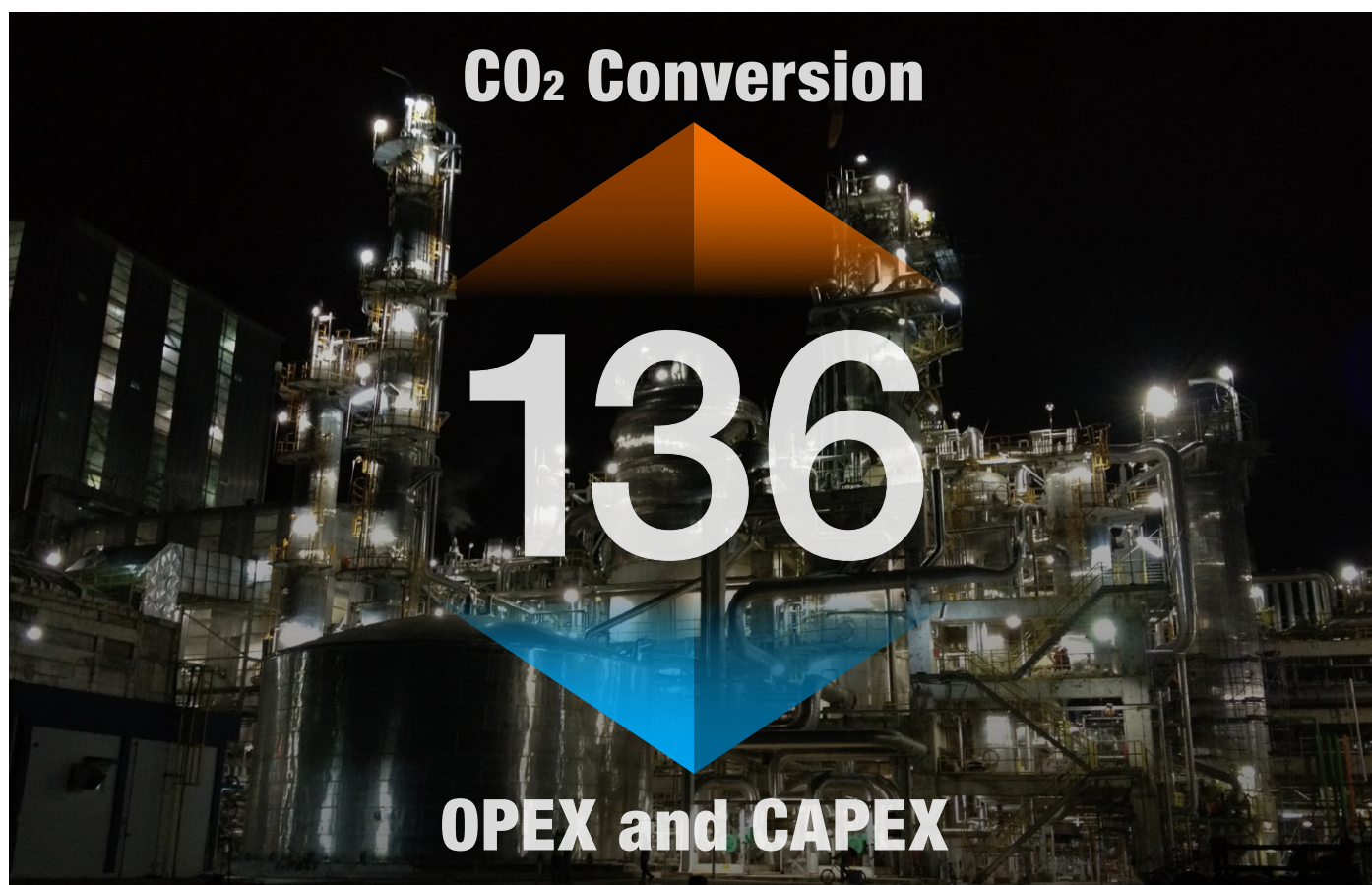


# ACES21-LP™

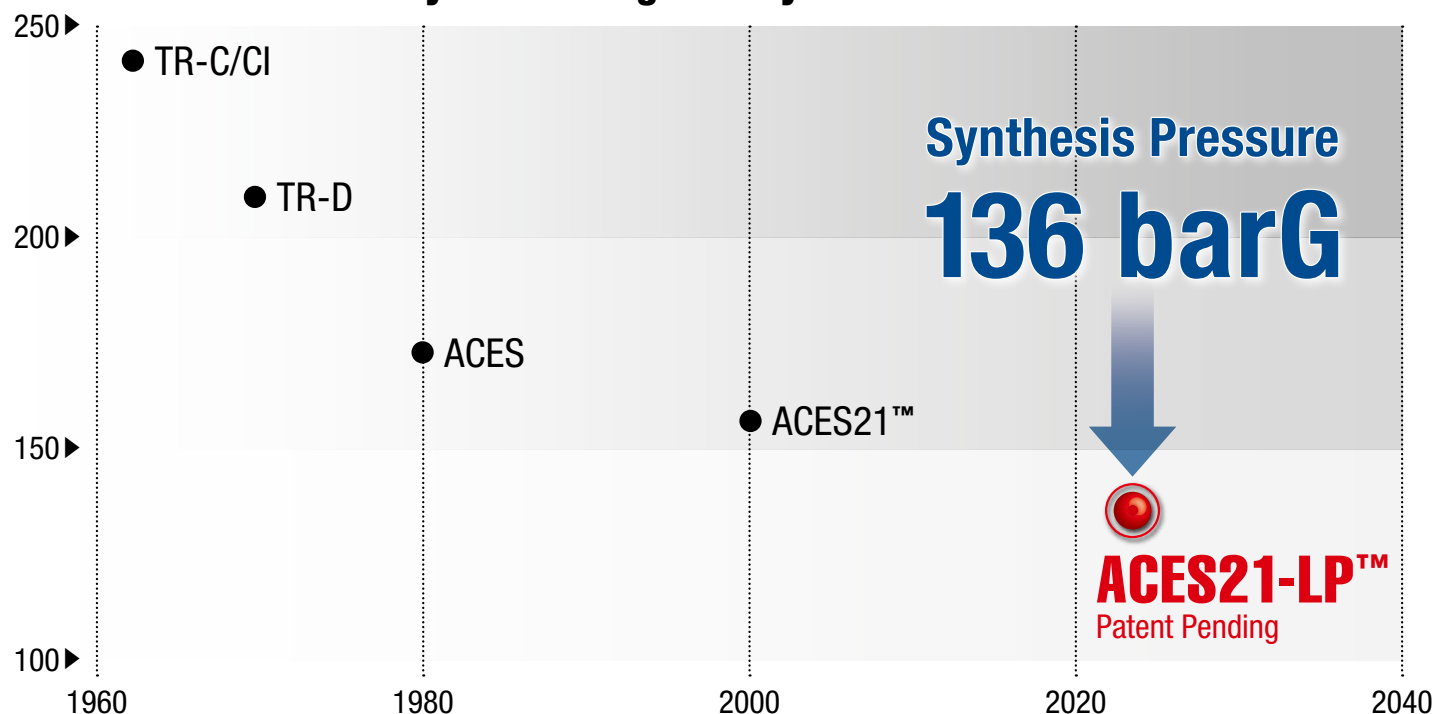
UREA PROCESS by TOYO



## Lowest Synthesis Pressure in Urea History



### History in Lowering Urea Synthesis Pressure



## ACES21-LP™ Lowers Synthesis Pressure to 136 barG\*

- Urea synthesis at the lowest pressure maintaining all salient features of current ACES21™
- Highest CO<sub>2</sub> Conversion
- Less OPEX
- Less CAPEX
- 5-10% reduction of weight of synthesis equipment

## ACES21-LP™ drastically reduces passivation air\*

Sophisticated application of DP28W™, duplex SS and 316L SS to synthesis section further enhances corrosion resistance even with significantly reduced passivation air

### Comparison with other processes

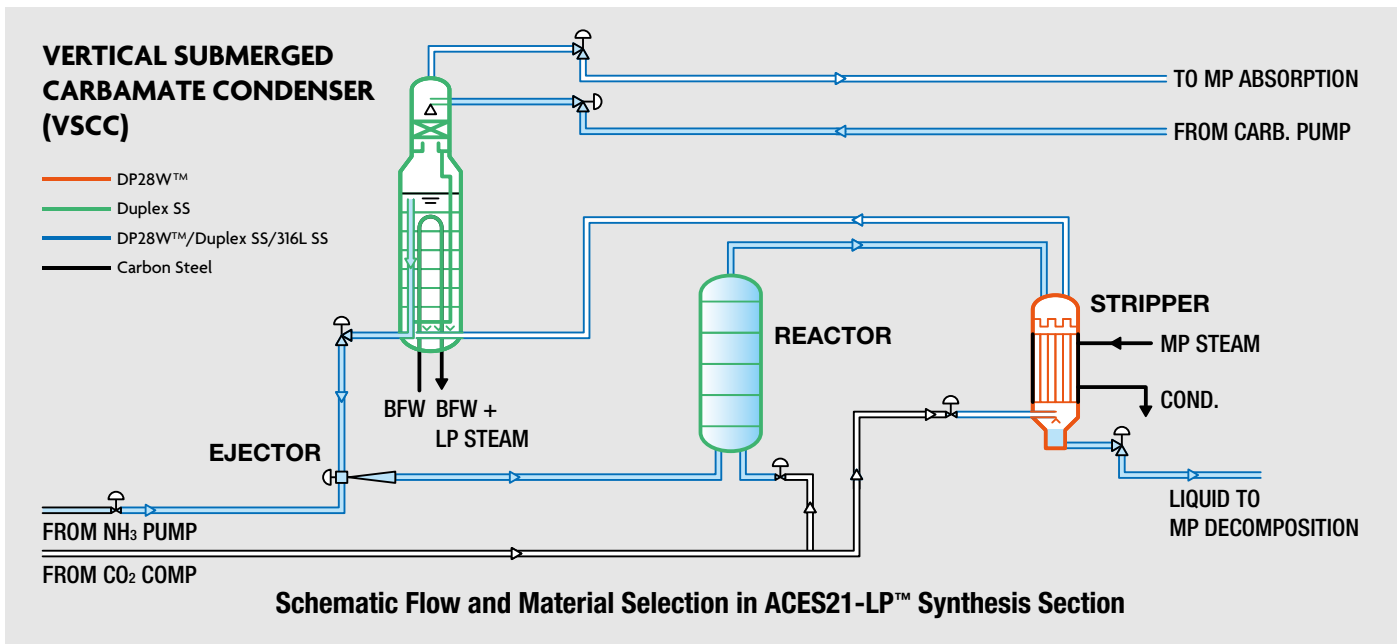
Process	ACES21-LP™ CO <sub>2</sub> Stripping	Process A CO <sub>2</sub> Stripping	Process B NH <sub>3</sub> Stripping
Synthesis Pressure [barG]	<b>136</b>	142	147
Reactor N/C Ratio [mol/mol]	<b>3.7</b>	3.0	3.3

### OPEX Reduction by ACES21-LP™

	ACES21™	ACES21-LP™
Electricity	Base	<b>5% Reduction</b>
Steam (MT/MT) at compressor turbine inlet	Base	<b>3% Reduction</b>

## Currently operating ACES21™ plants can be easily upgraded to ACES21-LP™\*

- Low-pressure synthesis at 136 barG realizes 3% energy savings or 3% production increase only with minor modifications, maintaining original process scheme and HP equipment in-situ
- Excellent cost-benefit performance; payout within one year



\*Patent pending by Toyo Engineering Corporation



### Toyo Engineering Corporation

Makuhari Technical Center, 1-1 Nakase, Mihama-Ku, Chiba-shi, Chiba 261-8601, Japan  
 Tel: +81-43-274-1000  
 E-Mail: urea@toyo-eng.com  
<https://www.toyo-eng.com/jp>