

SUSTAINABLE AVIATION BUSINESS OVERVIEW



Honeywell



DECARBONIZING AVIATION: SAF AND HYDROGEN

Commercial Demonstration - 2008

First SAF powered flight occurred.

Underlying Infrastructure - 2023

New feedstock (biomass and ethanol) going commercial.

Gov't & Policy Milestones - 2023

Policies incenting SAF production coupled with volumetric requirements.

Projected 5% Adoption Rate - 2030

Projected 20% Adoption Rate - 2035

Timeframe for SAF with majority supplied from new processes.

5%

20%



Gov't & Policy Milestones - 2023

C.I. and emissions reductions targets set for industry.

Underlying Infrastructure - 2030

Projected global electrolyzer capacity ~90 GWs by 2030; only enough for 25% of aviation fuel need.

Projected 5% Adoption Rate - 2050

Assuming hydrogen fueled aircraft enter into service in 2035 & narrow body H₂ planes are delivered in 2050.

5%

20%

Commercial Demonstration - 2035

ZEROe initiative from Airbus targeting 2035 for announcement of zero emission plane.

Projected 20% Adoption Rate - 2060

~2075 timeframe assuming entry into service timelines are met.

2000 - 2020

2020-2025

2025-2030

2030-2040

2040-2060



COMMERCIAL RENEWABLE AVIATION BIOFUELS...

A REALITY

2009 – 2011: Honeywell UOP led the committee for approval of HEFA SPK as aviation turbine fuel under ASTM D7566 Annex 2 (approved July 2011)

2016 – present: United Airlines became the first commercial airline in the US to use renewable jet fuel on regularly scheduled flights from LAX (March 2016)

2021: First commercial passenger flight on 100% SAF with United Airlines using renewable jet fuel produced at World Energy (AltAir) using UOP Renewable Jet Fuel Process

2012 – 2015: AltAir Fuels installed the first commercial renewable jet fuel (HEFA SPK) production unit using UOP technology with offtake by United Airlines

2019: Gulfstream Corporate Aircraft Fly More Than 1M Nautical Miles On SAF produced by UOP Renewable Jet Fuel Process at World Energy (AltAir)



Honeywell UOP Technology Produces first Commercial Aviation Biofuel

ECOFINING UNITS PRODUCING SUSTAINABLE AVIATION FUEL (SAF)



World Energy operating since 2016

- 150,000 MTA Feed (3,000 BPD)
- First refinery retrofit to UOP SAF at Paramount, California
- Produces SAF
- Expansion to 1,000,000 MTA (20,000 BPD)



In Jan 2023, Honeywell AERO will receive its first monthly delivery of 8,000 gallons of SAF to be used in engine and APU testing.

The blend is 70% Jet A and 30% SAF, produced by World Energy using our IP technology. Every APU/Engine will run with SAF before being certified and shipped to customers.

Most Experienced Licensor producing Sustainable Aviation Fuel



UOP TECHNOLOGY OF CHOICE FOR SAF

Honeywell is the leader in SAF projects around the world: 23 SAF units licensed



bp selects Honeywell's Ecofining™ Technology for the new Diesel and Sustainable Aviation Fuels Project in Kwinana, Australia



JGC and Cosmo Oil to build first Sustainable Aviation Fuel Project in Japan using Honeywell Technology



Oriental Energy licenses Honeywell technology to build Million-ton SAF Production Facility

World Energy Secures Permits; will completely convert its Southern California refinery to create North America's largest, world's most advanced Sustainable Aviation Fuel Hub¹

- The world's first SAF producer assembles Air Products, Honeywell, and leading energy transition innovators to team up to pioneer the frontier of low-carbon aviation in Southern Calif. for replication globally -



199,000 BPD of Ecofining SAF capacity under design & construction globally





NEW TECHNOLOGY BENEFITS OF ETJ



**High Jet
yield output**



**Lower CAPEX
& OPEX**



**Reduced GHG
emissions**



**Higher profit
margins**

FUELING THE FUTURE FOR CLEANER SKIES

Honeywell

Take off with UOP's ethanol to jet (ETJ) process technology. The next generation of renewable fuels.



5. SUSTAINABLE AVIATION FUEL (SAF)

BENEFITS OF ETJ



High jet yield output



Lower CAPEX & OPEX



Reduced GHG emissions



Higher profit margins



Reduced GHG emissions is based on UOP analysis derived from a 3rd party LCA for 1G low carbon ethanol production with locally sourced feedstock used in comparison to fossil fuels.



TECHNICAL DETAILS

Leveraging over a decade of Ecofining™ experience
Ethanol to Jet Fuel Charts A More Efficient Path To Profits

Honeywell



THREE WAYS TO PRODUCE GREEN FUELS

CUSTOM SOLUTIONS FOR YOUR OBJECTIVES

Stand-Alone
Greenfield Ecofining Unit



- Maximum unit flexibility
- Produce 100% green fuel
- Targeted product slate
- Highest capital expense, but the **best** economy of scale

Refinery Revamp of
Existing Hydrotreater



- Repurpose underutilized assets
- Faster time to production
- Limited capacity and feed flexibility
- Moderate capital expense and economy of scale

Co-Processing Green
Feed with Petroleum Feed



- Fast implementation
- Produce blended fuel
- Minimal capital expense
- Limited capacity and feed flexibility

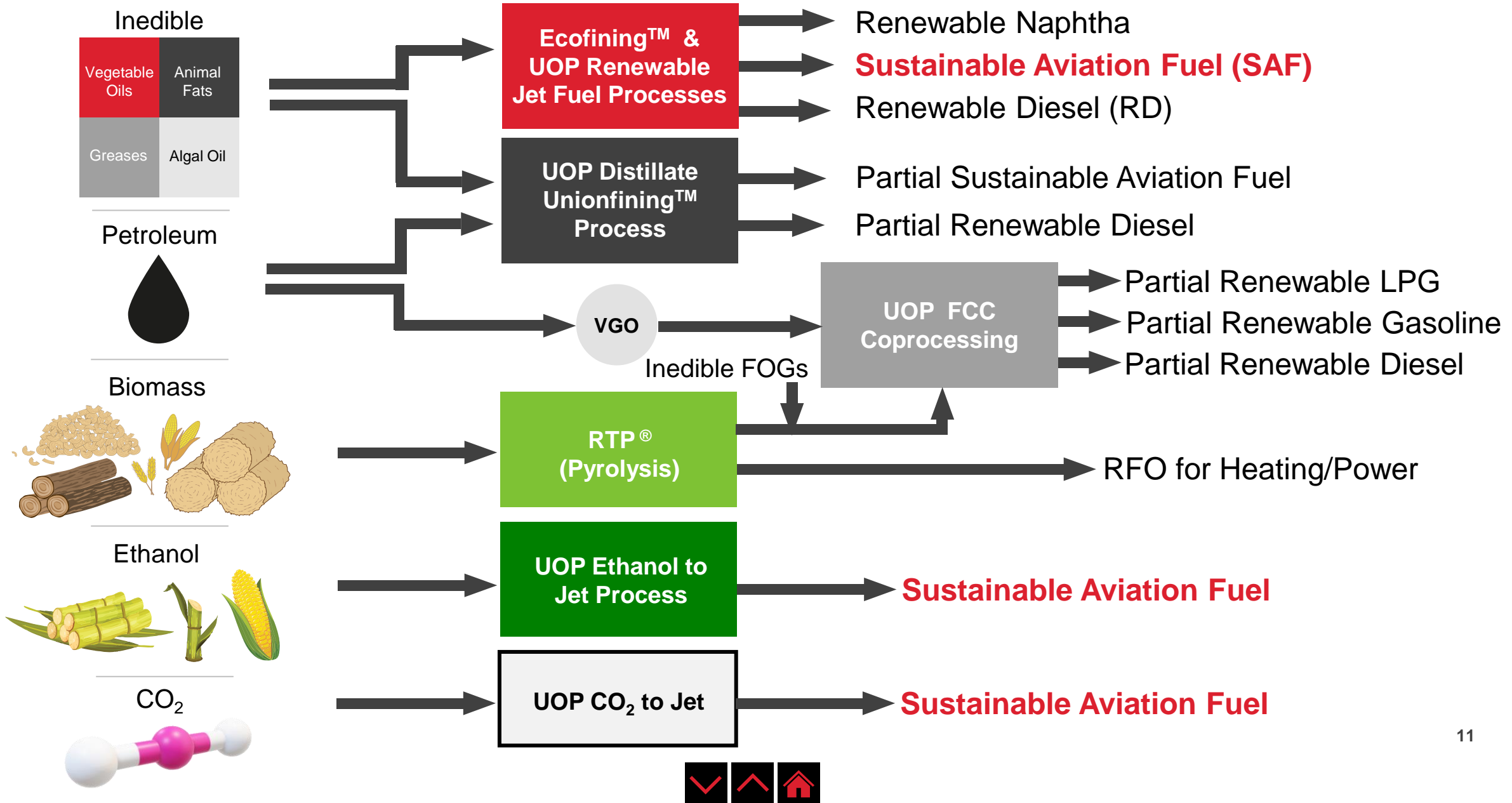


ECOFINING™ UNIT



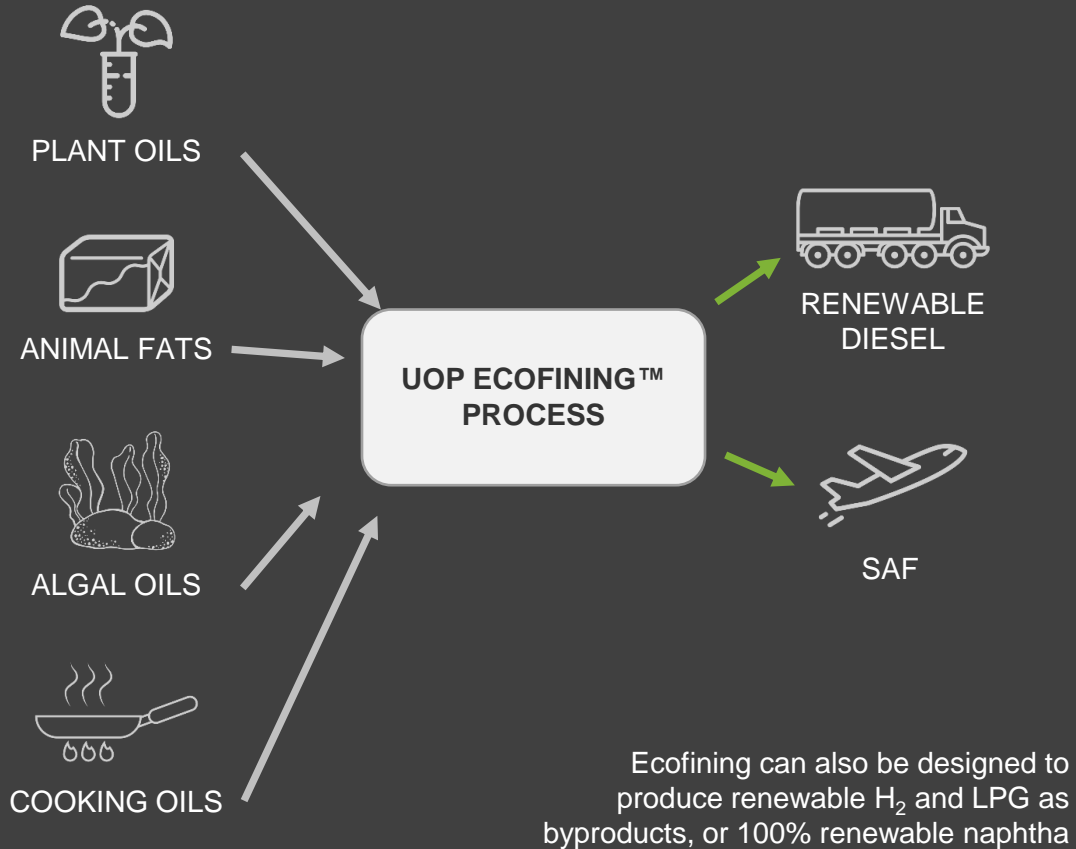
UOP RENEWABLE TECHNOLOGY SOLUTIONS

Proven Technologies for Feedstock Flexible Drop-In Fuels



DROP-IN RENEWABLE FUELS FROM HONEYWELL UOP

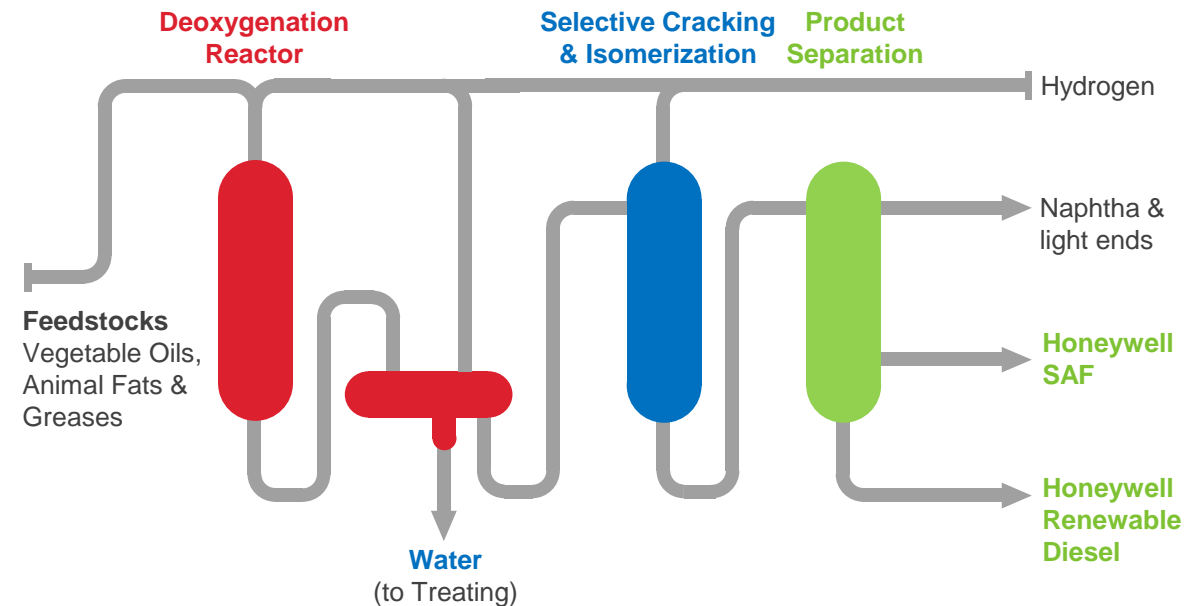
ECOFINING™



Proven Licensor in Renewable Fuels

- Leading renewable fuels experience; 35 licenses and 7 operating plants +30 years combined operating data
- Flexibility to process a **wide range of sustainable oil and fat feedstocks**
- Delivering **3-4x typical industry profit margins** for refining customers

Two-Stage Ecofining Unit

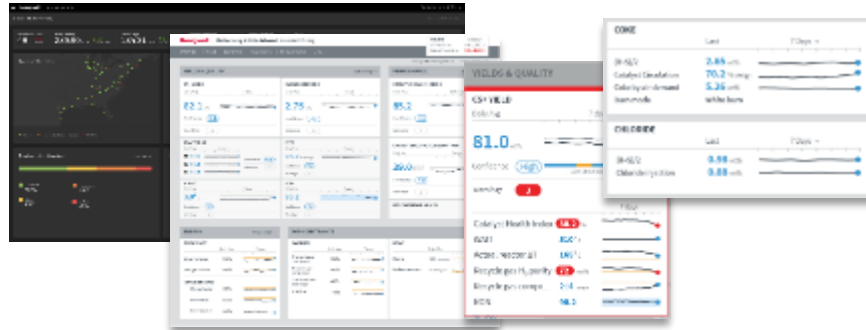


REDUCING DIESEL AND JET GHG EMISSIONS >80% COMPARED TO PETROLEUM FUELS



UOP ECOFINING WITH HPS CONTROLS

HOW DOES IT WORK?



<p>Startup Your Facility Sooner</p> <p>Proven world-class UOP process technology, pre-engineered automation solutions and innovative execution to reduce project schedule and risk</p>	<p>Reach Target Production Faster</p> <p>Processes and equipment embedded with Honeywell UOP's expertise, deep process knowledge and best practices to optimize startup and operator experience</p>	<p>Operate at Peak Performance</p> <p>Honeywell process-specific software solutions to enhance safety, productivity and reliability</p>
<p>Migrate, Optimize, Support</p>		

Experion Pre-Integration
for UOP critical control system packages

Alarm Knowledge
Operator Alarm Help

Safety Knowledge
Cause and effect logic, startup / maintenance bypasses and shutdown logic displays

Operational Knowledge
Interaction requirements-based operator displays and console workspaces, embedded operating procedures

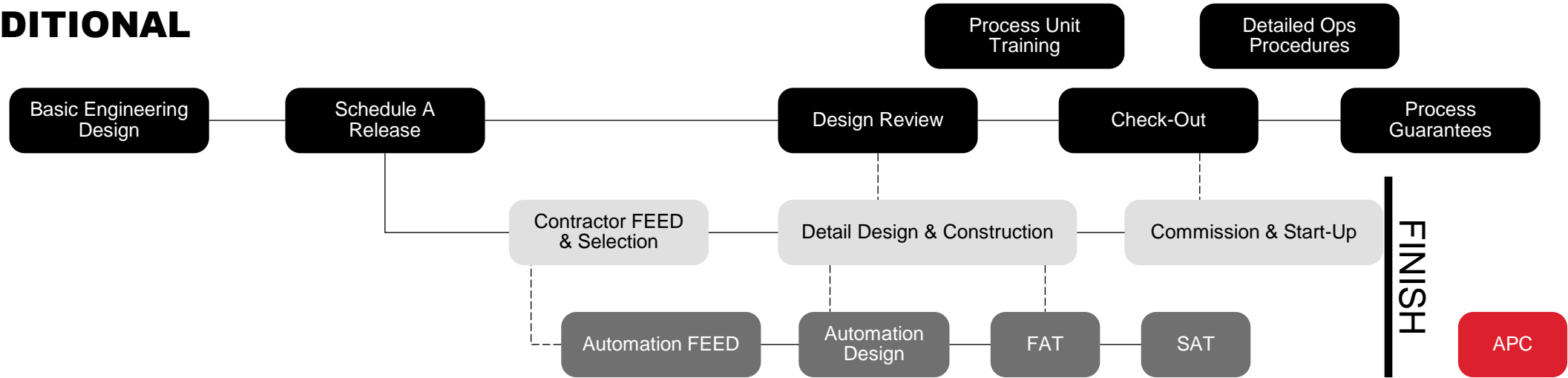
Control Knowledge
Basic and complex loops, automated sequences

Earlier production & higher unit margin

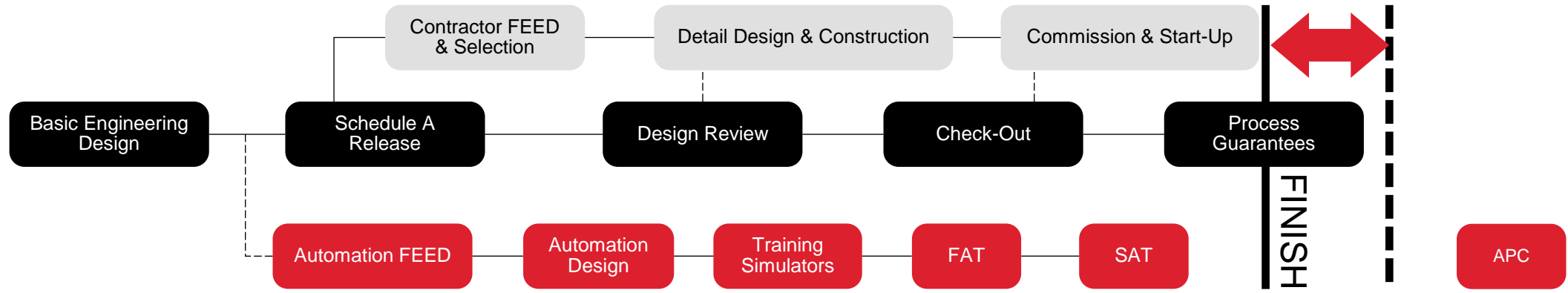


HOW WE DELIVER IT

TRADITIONAL



THE HONEYWELL ADVANTAGE



Pre-engineered solutions with UOP Knowledge embedded into ICSS and APC

Detailed operating procedures, scenarios, exercises, & workbooks developed on OTS using UOP proprietary models

Cloud based validation of configuration and embedded procedures with UOP experts

UOP process know-how embedded in APC strategies can be implemented up to 4 months earlier

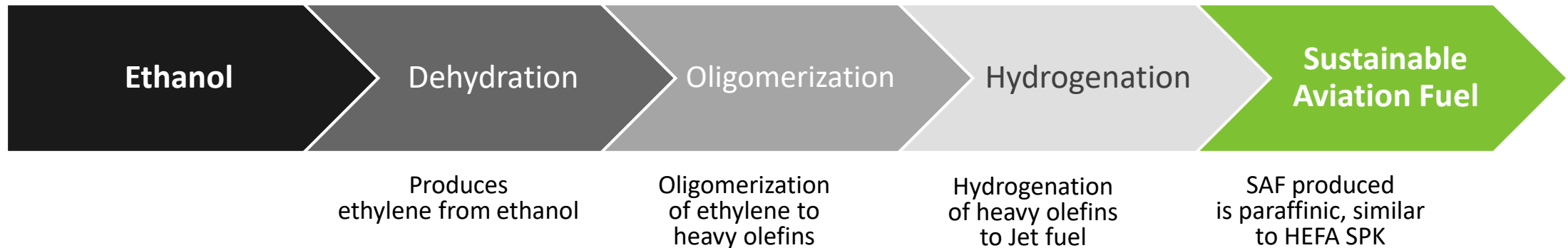
UOP

EPC

TRAD

HON ADV

UOP'S APPROACH ETHANOL CONVERSION TO JET



Key Features

- High yields to jet and diesel from UOP's ETJ process
- Compatible with hydrous or ASTM D4806 anhydrous ethanol
- Advanced heat integration for lower carbon intensity route
- Simplified oligomerization, leading to a lower CAPEX and OPEX than competing technologies
- Based on commercially demonstrated technologies – enabling fast scale-up and quicker time to commercialization



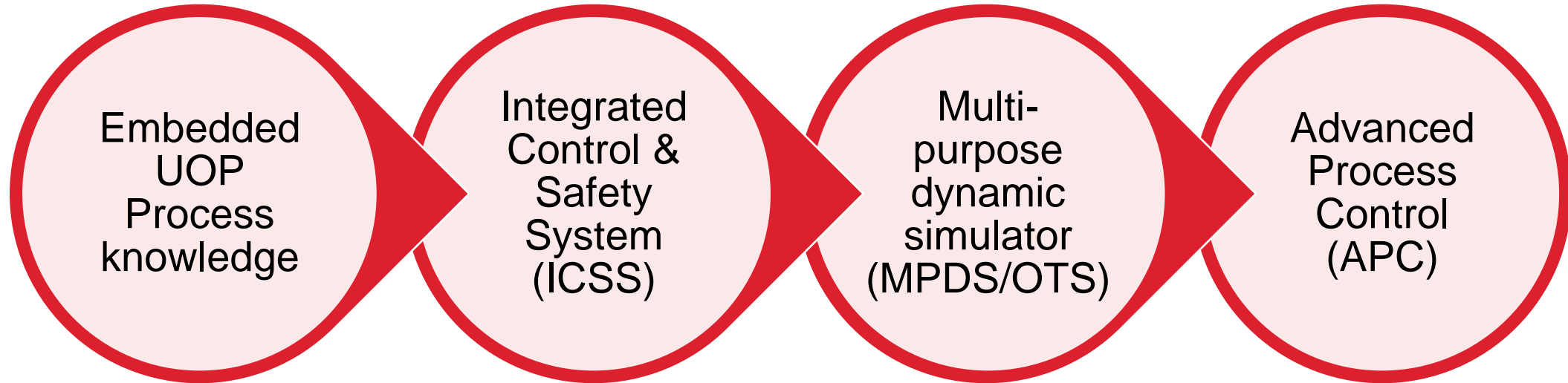
APPENDIX

October 20, 2023

Honeywell



SUMMARY: UOP + HPS INTEGRATED VALUE



- Unique insights into start-up, shut down and operational cases
- Unmatched insights throughout all phases of the project including design, construction, building, commission, and long-term operations

- Preconfigured cause / effect matrix based on UOP expertise
- Preconfigured operator screens for key process areas to save errors
- Decrease complexity and schedule

- Savings on re-engineering of equipment design based on dynamic studies
- Reduced start-up time due to pre-identified bottlenecks
- Control checkout of complete loops, saving time in the field
- Operational technology implementation miss-configuration identified early

- Analysis and tuning of individual loop and services
- Pre-configured seed model to reduce testing and field implementation complexity
- Tested and verified in the MPDS, advancing the schedule forward

UOP's technical expertise is integrated into solution suite