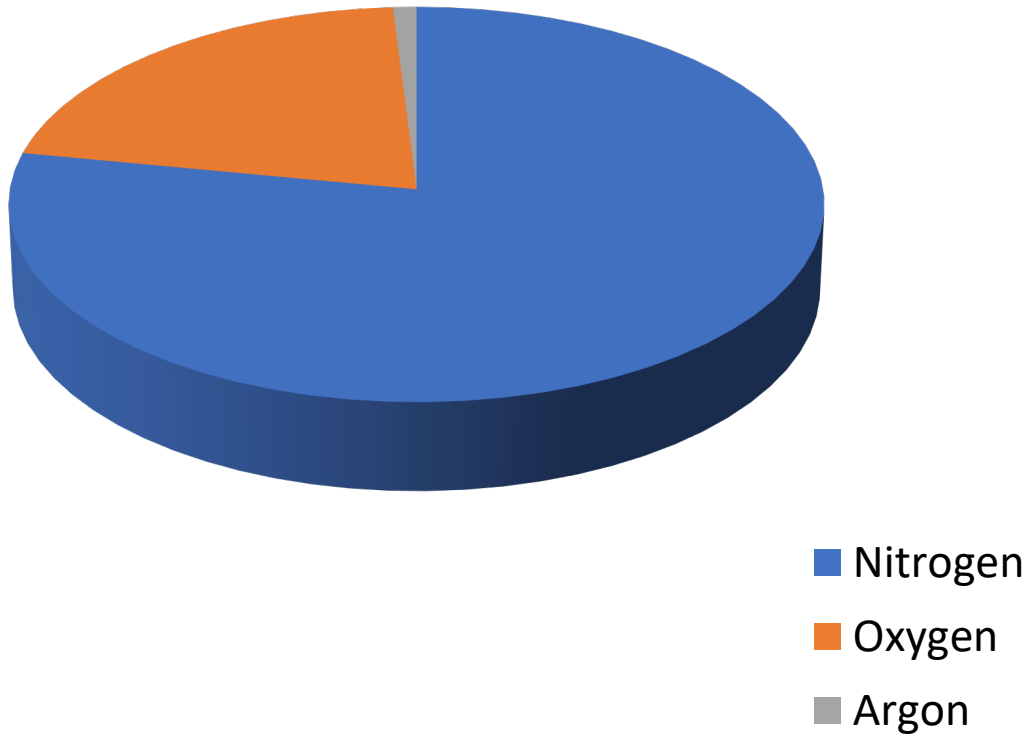

- Air is used as feed stock
- Oxygen is separated based on physical characteristics
- Must remove nitrogen for 93% oxygen purity

AIR SEPARATION

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PRESSURE SWING ADSORPTION

- Uses sorbents (zeolites, nanotubes) in two adsorption columns to separate molecules
- Two columns allow for the preocess to operate semi-continuously
- 4 process stages
  - Adsorption/Production
  - Blowdown/Purge

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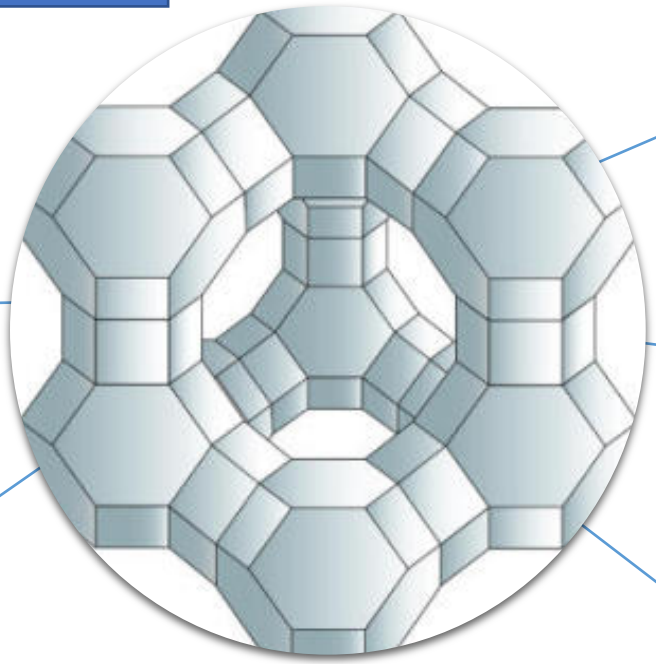
ZEOLITES

Lifespan of 10 years

Microporous crystalline structures



The zeolite's structure governs which molecules are adsorbed.

–separate molecules based on differences of size, shape and polarity

Various ways of controlling adsorption

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PRESSURE SWING ADSORPTION

Compressed air is fed into the frist bed.

Nitrogen and argon molecules are trapped, while oxygen is allowed to flow through.

The adsorbent in the first bed becomes saturated with nitrogen and argon molecules

The airflow feed is directed into the second bed.

The adsorbent adsorbs nitrogen and argon in the second bed.

The first bed is depressurized allowing argon and nitrogen to be purged out of the system and released to the atmosphere

The process starts over.

Compressed air is once again fed into the first bed.

The second bed is depressuirezed releasing argon and nitrogen molecules to the atmosphere.

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GENESIS 1

SPECS

- **Oxygen purity:** 93% +/- 3%
- **Oxygen production capacity:** 20-30 liters/min
- **Filling oxygen pressure:** 2200 psi
- **Dimensions:** 1150x 1500x800 mm
- **Weight:** 200 kg (441 lb.)
- **Electrical:** 220 VAC 50/60 Hz, 15 Amps, 3.3 kW
- **Alarms:** High and Low Pressure, Low Purity, Power Failure, Open Door, Low Flow

BUSINESS MODEL

Financial Analysis		
	Concentrator	**Liquid Oxygen**
Total Cost per 5 Year	$500,000	$850,000
Total Savings for 5 Years	$350,000	
Average Savings per Year	$70,000	

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Preliminary Risk Estimates of Oxygen Concentrator

1

predict profit if the scenario occurs that less consumers purchase the product.

2

Consumer utility maximization could have predicted wrong.

3

Copycats may enter market or oxygen prices may drop limiting market.

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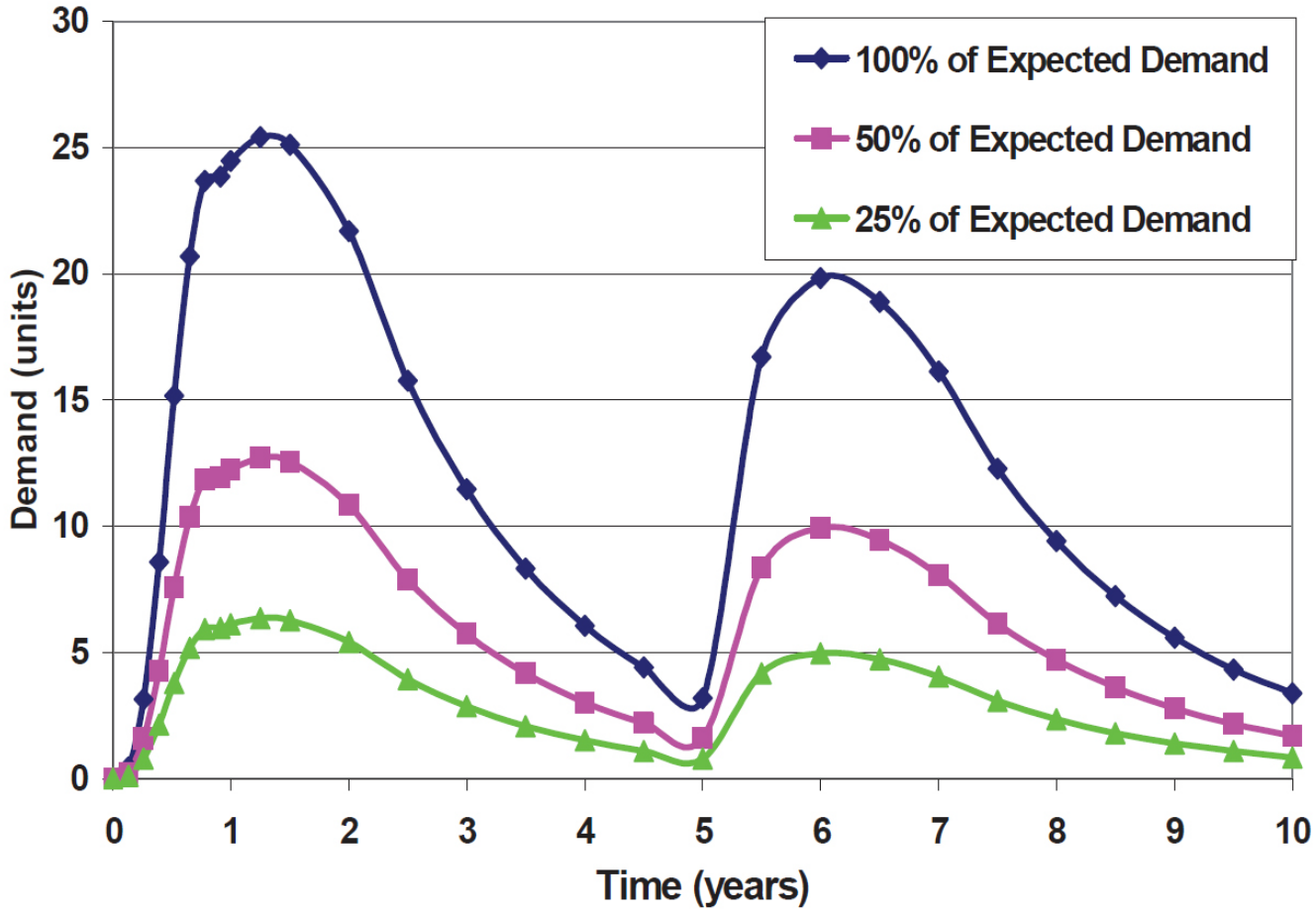
DEMAND VS TIME



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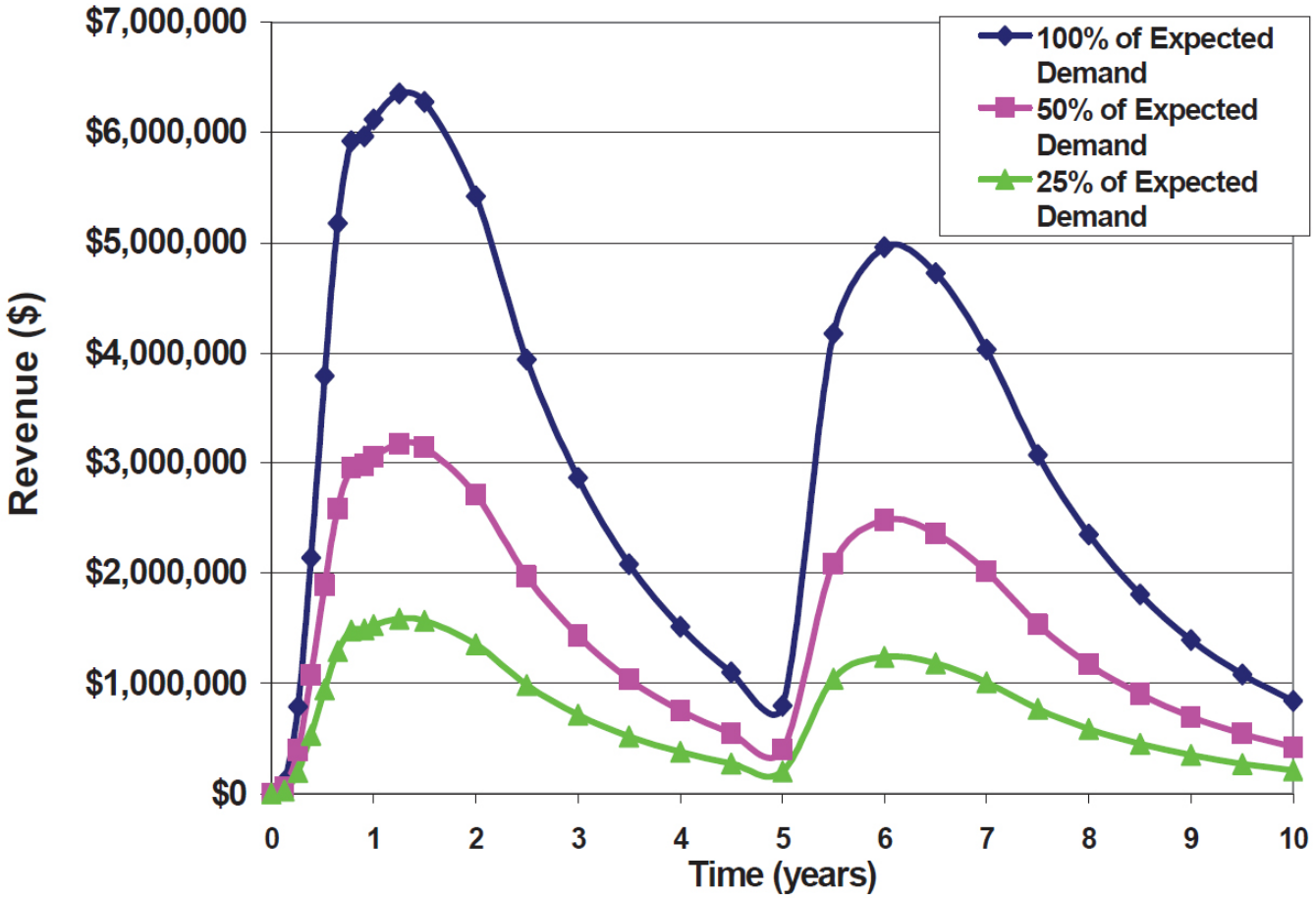
REVENUE VS TIME



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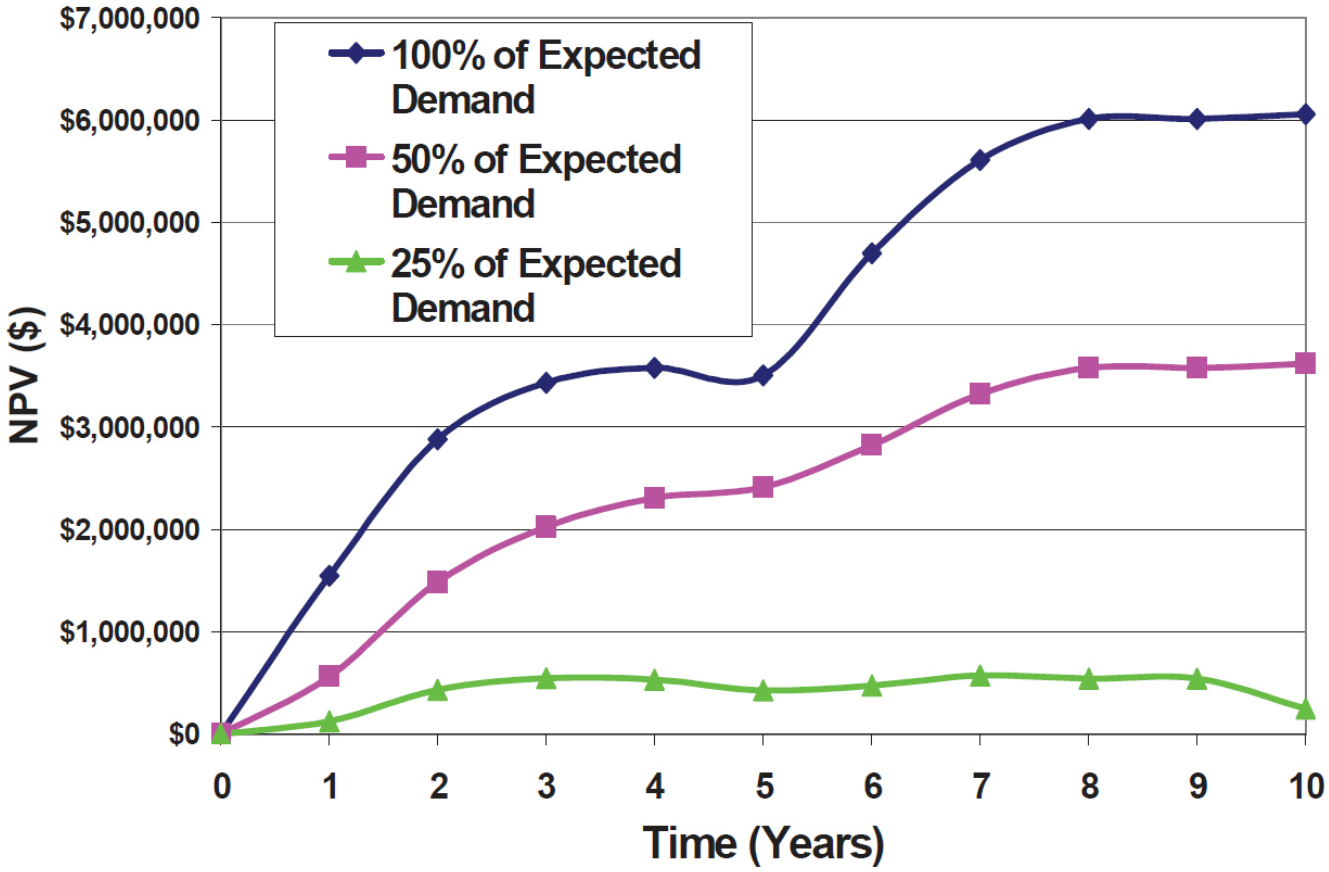
NPV VS TIME



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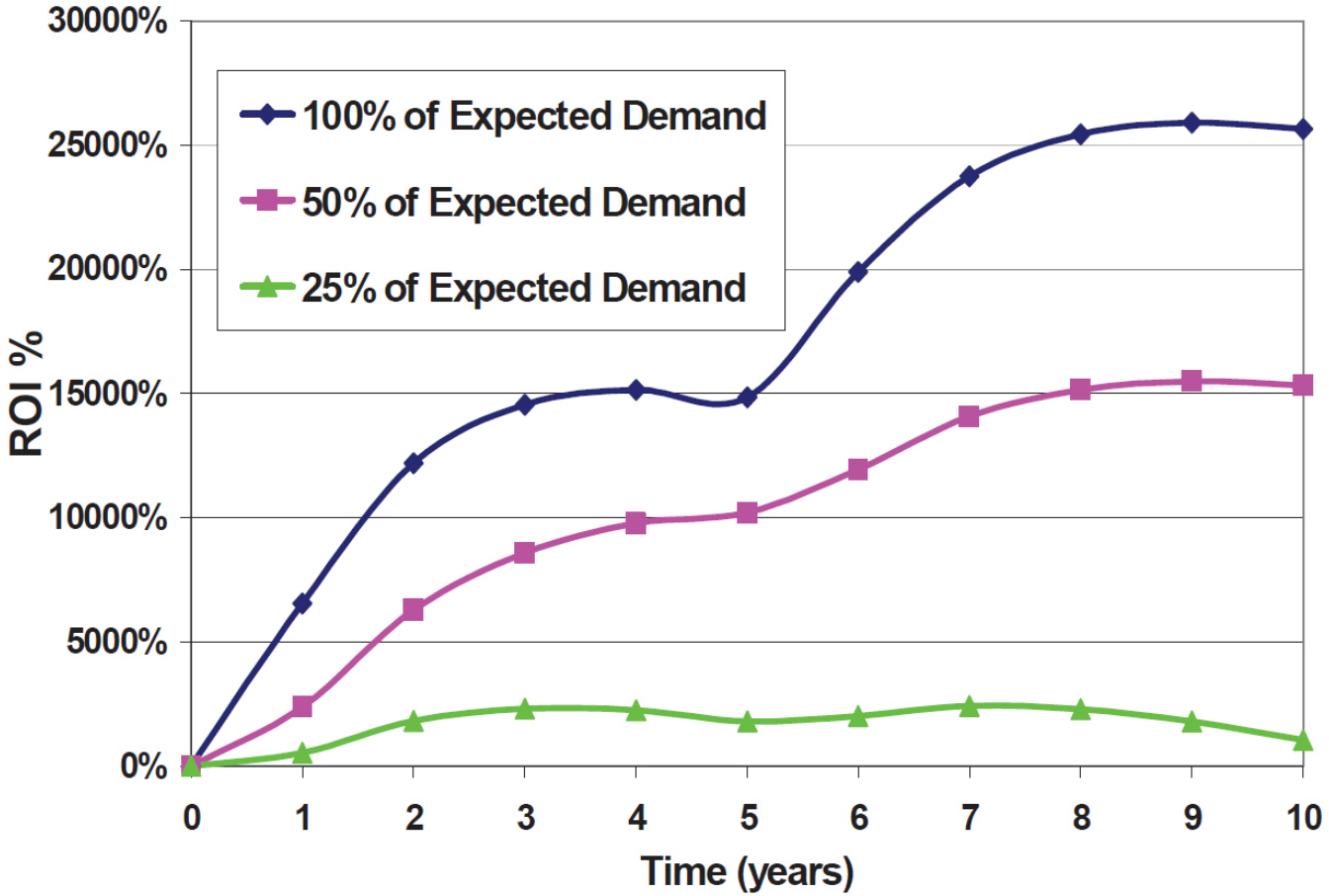
ROI VS TIME



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Graphs Conclusions

- The hospital project has been shown to be profitable even if demand is less than 75% than expected.

- NPV over 5 year span= $2,800,000
- ROI over 1 year span = 5200%

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Future

- Research more into practical application of portable oxygen concentrators.
- Further studies on maximization of NPV, ROI, and hospital preferences.
- More in-depth analysis of risk and consumer/competitor reaction estimation.

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FINAL CONCLUSIONS

It is now possible to deliver 93% oxygen to patients in a hospital, and to those who want to enjoy a life without the restriction of bulky liquid oxygen bottles.

This technology can change the lives of millions of patients and those needing oxygen around the world for years to come.

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