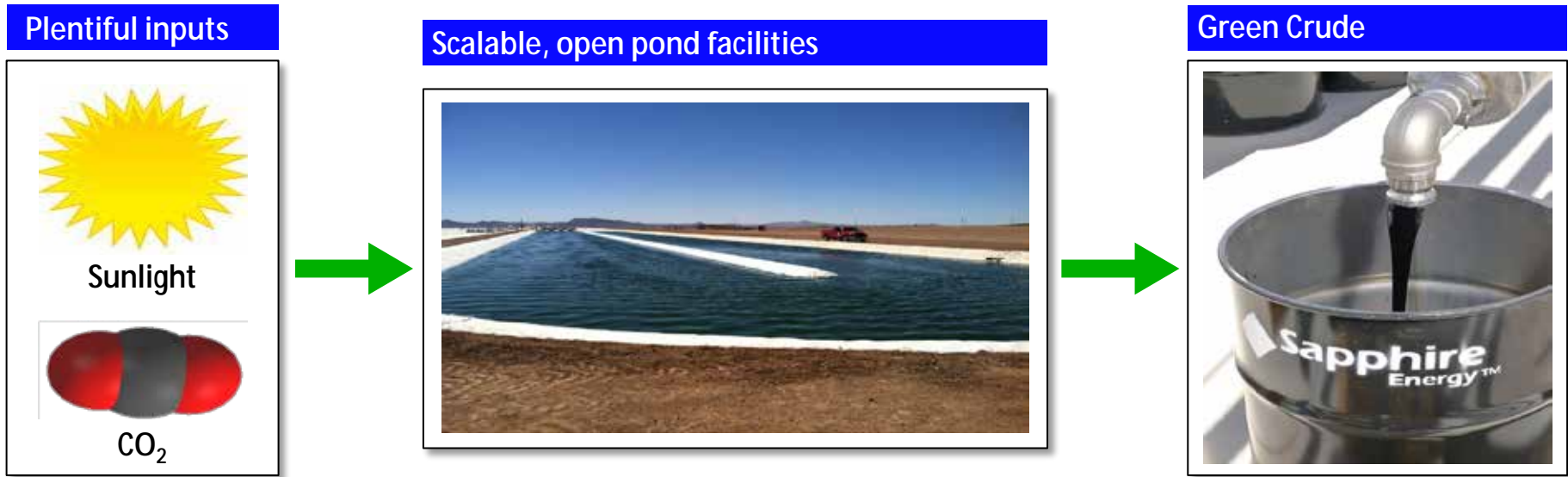


From Pilot to Player: Bringing Green Crude to Scale

Tim Zenk, Vice President
of Corporate Affairs



Sapphire produces drop-in crude oil from algae, sunlight, and CO₂ – in a scalable and sustainable process

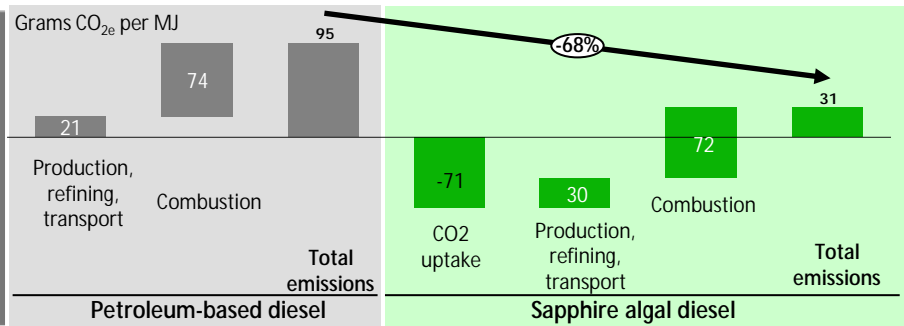


Fossil crude came from algae and other plants living millions of years ago;
Sapphire radically accelerates a natural phenomenon

Non-potable water • Non-arable land • Enhanced algae • Proprietary process

Algae is a superior renewable feedstock

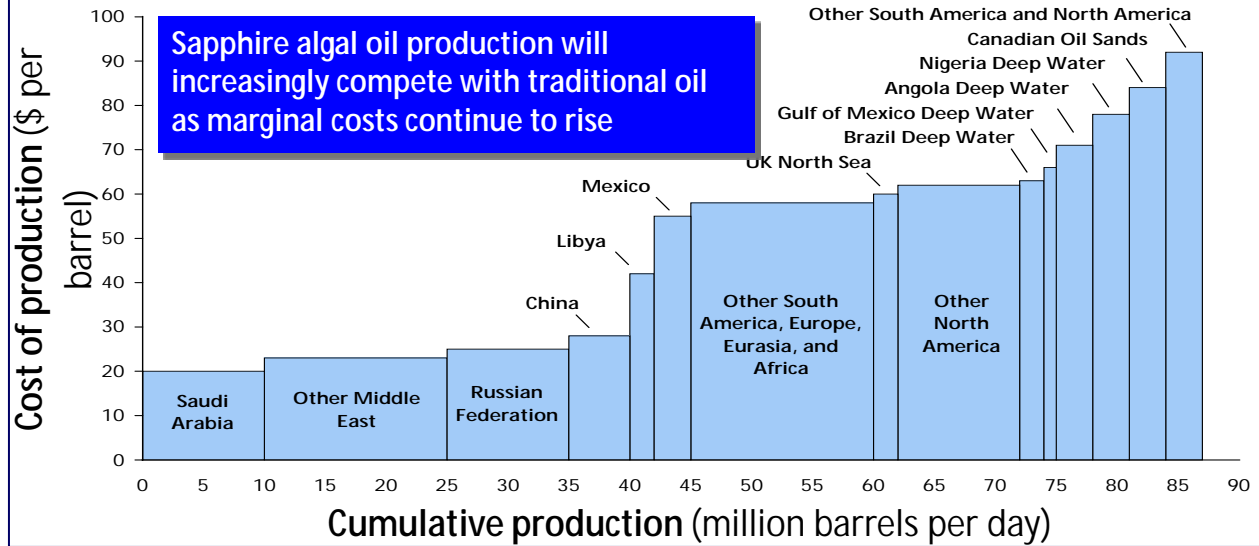
- Scalable to millions of barrels per day
- Cost competitive with marginal crude oil production
- Completely fungible with infrastructure and fleet
- Favorable life cycle with respect to CO₂
- Does not compete with agricultural products, land, or water



Algae fuel can be grown on marginal land with saline water



Oil supply marginal cost curve for 2008 WTI equivalent



Source: Cambridge Energy Research Associates

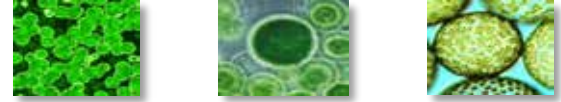
Sapphire has developed the most advanced large-scale algal oil system in the world

Advanced algae strain development
Algae-derived fuel process units

Algae facility in Columbus, NM



Strain creation



Cultivation



Harvesting



Extraction & processing



Refining
(final products)*



*Upgraded in a refinery or by a stand-alone processor;
Sapphire's oil quality enables processing in today's refineries with no modifications

**OPEN POND CULTIVATION—
*BREAKTHROUGHS IN THE FIELD***

Large-scale production of photosynthetic algae

Pilot technology facility

- 22-acre pilot facility operated since 2009
- Over 180,000 hours of large pond cultivation piloting

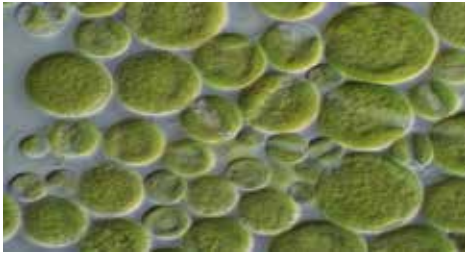


Commercial demonstration facility

- Sapphire is operating the world's first integrated algal-oil production facility
- Operations began in Q3 2012



Cultivation: Sapphire grows algae in a proven, scalable, growing system, while continually reducing cost



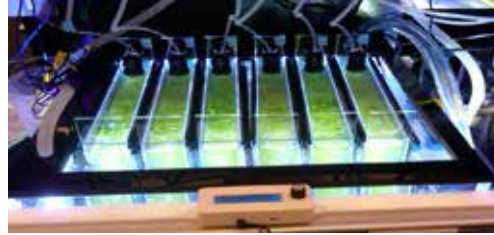
Algae grow rapidly and continuously, all year

- Ponds are harvested daily and some of the biomass is removed for processing
- The remaining algae quickly replicate and replace the harvested portion
- The result is a consistent biomass density, set for optimal growth

Sapphire has a fully integrated R&D asset pipeline, enabling creation and testing of strains from the laboratory to the field

Laboratory (SD)

- Screening
- Columns
- Pond simulators
- Greenhouse mini-ponds



Pilot facility (NM)

- Outdoor mini-ponds
- Large Ponds
- Harvest
- Extraction



Comm. Demo. (NM)

- Inoculation Ponds
- 1.1 Acre & 2.2 Acre ponds
- Harvest Channel & Pond
- Large Scale Harvest
- Water Return Pond

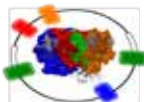


Sapphire has the most advanced biotech and oil production systems

Molecular and biochemical innovation, enhancement, control, and oil production



High throughput screening and selection
(not previously demonstrated with algae)



Novel genetic enhancements and manipulations
(not previously possible with algae)



Advanced, industrial-class crop evaluation systems



Breakthrough, novel chemical engineering and oil production systems

Sapphire's technology improves strain robustness

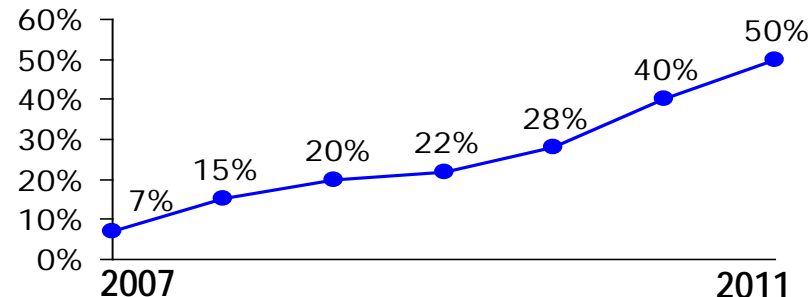


Unhealthy base strain

Healthy Sapphire improved strain

Sapphire has steadily increased oil extraction yield and decreased cost

Percentage of biomass extracted as hydrocarbon



**WET EXTRACTION—
*BREAKTHROUGHS IN THE FIELD***

Harvesting: algae and water are separated to prepare algae for extraction

Sapphire uses a Dissolved Air Flotation (DAF) system to concentrate algae



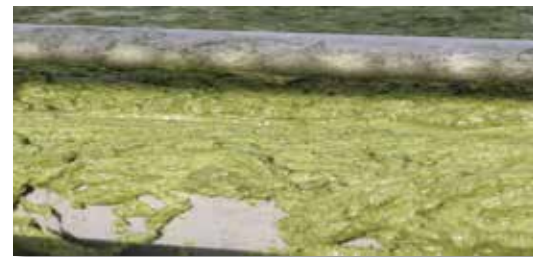
Solution enters the DAF in dilute concentration



DAF technology adapted for algae

1. **Cluster**: chemicals are applied which make the algae stick together
2. **Float**: air bubbles float algae to the surface
3. **Skim**: floating algae harvested with a skimmer

After the DAF, the algae is concentrated



Harvesting: algae and water are separated to prepare algae for extraction



Dissolved Air Flotation
(DAF)



Dilute Algae



Concentrated Biomass

Extraction: a 15% solid algae slurry is processed using proprietary technology to extract oil and nutrients

Sapphire uses a proprietary, innovative, solvent-based extraction system



Concentrated algae enters the extractor as a slurry



Slurry undergoes chemical reactions

1. **Heat and pressure**: the slurry is exposed to heat and pressure, causing separation of materials
2. **Chemicals**: solvents are added to complete separation process

Extraction process creates refinable crude oil



Extraction breakthrough: Sapphire has substantially increased the amount of oil which can be recovered from biomass

Sapphire uses a proprietary, innovative, solvent-based extraction system



| Strain | Species | Extracted oil yield (% ash free dry weight) | |
|----------|------------------------------------|---|---|
| | | Dry Hexane (soy bean oil extraction) | Sapphire Process v2 (proprietary treatment and solvent extraction) |
| Strain A | <i>Nannochloropsis salina</i> | 15% | 50% |
| Strain B | <i>Nannochloropsis salina</i> | 15% | 43% |
| Strain C | <i>Desmodesmus sp.</i> | 10% | 48% |
| Strain D | <i>Scenedesmus dimorphus</i> | 10% | 38% |
| Strain E | <i>Spirulina sp. (Arthrospira)</i> | 5% | 38% |
| Strain F | <i>Spirulina platensis</i> | 5% | 36% |
| Strain G | <i>Spirulina maxima</i> | 5% | 41% |
| Strain H | <i>Spirulina maxima</i> | 5% | 39% |

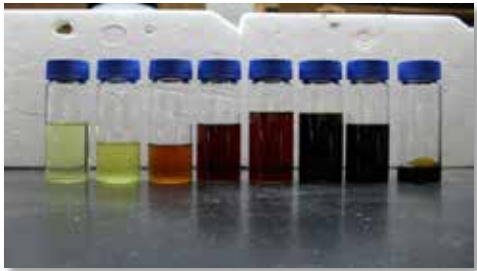
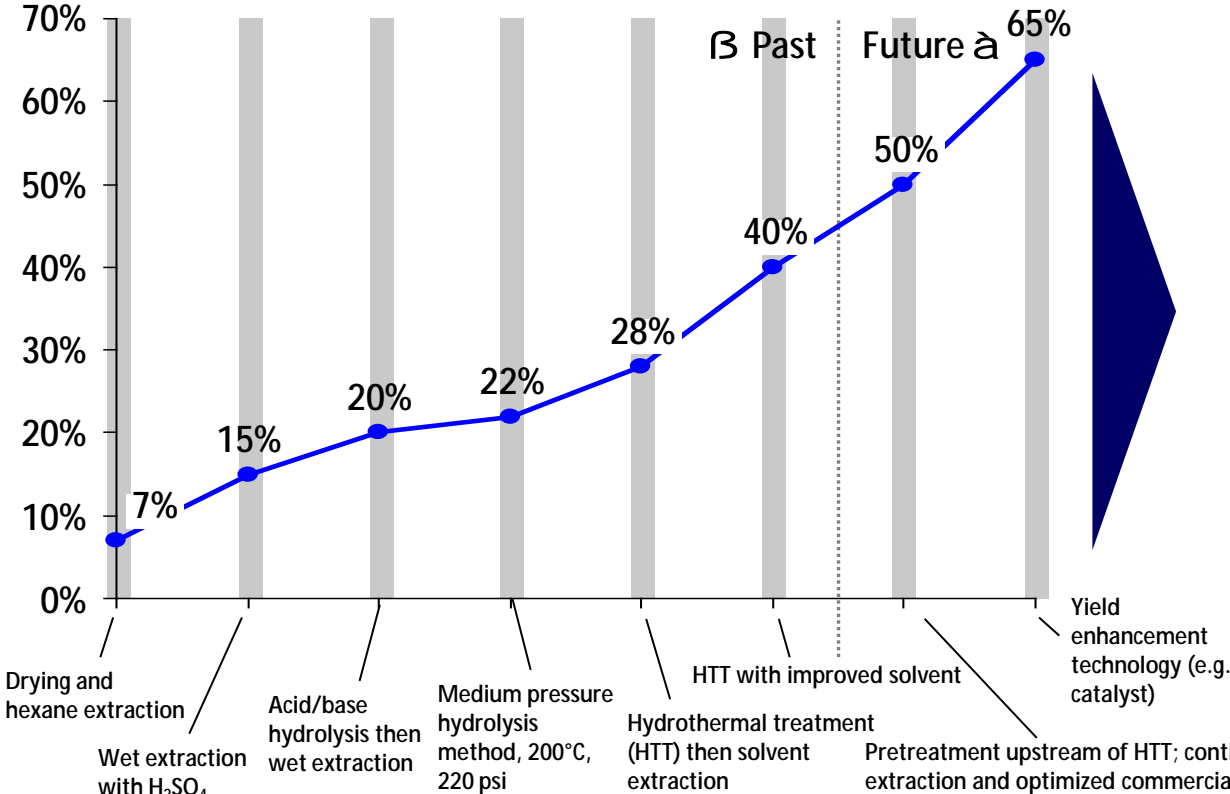
Advantages:

- Algae can be processed wet
- High yield boost
- Enables broad range of algae strains

**COMPATIBLE CRUDE OIL—
*BREAKTHROUGHS IN THE FIELD***

Extraction R&D projects have substantially increased the amount of oil which can be recovered from biomass

Extractable oil fraction
Mass of oil per mass of algae



- Past and future yield benefits are absent biological improvement
- Patent issued for conversion and extraction process on June 5, 2012
- Operating demonstration scale HTT since October 2011
- Plan to convert demonstration scale HTT and extraction to improved solvent in 2014
- Lab, pilot and demonstration scale facilities for R&D

Algae bio-crude has been successfully upgraded at typical refinery hydrotreating conditions

10% Sapphire bio-crude balance solvent and inerts



| | | | | | |
|------------|--------|--------|--------|--------|--------|
| d = g/ml | 0.7932 | 0.7795 | 0.7798 | 0.7793 | 0.7803 |
| S = ppm | 466 | 7* | 12.1* | 12.9* | 12.6* |
| N = ppm | 3537 | 3 | 13.7 | 23.3 | 48.4 |
| TOS = hour | 0 | 36 | 60 | 108 | 192 |

10% Sapphire bio-crude with petroleum feedstock (6 day test run)



Diesel product meets all requirements of ASTM D975

Sapphire Energy is providing barrels of oil to be refined for market use



Green Crude is renewable crude oil:



Tesoro – Sapphire commercial agreement

- Tesoro recently signed an agreement to purchase crude oil from Sapphire Energy's Green Crude Farm in Columbus, New Mexico
- Commercial Agreement
 - Under the agreement, Tesoro will purchase crude oil from Sapphire Energy's Green Crude Farm in Columbus, New Mexico, which recently reached a new milestone: continuous cultivation and crude oil production
 - For Tesoro, the commercial agreement with Sapphire Energy represents an opportunity to support a technology that has good long-term potential as a renewable fuel

**GREEN CRUDE FARM—*INTEGRATED
ALGAL BIOREFINERY CASE STUDY***

Phase 1 construction was completed on-time and on-budget. The facility has been in continuous integrated operation since June 2012



1.1 acre (.45 hectare) pond next to a pickup truck



Challenges and Success

Corn Husks



Tumbleweeds



Green Ponds



Black Oil



Sapphire's intellectual property program has produced a robust portfolio

Extensive portfolio

- Over 303 active patent cases*
- ~50 patent families
- Average of 25 filings annually
- Filings and grants are worldwide

Freedom to operate and barrier to entry

Includes patents on all key platform technologies

- Molecular biology
- Cultivation / harvesting
- Extraction
- Upgrading
- Analytics

Claims limit competitors' freedom to operate

- Sequences
- Organisms
- Oils and products

Sapphire is currently producing barrels of Green Crude Oil

