



A Novel, Highly Efficient and Economic Purification Process Revolutionizing PTA Production

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Outline

- **Introduction**
- **Project Objectives**
- **Technical Approach**
- **GTC Purification Process**
- **Project Impacts**
- **Future Plans**
- **Summary**



Introduction

- **US polyester production has grown from 2MM tons → 5MM tons per year**
- **Polyester used for consumer goods**
- **PTA is polyester precursor**
- **Substantial energy savings**
- **Reduced environmental impact**



PTA Production Capacity vs. Consumer Demand

Year	World PTA Production Capacity (Mt/y)	Consumer Demand (Mt/y)
2006	37,480	33,752
2008	46,283	39,494
2010	55,290	46,287
2014	68,875	59,962



PTA Production Capacity

Year	Producers/Sites	Production Capacity (Mt/y)
2006	~55/80	70 to 1740
2014	~55/90	70 to 3000



Project Objectives

- **Commercialize a revolutionary new PTA process**
- **Reduce energy consumed**
- **Eliminate use of hazardous chemicals**
- **Accept lower-cost feedstocks**
- **Increase fundamental understanding**

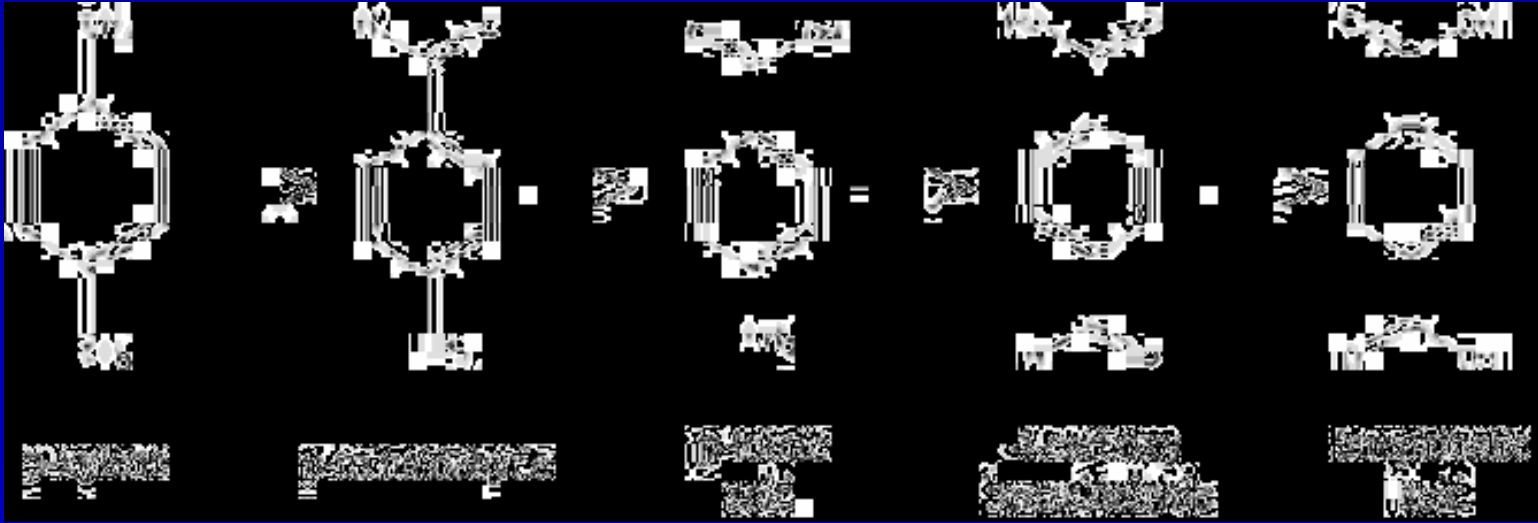


Technical Approach

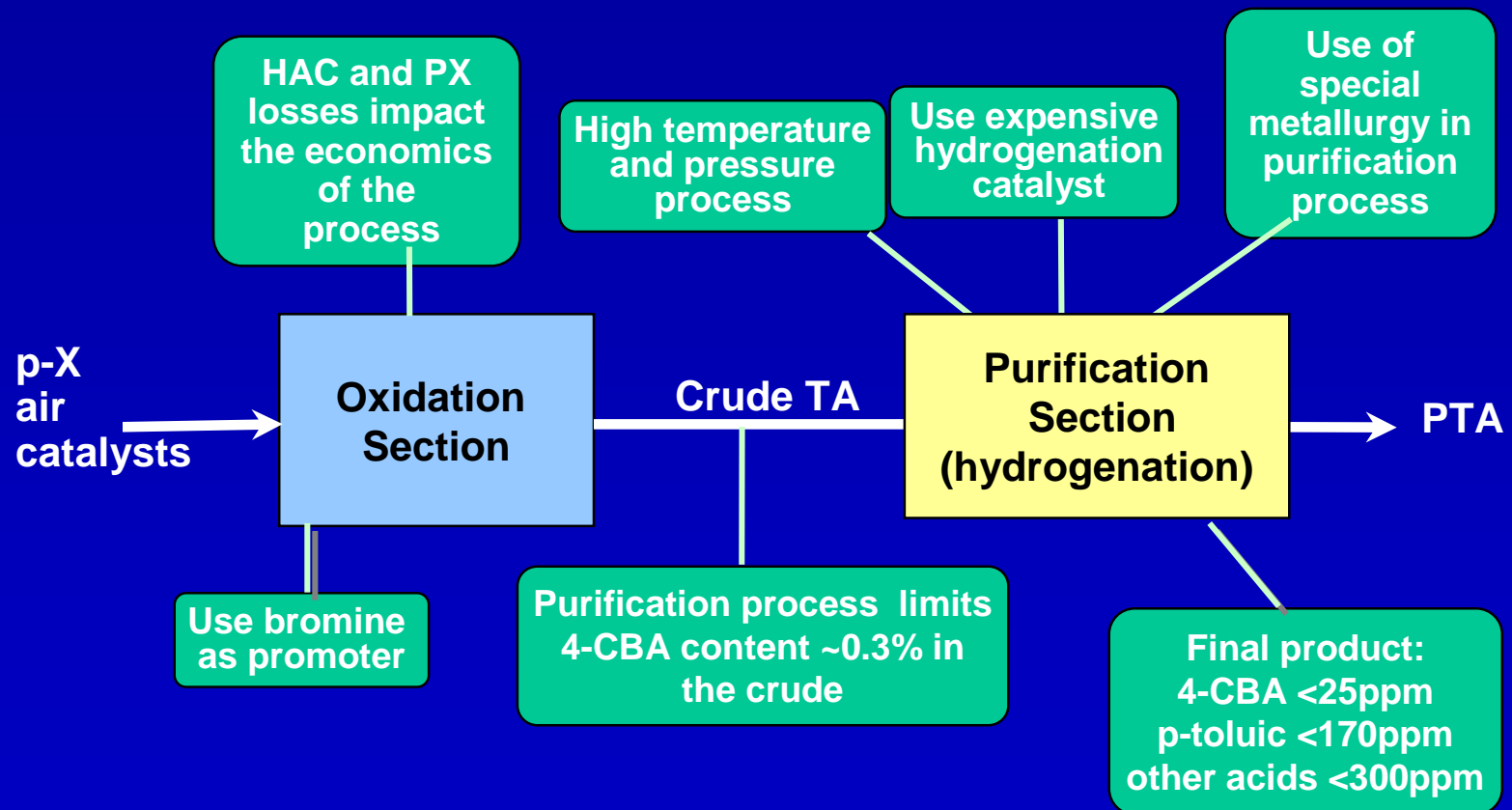
- **Low temperature, low pressure crystallization**
- **Highly selective solvent**
- **Simplified process**



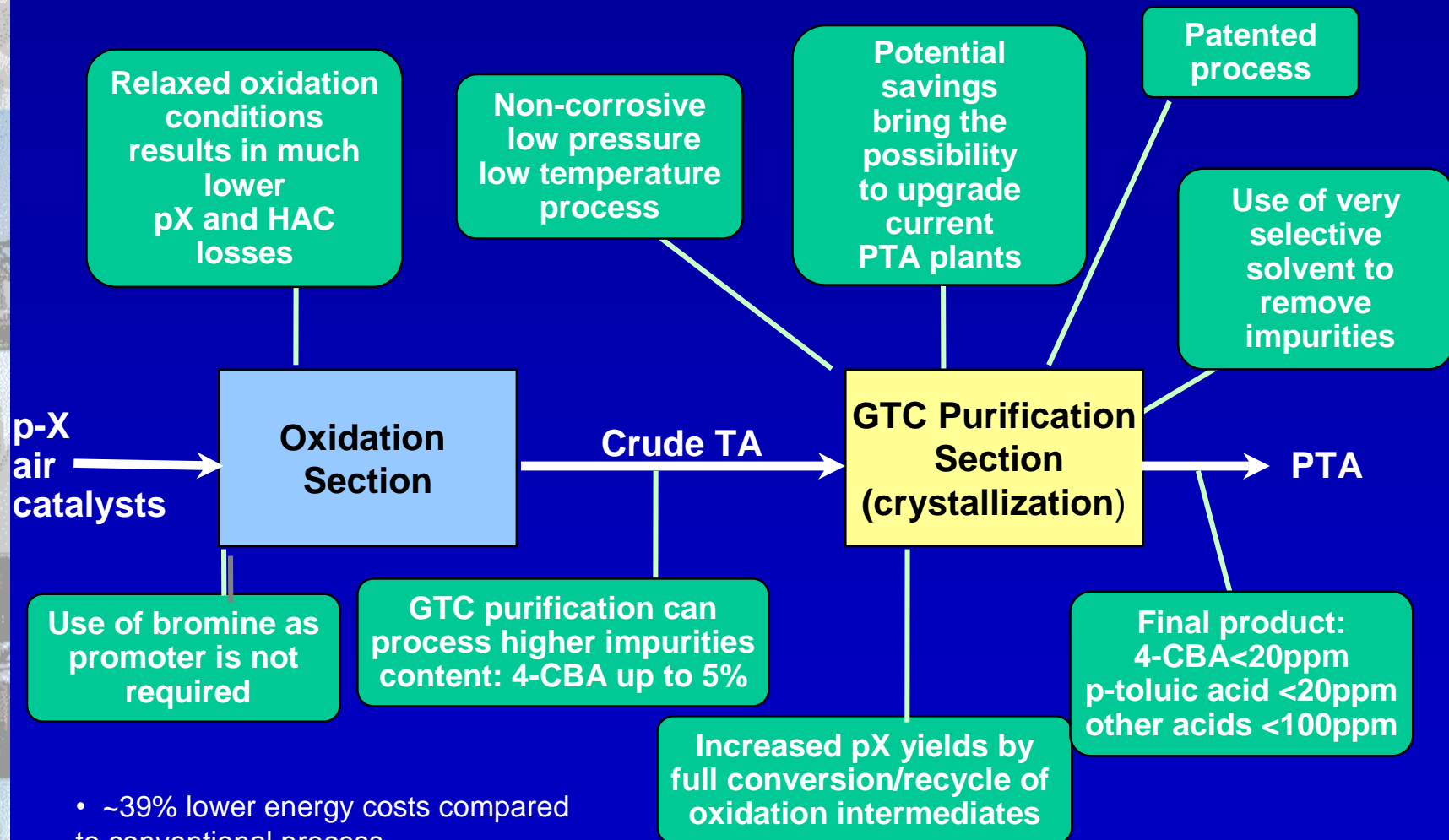
Typical Oxidation Products



Conventional PTA Process



GTC PTA Technology

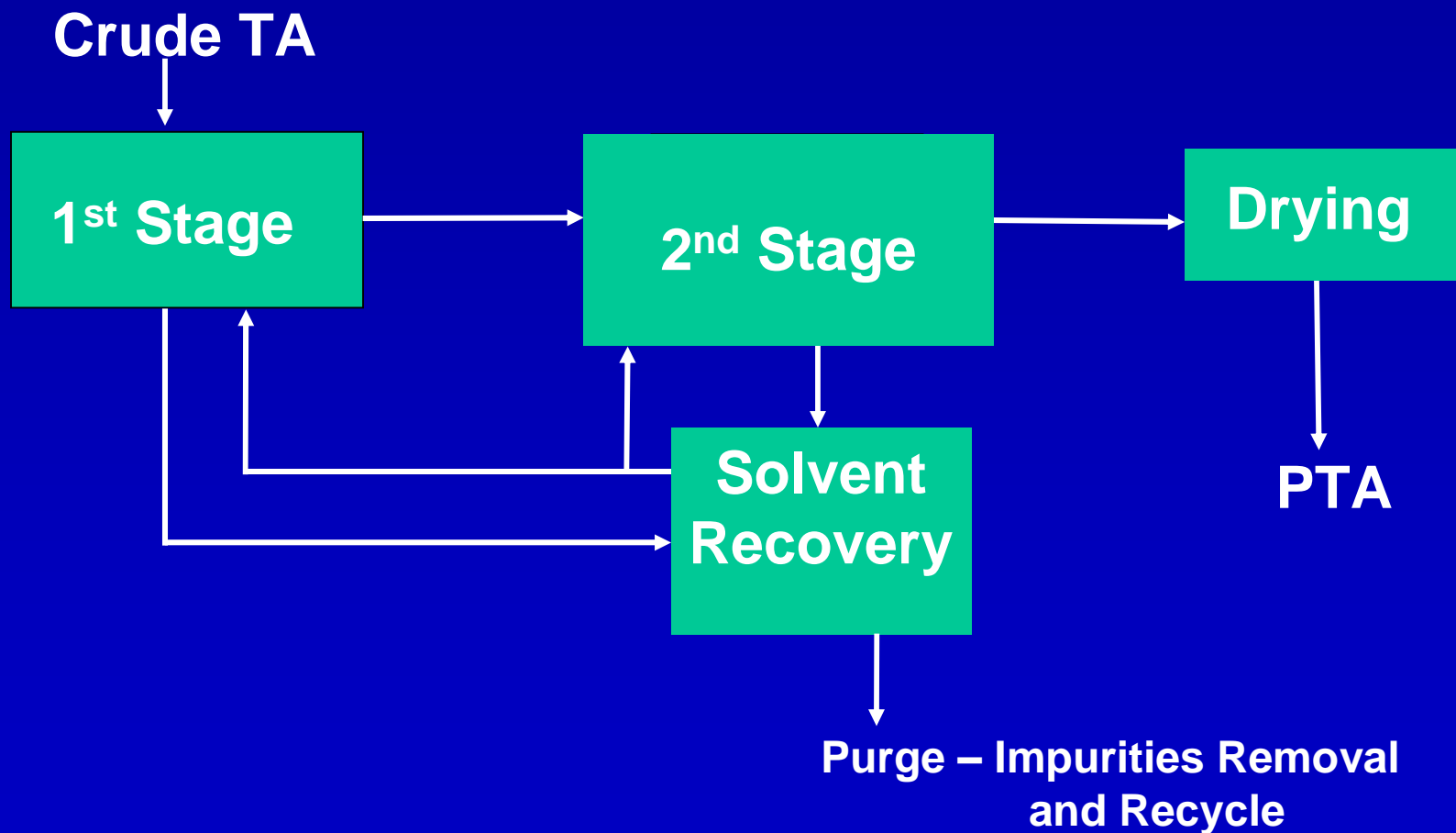


- ~39% lower energy costs compared to conventional process

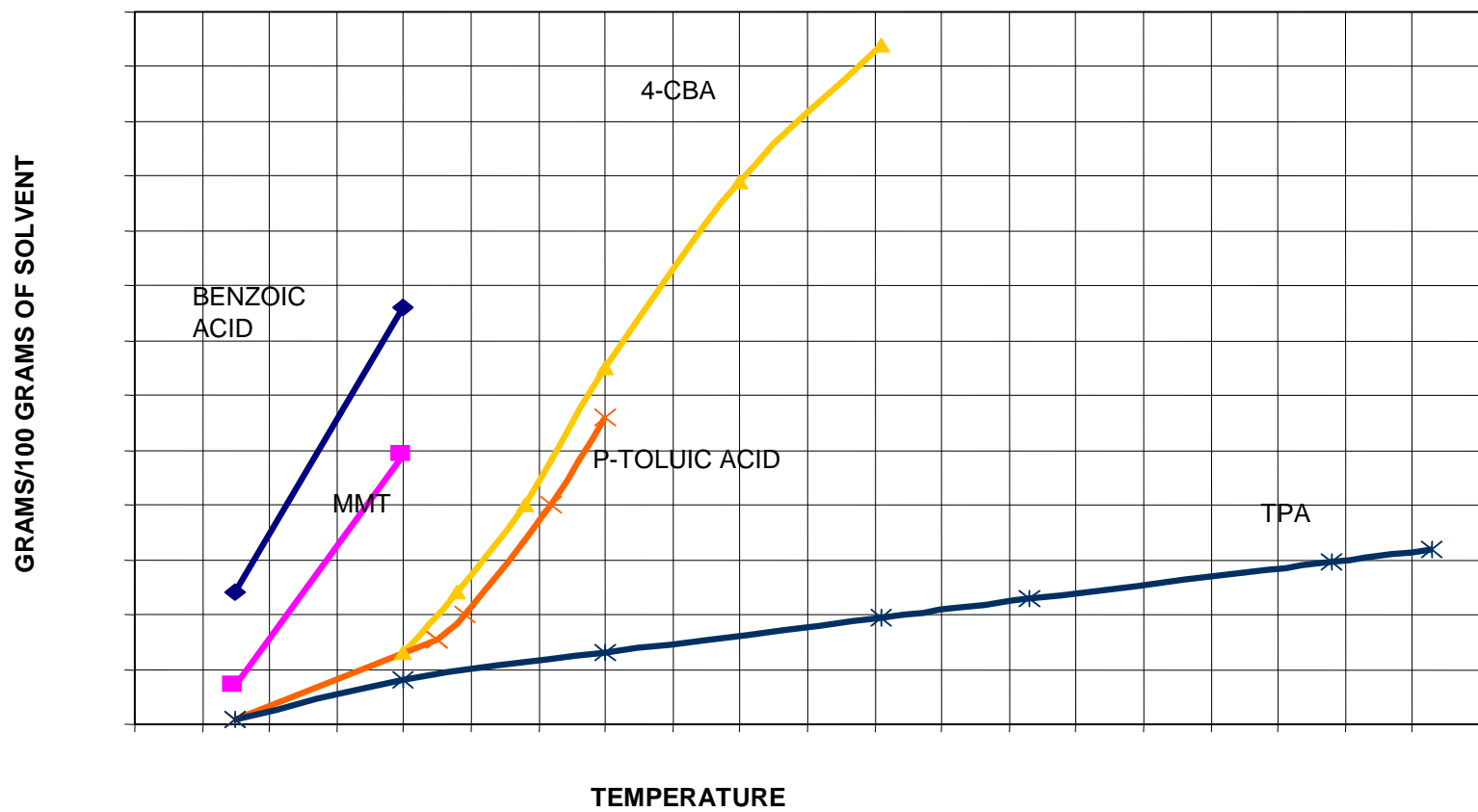
- ~16% lower capital investment

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Simplified PTA Purification Process



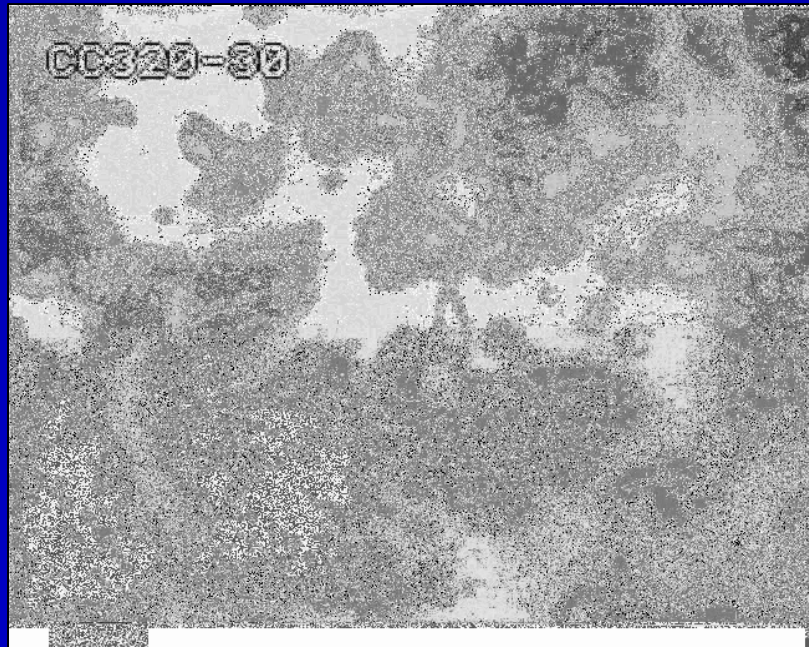
Solubility Curve





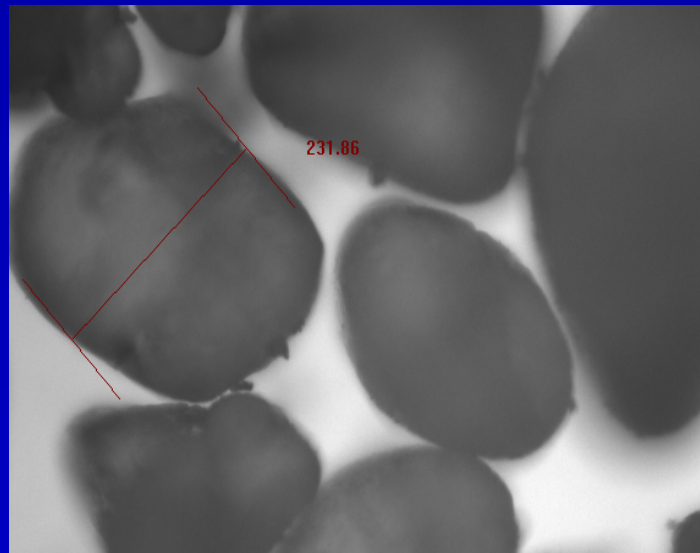
Bar Type Crystals by Crystallization: Before and After

- Ham et. al. reported 'salt complex'
- Selective solvent
- Washed to fines



Globular PTA

- Further understanding of crystallization
- Selective solvent
- Washed to crystals



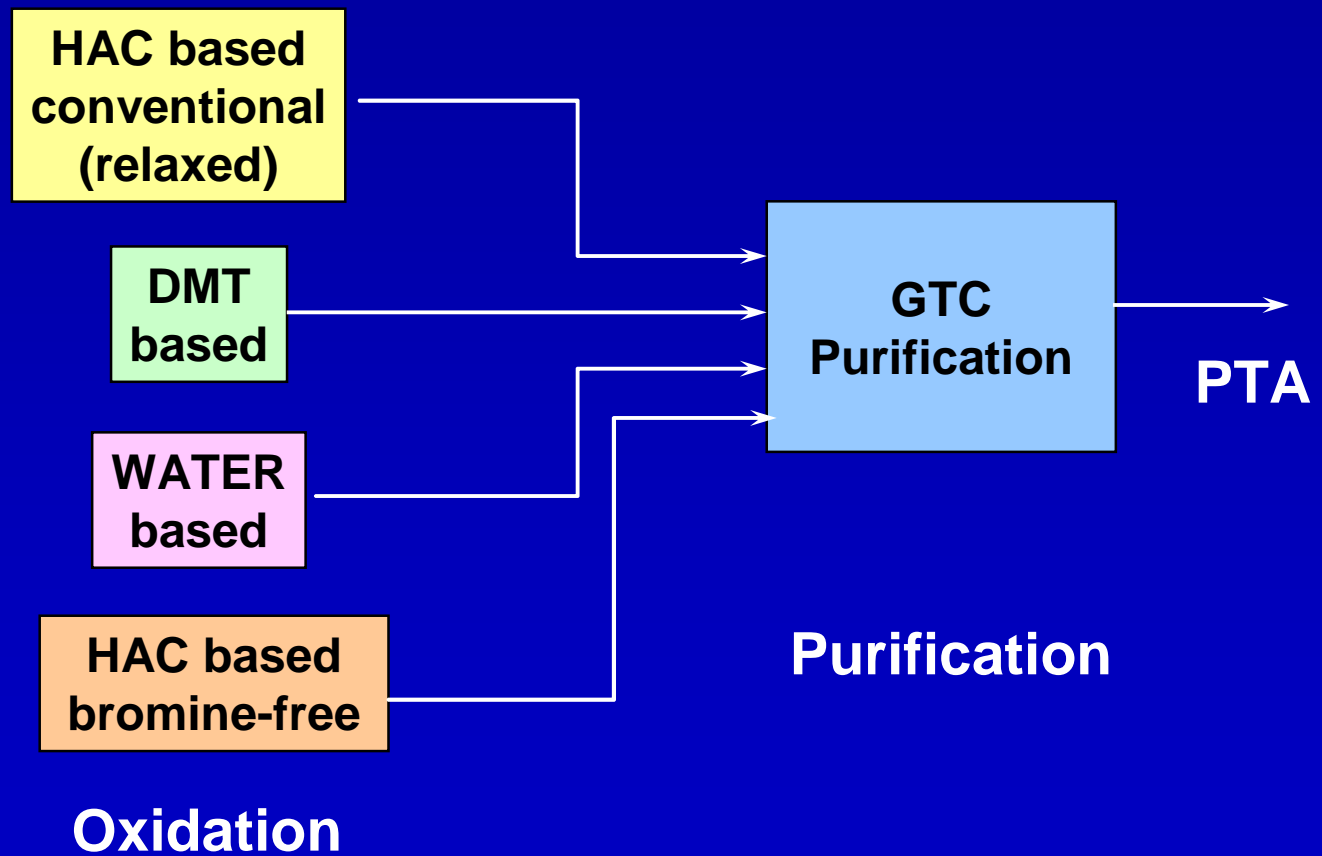


GTC PTA Typical Product Purity

PARAMETER	CONVENTIONAL	GTC
4-CBA, ppm	< 20	< 20
p-Toluic Acid, ppm	< 170	< 20
Other Acids, ppm	< 300	< 100
Optical Density	< 0.1	< 0.1
Particle Shape / Average Size, microns	Globular / 110	Globular / 130

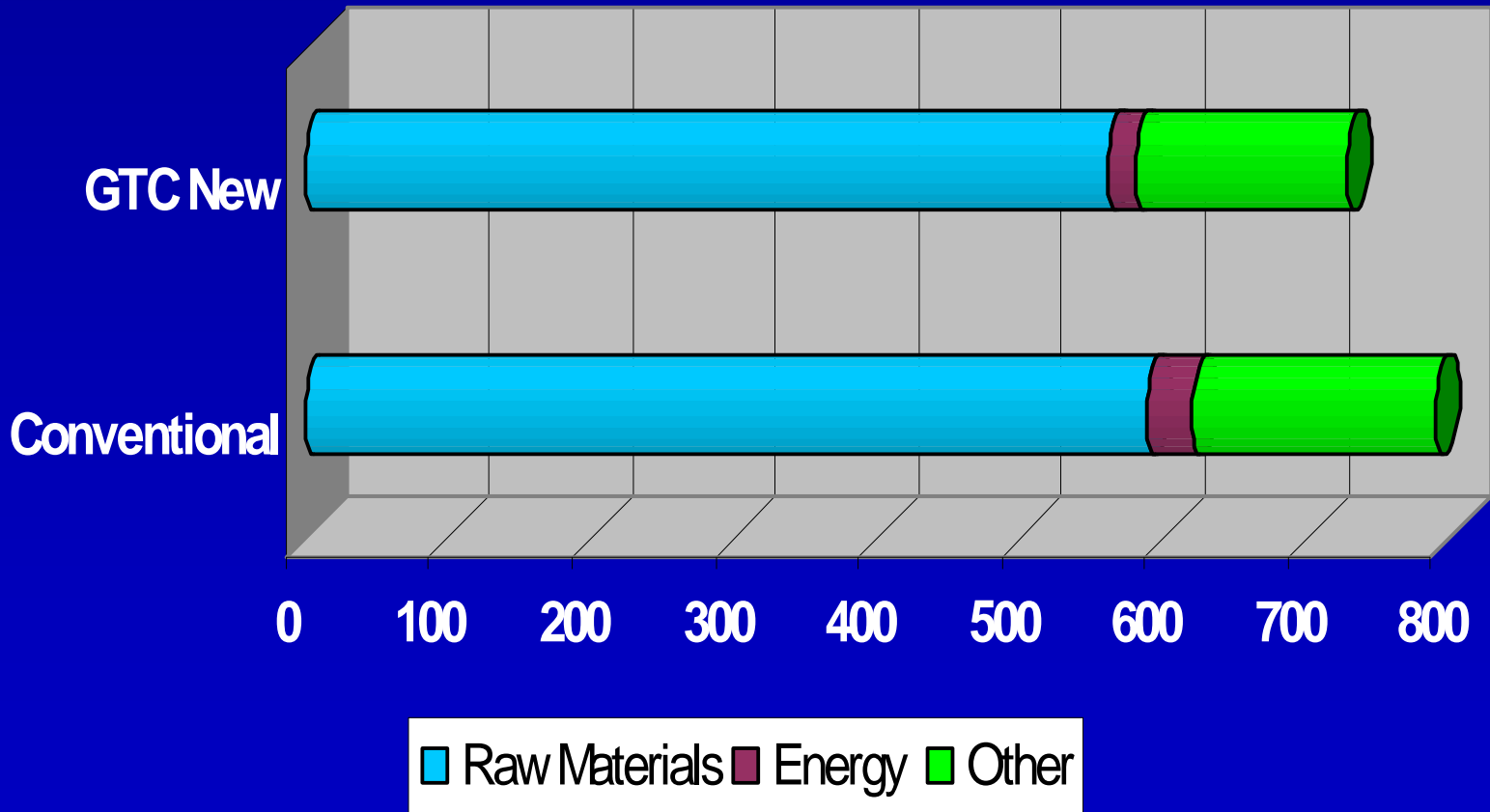


Uniqueness & Flexibility of GTC's Process



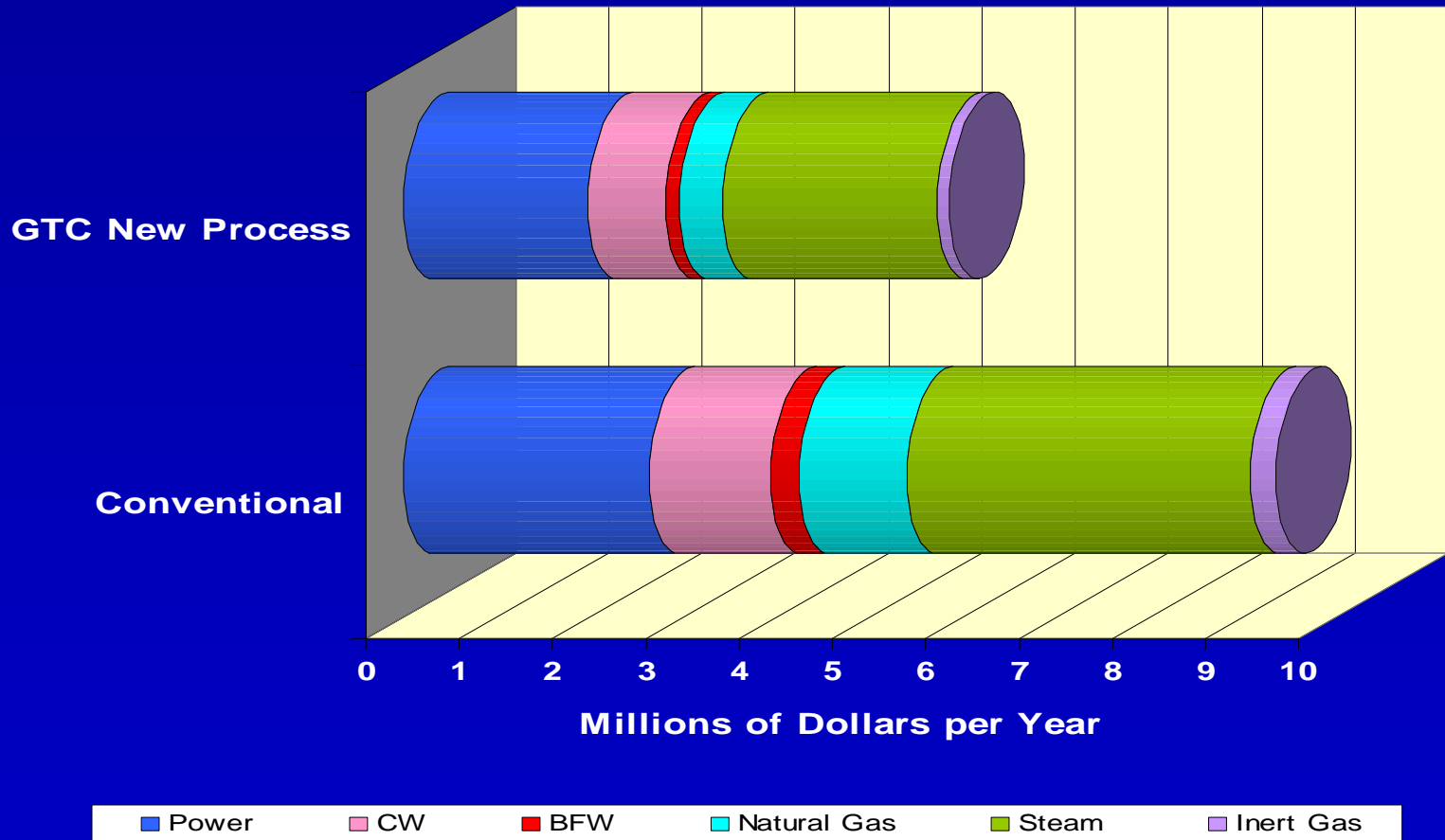


Operating Cost Comparison (600 Mt/y - cost in \$/Mt)





Utility Consumption Comparison



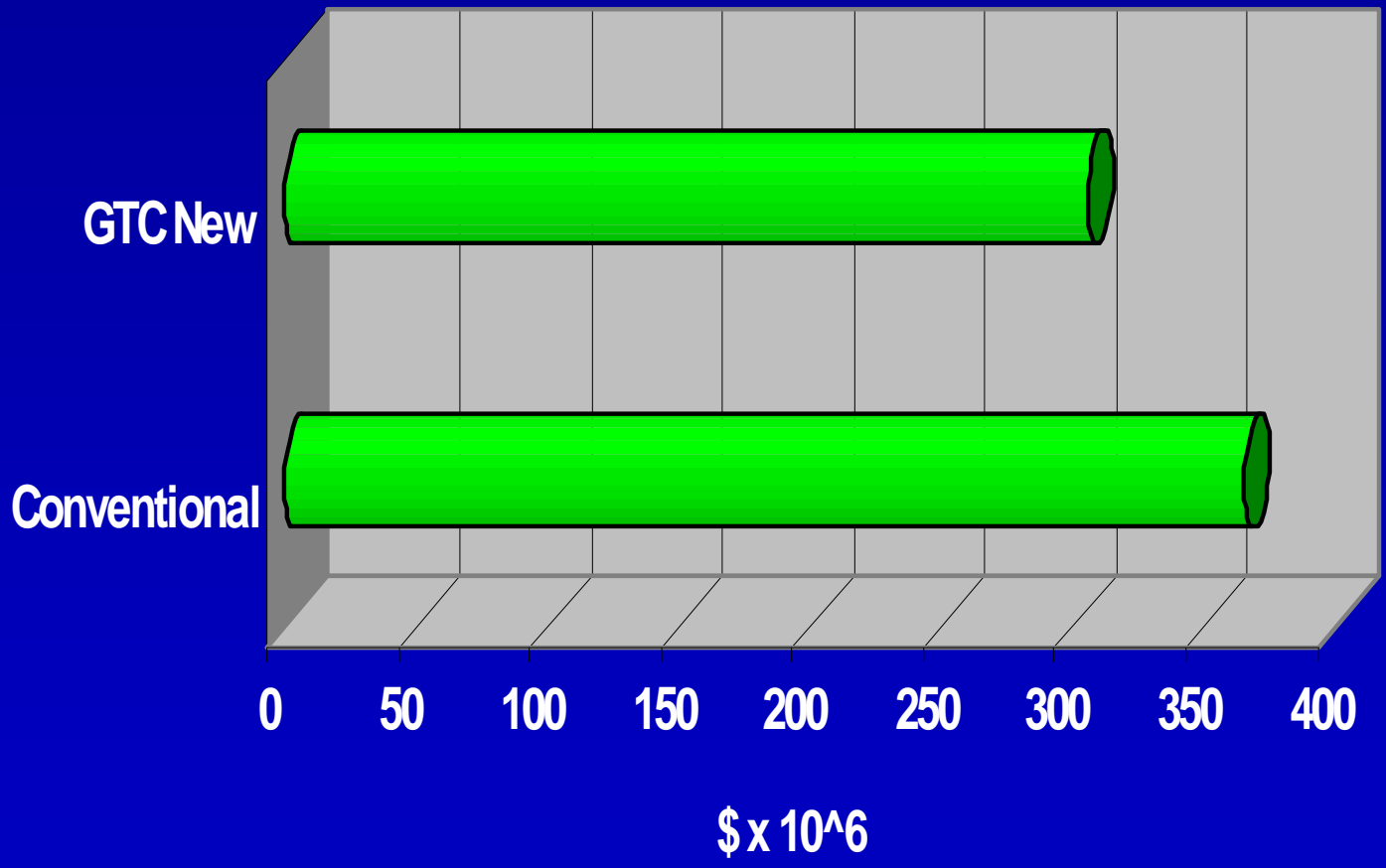


Operating Cost Advantages of the GTC PTA Process

- **Estimated ~39% reduction in utility consumption and ~10% operating costs.**
- **Improved raw materials consumption.**
- **Lower compression costs.**
- **Low temperature and pressure in crystallization and residual solvent removal sections mean lower energy consumption**



Capital Investment Cost (600 Mt/y)





Capital Cost Advantages of the GTC PTA Process

- **Estimated ~16% lower capital cost.**
- **Savings on reactor and compressor.**
- **No dissolver/hydrogenation reactor/catalyst required.**
- **Non-corrosive crystallization operates at atmospheric pressure and low temperatures and does not require special alloys.**



Project Impacts

- **1.9E13 Btu/yr US energy savings**
- **2.0E14 Btu/yr world energy savings**
- **16% lower Capital Investment compared to conventional technology**
- **39% reduced utility consumption compared to conventional technology**
- **Higher purity product and flexibility**
- **Adaptable to non-bromine oxidation systems**



Future Plans

- **Finalize industrial evaluation**
- **Continue optimization of technology for further energy savings**
- **Finalize process for commercialization**
- **Implement technology at commercial scale**



GTC-PTA Purification Technology Summary

- **Significant energy savings**
- **Low temperature/low pressure crystallization**
- **Selective solvent**
- **16% lower Capital Investment**
- **39% reduced utility consumption**
- **Higher purity product and flexibility**
- **Adaptable to non-bromine oxidation systems**

Acknowledgements

- **Department of Energy**
- **Team members:**
 - **George Ball**
 - Manager of Technology Development
 - **Costantino Braggiato**
 - Sr. Design Engineer
 - **Tai-Li Chou**
 - Research Engineer
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CTC Technology

