

UNISIM DESIGN

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Software Manager

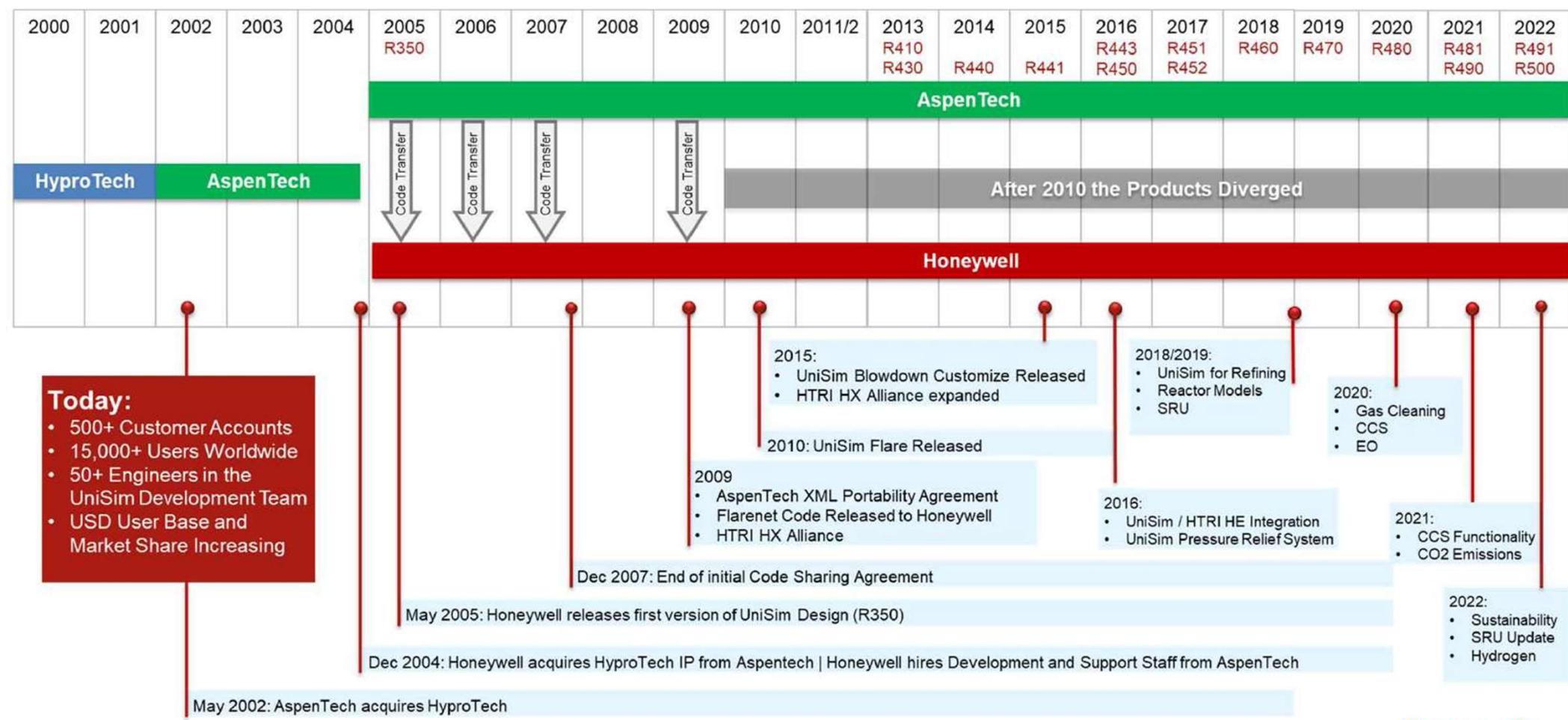
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AGENDA

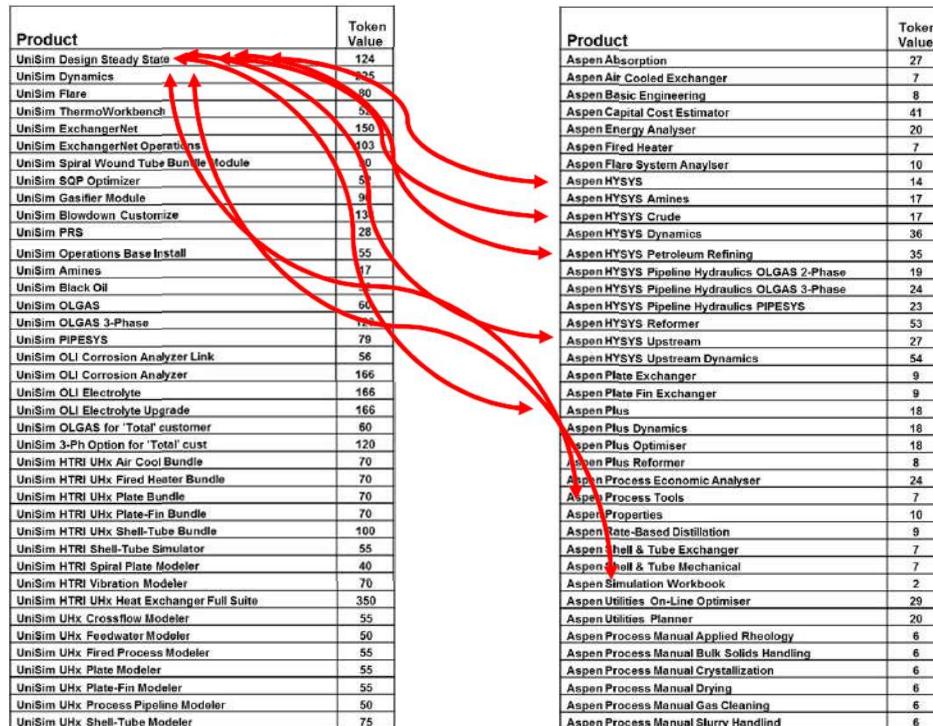
- Introductions
- UniSim Background & History
- Modules & Functionality
- What's new in UniSim Design
- UniSim License
- Major Operators, EPC & Consulting Clients
- UniSim Design Migration Clients Reference

- Q&A

UNISIM DESIGN SUITE: HISTORY



UNISIM DESIGN SUITE: FUNCTIONAL CONSOLIDATION



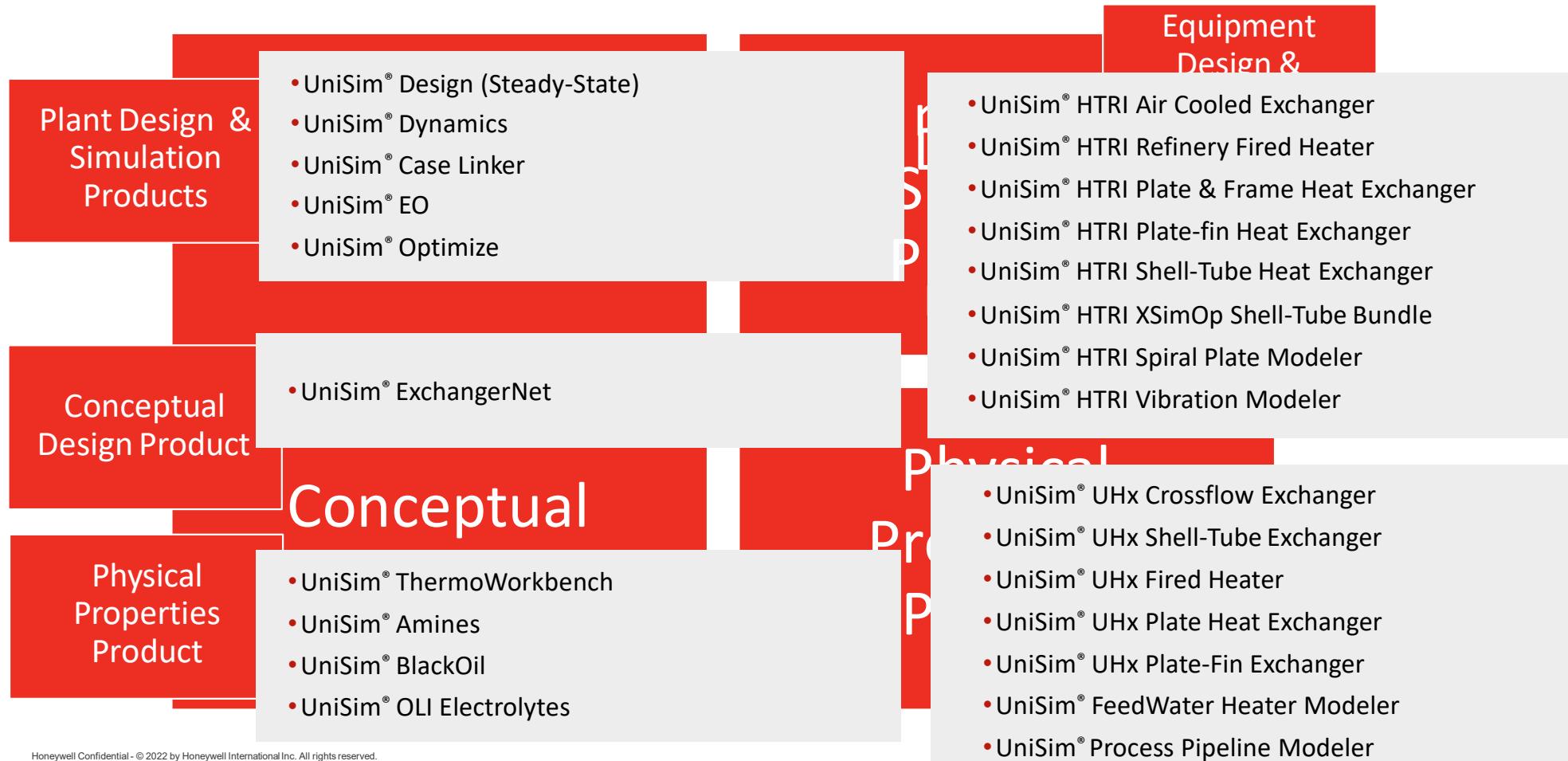
UNISIM DESIGN: STEADY STATE LICENSE

Base UniSim Design Steady State license includes:

- **UniSim Oil Manager**
- **UniSim Crude Environment**
- **UniSim Excel Interface (link to Excel tools)**
- **UniSim Pipe Segment**
- **UniSim Design Utilities (detailed list)**
- **Production Allocation Utility**
- **UniSim Module Coupler Interface**
- **UniSim Case Scenario Manager**
- Each UniSim Design Suite module license can open up-to **3 concurrent cases/instances** on the same machine.

Utility	Description
Blowdown Utility	Models dynamic depressurizing of a single vessel under plant emergency conditions.
Boiling Point Curves	Obtains laboratory-style distillation results for streams.
CO2 Freeze Out	Determines stream CO2 freezing conditions.
Cold Properties	Calculates several stream Cold Properties, for example True and Reid Vapour Pressures, FlashPoint, Pour Point, Refractive Index, and so forth.
Composite Curves	Optimizes the use of process heat exchange and utilities for heat exchangers, LNG's, coolers, and heaters.
Critical Properties	Calculates true and pseudo critical properties for streams.
Depressurizing-Dynamics (Legacy)	Models the pressure letdown of a single vessel or network of vessels under plant emergency conditions.
Envelope	Shows critical values and phase diagrams for a stream.
Hydrate Formation	Determines stream hydrate formation conditions.
Master Phase Envelope	Shows three-phase envelope for multiple streams.
Pipe Sizing	Performs design calculations on any of the case streams.
Property Balance	Performs balance calculations across any utilities. You can select individual utilities or the entire flowsheet.
Property Table	Examines stream property trends over a range of conditions.
Tray Sizing	Size or rate existing sections or full towers.
User Property	Defines new stream properties based on composition.
Vessel Sizing	Size and cost installed Separator Unit Operations.

UNISIM DESIGN SUITE: CORE FUNCTIONALITY



UNISIM DESIGN SUITE: EXTENDED FUNCTIONALITY



Safety System Design, Rating and Simulation Products

- UniSim® Flare
- UniSim® Blowdown Customize
- UniSim® Pressure Relief System

O&G Market-Specific Design and Simulation Products

- UniSim® Spirally-Wound Tube Bundle
- UniSim® PIPESYS
- UniSim® OLGAS
- UniSim® OLGAS-3P
- UniSim® Predict

Power Generation Market-Specific Design and Simulation Product

- UniSim® Gasifier

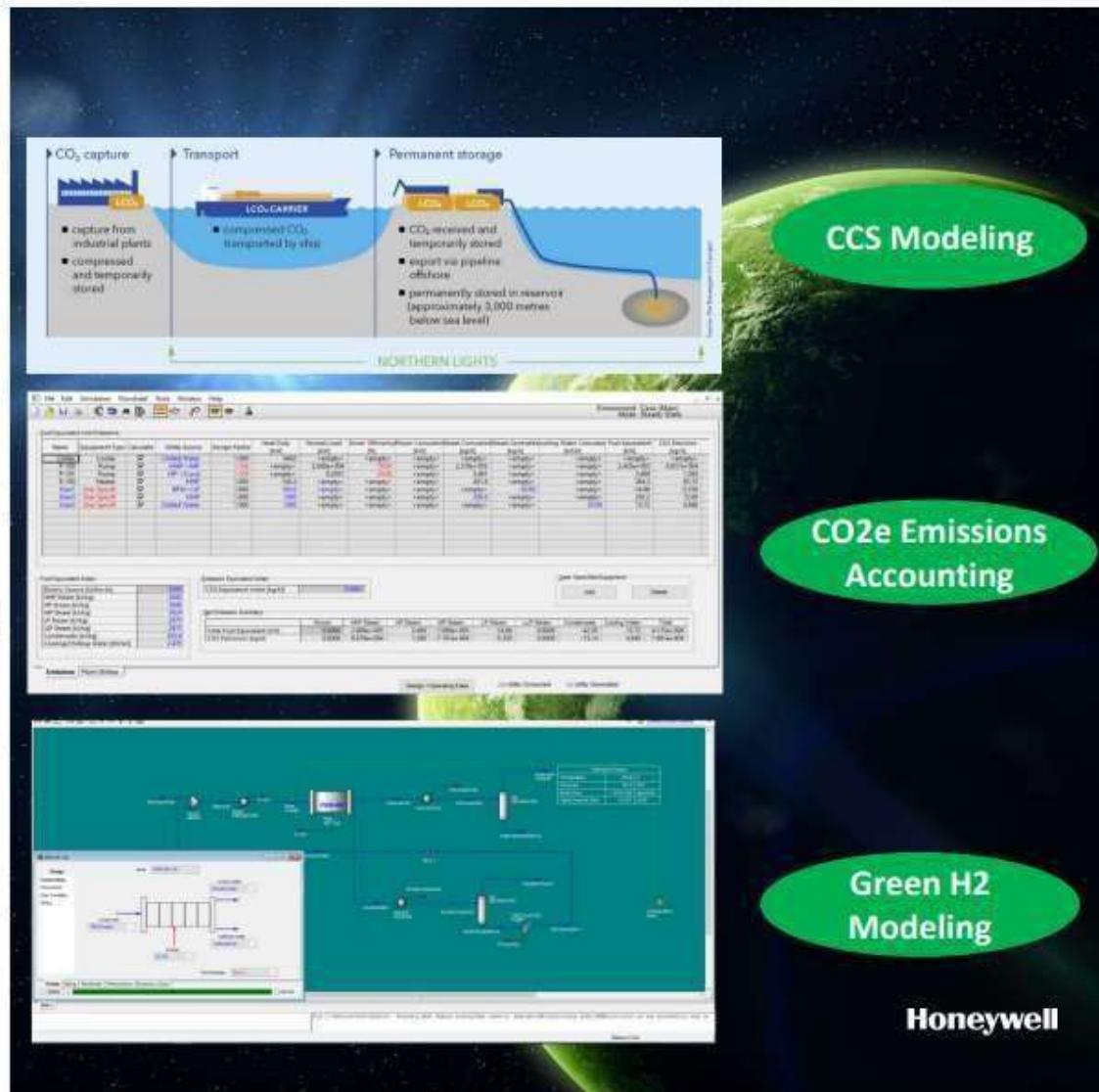
Refining Market-Specific Design and Simulation Products

- UniSim® Assay Synthesis
- UniSim® Hydrocracker
- UniSim® Hydrotreater
- UniSim® Catalytic Reformer
- UniSim® Alkylation Reactor
- UniSim® Isomerization Reactor
- UniSim® FCC Reactor
- UniSim® DCU Reactor
- UniSim® Product Blender
- UniSim® Sulphur Recovery Unit

UNISIM DESIGN: SUSTAINABILITY APPLICATIONS

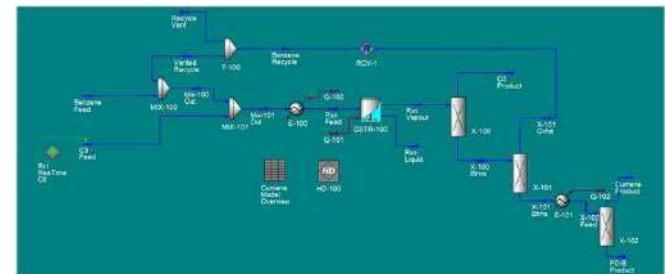
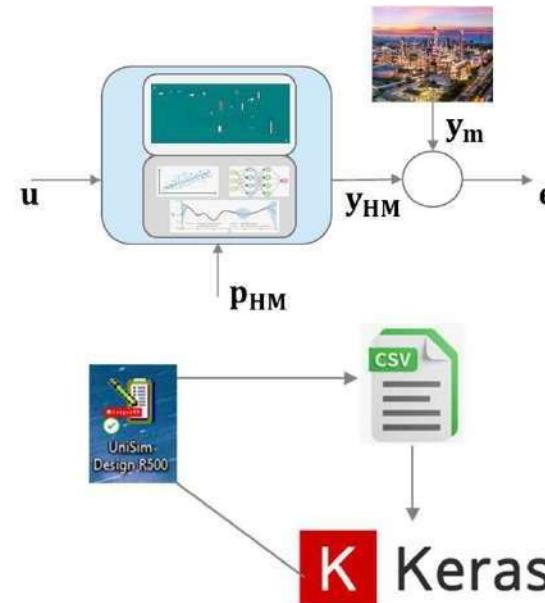
Carbon Capture and Storage (CCS):

- CO2 Capture
- Specialized Property packages:
 - Span-Wagner & CG-EOS
- CO2 Freeze Out utility

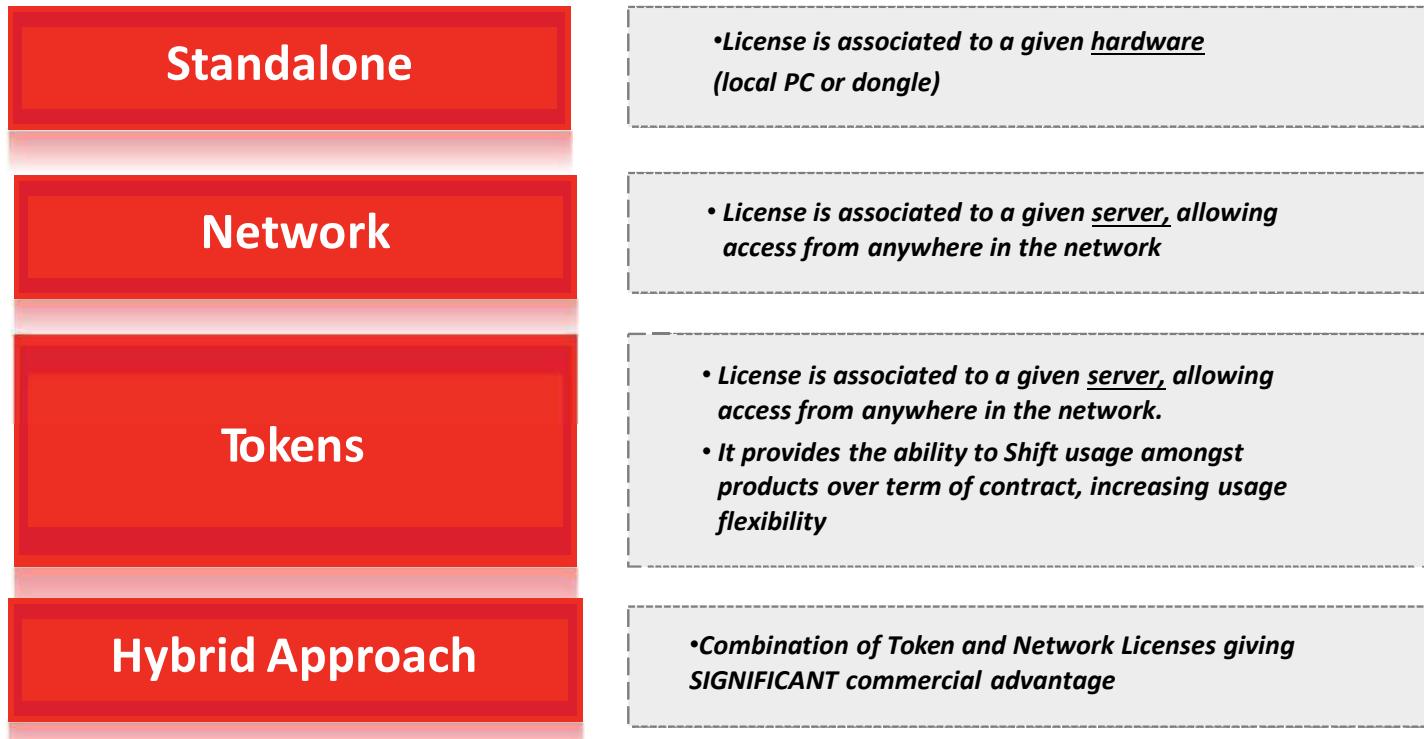


WHAT'S NEW IN UNISIM DESIGN R500?

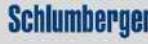
- **Sustainability** – Green hydrogen model in dynamics mode to facilitate dynamic analysis of electrolysis along with the balance of the plant.
- **AI/ML modeling applications using UniSim Hybrid model** (1st principles model combined with a data driven model)
- **CO₂ capture – Membrane separator module**
- **CO₂e Emission Utility enhancements – support dynamics mode**
 - Calculates emissions in dynamic mode for a particular time instant
 - Will now support calculation for operational hours per year
 - Emission from vent
 - Emissions from electric sources
 - Combustion fuel enhancements
- **Thermodynamics:**
 - Integration of NIST SRD pure component, pure component properties correlations, VLE experimental data, and binary interaction parameters.
 - More enhancements.



UNISIM DESIGN SUITE: LICENSING OPTIONS



UNISIM DESIGN SUITE: LINK TO 3RD PARTY OPTIONS

DDBST  <p>Leading databank of VLE data for the process industries.</p>	Amines Option  <p>For amine treatment process simulation.</p>	GAP and Resolve  <p>For overall O&G field simulation.</p>	Cleopatra Enterprise  <p>For cost engineering and estimation.</p>
DIPPR  <p>For thermodynamic properties of pure components.</p>	PVTsim Nova  <p>For fluid properties and experimental PVT data simulation.</p>	PIPESYS Option  <p>For steady-state pipeline simulation.</p>	MySEP  <p>For separator and scrubber design.</p>
H/CAMS  <p>Market leading crude assay library with over 3200 assays.</p>	BPT SimApps  <p>Oil & Gas Services & Software.</p>	PIPESIM  <p>For steady-state pipeline simulation.</p>	Predict  <p>For corrosion prediction in upstream and refinery environments.</p>
OLI Engine & Corrosion Analyzer  <p>For electrolyte & corrosion system modeling.</p>	COMOS  <p>For engineering workflow.</p>	OLGAS 2P/3P  <p>For steady-state pipeline simulation.</p>	
NEXUS HALLIBURTON  <p>For Reservoir Simulation.</p>	Xchanger Suite & XSimOp  <p>For heat exchanger design and rating.</p>	OLGA  <p>For multi-phase dynamic pipeline simulation.</p>	

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UNISIM DESIGN SUITE: TOKEN SYSTEM OVERVIEW

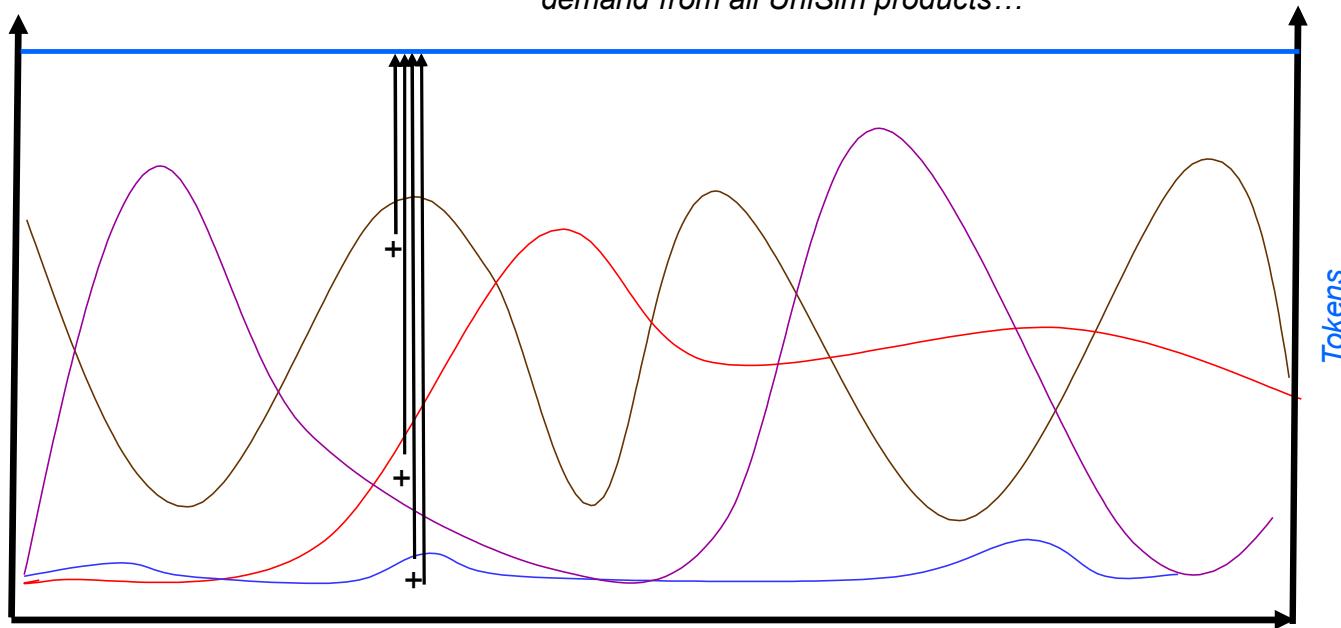
Product	Token Requirement
UniSim Design Steady State	124
UniSim Dynamics	225
UniSim Flare	80
UniSim EO	35
UniSim ThermoWorkbench	52
UniSim ExchangerNet	150
UniSim Spiral Wound Tube Bundle Module	90
UniSim Optimize	52
UniSim Gasifier Module	90
UniSim Blowdown Customize	134
UniSim PRS	28
UniSim Assay Management	50
UniSim Alkylation Reactor	75
UniSim FCC Reactor	200
UniSim Delayed Coker	120
UniSim Hydrocracker	190
UniSim VGO Hydrotreater	130
UniSim Naptha Hydrotreater	60
UniSim Distillate Hydrotreater	75
UniSim Residue Hydrotreater	130
UniSim Reformer	145
UniSim Polymers	120
UniSim Sulfur Recovery	0
UniSim Product Blender	20
UniSim NRTL Electrolyte	75
UniSim Isomerization Reactor	75
UniSim PREDICT Corrosion Modeler	170
UniSim Design Case Linker	55
UniSim Amines	17
UniSim Black Oil	32

Product	Token Requirement
UniSim OLGAS	60
UniSim OLGAS 3-Phase	120
UniSim PIPESYS	79
UniSim OLI Electrolyte	210
UniSim OLI Electrolyte Upgrade	166
Heat Exchanger Options	
UniSim HTRI UHx Air Cool Bundle	70
UniSim HTRI UHx Fired Heater Bundle	70
UniSim HTRI UHx Plate Bundle	70
UniSim HTRI UHx Plate-Fin Bundle	70
UniSim HTRI UHx Shell-Tube Bundle	100
UniSim HTRI Shell-Tube Simulator	55
UniSim HTRI Spiral Plate Modeler	40
UniSim HTRI Vibration Modeler	70
UniSim HTRI UHx Heat Exchanger Full Suite	350
UniSim UHx Crossflow Modeler	55
UniSim UHx Feedwater Modeler	50
UniSim UHx Fired Process Modeler	55
UniSim UHx Plate Modeler	55
UniSim UHx Plate-Fin Modeler	55
UniSim UHx Process Pipeline Modeler	50
UniSim UHx Shell-Tube Modeler	75

- Maximum Flexibility via Token Deployment across OPUs
- Concurrent User/Usage Network
- Reduces Technology Licensing Risk:
 - No Product Redundancy
 - No Additional Licensing Fees
 - No Licensing Amendments
- Peak Usage measured in aggregate not based on Individual Products.
 - ULM Tracking
 - Peak/Product Usage Analysis
 - Management Reporting
 - Training Support

UNISIM DESIGN SUITE: TOKEN SYSTEM

Tokens represent the combined concurrent demand from all UniSim products...



Model - As individual product usage changes, total token demand is relatively consistent.

Benefit - Minimizes idle capacity, while providing access to a wider range of software.

Major UniSim Energy Clients APAC

Company Name	Country
Pertamina (Partial)	Indonesia
Total Indonesia (Full)	Indonesia
MEDCO E&P Natuna	Indonesia
Genting Oil E&P (Full)	Indonesia
Saka Energi (Full)	Indonesia
Perusahaan Gas Negara (PGN)	Indonesia
Bina Rekacipta Utama	Indonesia
Petrokimia Gresik	Indonesia
Perta Samtan Gas	Indonesia
Pupuk Kalimantan Timur	Indonesia
Shell Global Solutions	Malaysia
Hibiscus Petroleum Bhd	Malaysia
EnQuest Petroleum Production Malaysia Ltd	Malaysia
Petroleum Sarawak Productions & Explorations	Malaysia
JX Nippon Oil and Gas Exploration M Ltd	Malaysia
Roc Oil Sarawak Sdn Bhd	Malaysia
Petron Malaysia Refining & Marketing Bhd	Malaysia
Petrofac Engineering	Malaysia
Alfa Laval Technologies	Malaysia
Beach / Lattice Energy (Full)	Australia
Woodside (Partial)	Australia
Brunei Shell Petroleum	Brunei
Inpex	Japan
PetroVietnam (Partial)	Vietnam



UNISIM DESIGN: PARTIAL GLOBAL CUSTOMER LIST



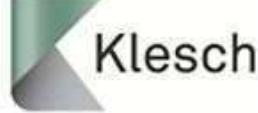
UNISIM DESIGN: NEW CUSTOMERS IN 2020



UNISIM DESIGN: NEW CUSTOMERS IN 2021



UNISIM DESIGN: NEW CUSTOMERS IN 2022



Harshini EPC Pvt. Ltd.
Engineering Solutions



We create chemistry



PETROKIMIA
GRESIK
Solusi Agroindustri



SUBLIME Energie



COMERCIO
INTERNACIONAL



(Millenia Resource Consulting o/a Millenia Engineering)

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PT. BINA REKACIPTA UTAMA
Integrated Oil and Gas Engineering Company

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UNISIM DESIGN: MAJOR EPC CONSULTING CLIENTS

- Aibel
- Aerzen Hungaria Kft
- Aker Solutions
- Anthony Veder Rederijzaken B.V.
- Arabian Consulting Engineering
- Atkins Limited
- Bayer Technology Services GmbH
- Bechtel
- Bilfinger
- Bluewater Energy
- Casale
- CB&I
- Chiyoda Corporation
- D'Appolonia / Projenia S.r.l.
- EPC Offshore Limited
- Entrepouse Contracting
- Fluor
- Frames Process Systems
- Geostock
- Genesis Oil and Gas
- Gulf Farabi Petrochemical
- Hyundai Heavy Industries
- ISC
- ILF
- Impac Engineering
- Inprocess Technology & Consulting
- ISG SpA
- Jacobs Engineering
- JGC Corporation
- Kanfa AS
- KBR
- KCI B.V.
- Linde Engineering
- Mitsui Engineering
- Mott MacDonald
- Optimus
- Osaka Gas Engineering Company Ltd
- Petrofac
- Ramboll
- Rominserv S.A.
- Shell Global Solutions
- Saipem SpA
- Samsung Heavy Industries Ltd
- SNC Lavalin
- Sofregaz
- SPIE
- Tebodin
- Technip Energies
- Tecnimont
- TGE Gas Engineering
- Thomassen Compression Systems
- TR Engineering LLC
- Tractebel
- UOP
- UNGG
- Value Engineering Centre
- Wood
- Worley

UNISIM DESIGN CONVERSION EXAMPLES

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UNISIM DESIGN: CONVERSION CASE STUDY SHELL

- **Company**

Shell plc - Multinational oil and gas company headquartered in Netherlands, incorporated in the UK with operations in seventy countries, revenue of \$305B and 90,000 employees...



- **Overview**

Complete switch from AspenTech HYSYS to Honeywell UniSim...

- **Scope**

Enterprise UniSim Token System

- **Transition/Conversion Requirements**

500+ Process Engineers - 1000 HYSYS, 500 FLARE

- **Business Justification**

Global Software Development Agreement...

Member of Honeywell Joint Development Programme...

License Management – Reseller/Distributer Rights...

Substantial Cost Savings...

UNISIM DESIGN: CONVERSION CASE STUDY EQUINOR

- **Company**

Equinor ASA - Norwegian multinational petroleum and renewable energy company headquartered in Stavanger with operations in thirty-six countries, revenue of \$65B and 20,200 employees...



- **Overview**

Complete switch from AspenTech HYSYS to Honeywell UniSim...

- **Scope**

90-Concurrent User Global UniSim Token System

- **Transition/Conversion Requirements**

250+ Process Engineers - 250 HYSYS, 150 FLARE, 100 EDR

- **Business Justification**

Non-alignment with AspenTech Roadmap...

Member of Honeywell Joint Development Programme...

License Management – Flexibility & Efficiency...

Substantial Cost Savings...

UNISIM DESIGN: CONVERSION CASE STUDY TOTAL

- **Company**

Total SA – French multinational oil and gas company headquartered in Paris with operations in thirty-six countries, revenue of \$171B and 98,000 employees...



- **Overview**

Global Conversion Programme (GPA) to Honeywell UniSim...

- **Scope**

Multiple Entity UniSim Token/Network Systems

- **Transition/Conversion Requirements**

300+ Process Engineers – 600+ HYSYS, 400+ FLARE

- **Business Justification**

Standardisation on single Process Simulation Platform...

Member of Honeywell Joint Development Programme...

Conversion Support – HYSYS, PRO II, PETROSIM, ASPEN+

Substantial Cost Savings...

UNISIM DESIGN ROADMAP

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ROADMAP: OPERATIONAL AND TECHNICAL ENHANCEMENTS

- Amine Fitter – Saipem
- Steady State Antisurge Controller - Shell
- EO Hydraulics – RWE (Innogy)
- PFD Hotkey Improvements - Linde
- Taskbar Status Indications - Linde
- Unit\Flyby Improvements - Casale
- Admin Console Improvements - Linde
- GDPR Compliant Logging – Linde
- Tear Stream Positioning Algorithm – Shell
- Adjust Bisection Method EO Blowdown Report – Shell
- Parachor Surface Tension Valve Blocking – Shell
- IPF Method in UniSim Flare - Shell



ROADMAP: JOINT DEVELOPMENT PROGRAMME

- Pipe Segment Improvements
 - GUI, Workflow, Heat Transfer, Stability
- Wet Gas Compressor
- HTRI Collaboration
- Scenario Transition Monitor*
- Module Coupling Interface*
- Simulation Balance Tool*
- Case Scenario Management*
- EO Blowdown Customise***
- Spreadsheet Improvements – Excel Functionality
- Copy/Paste Objects to Specific Locations



*Developed in Partnership as part of JDP with Linde

**Developed in Partnership as part of JDP with Shell

***Equinor standardise on EO Blowdown Customize

THANK YOU

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