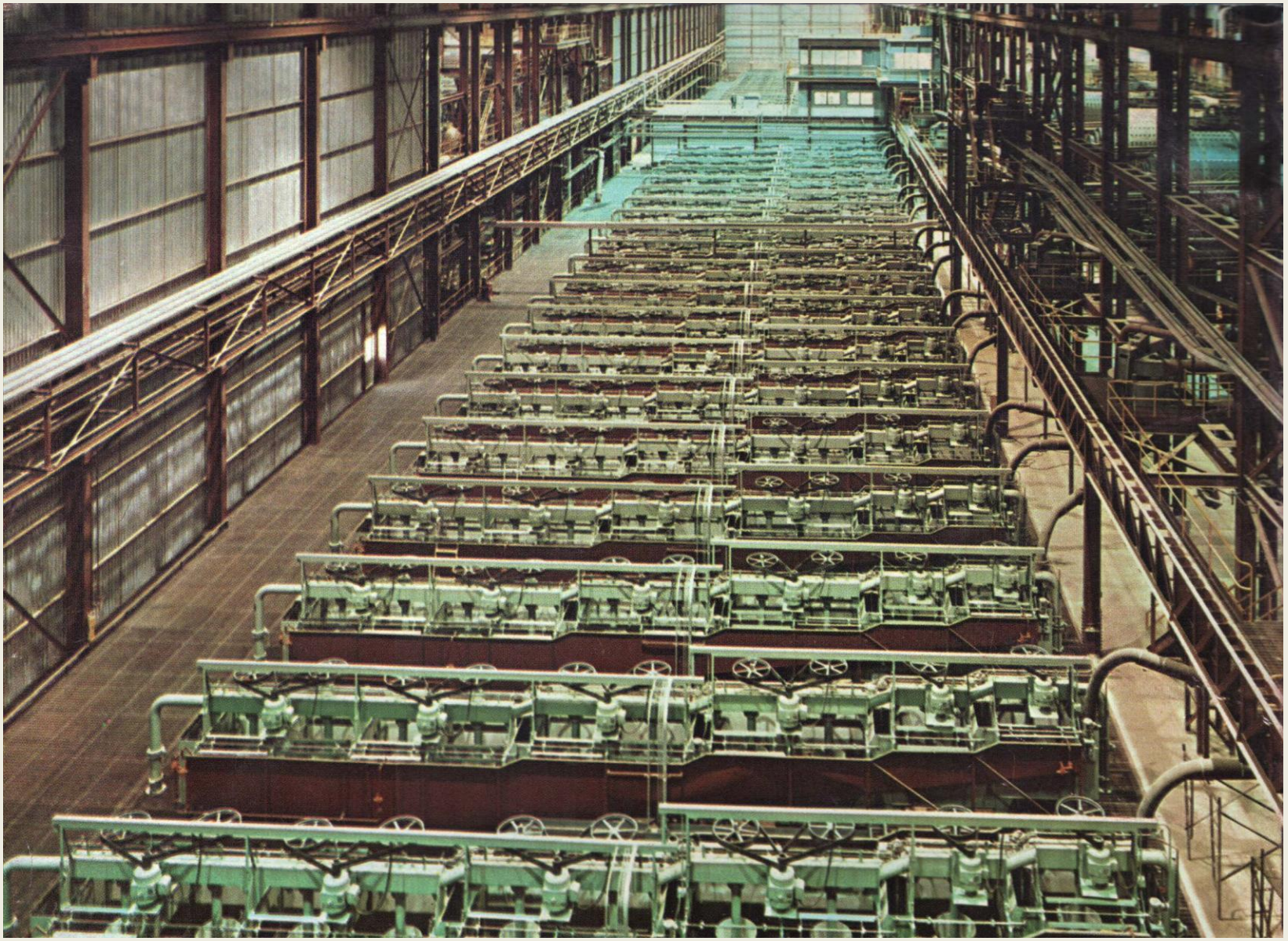
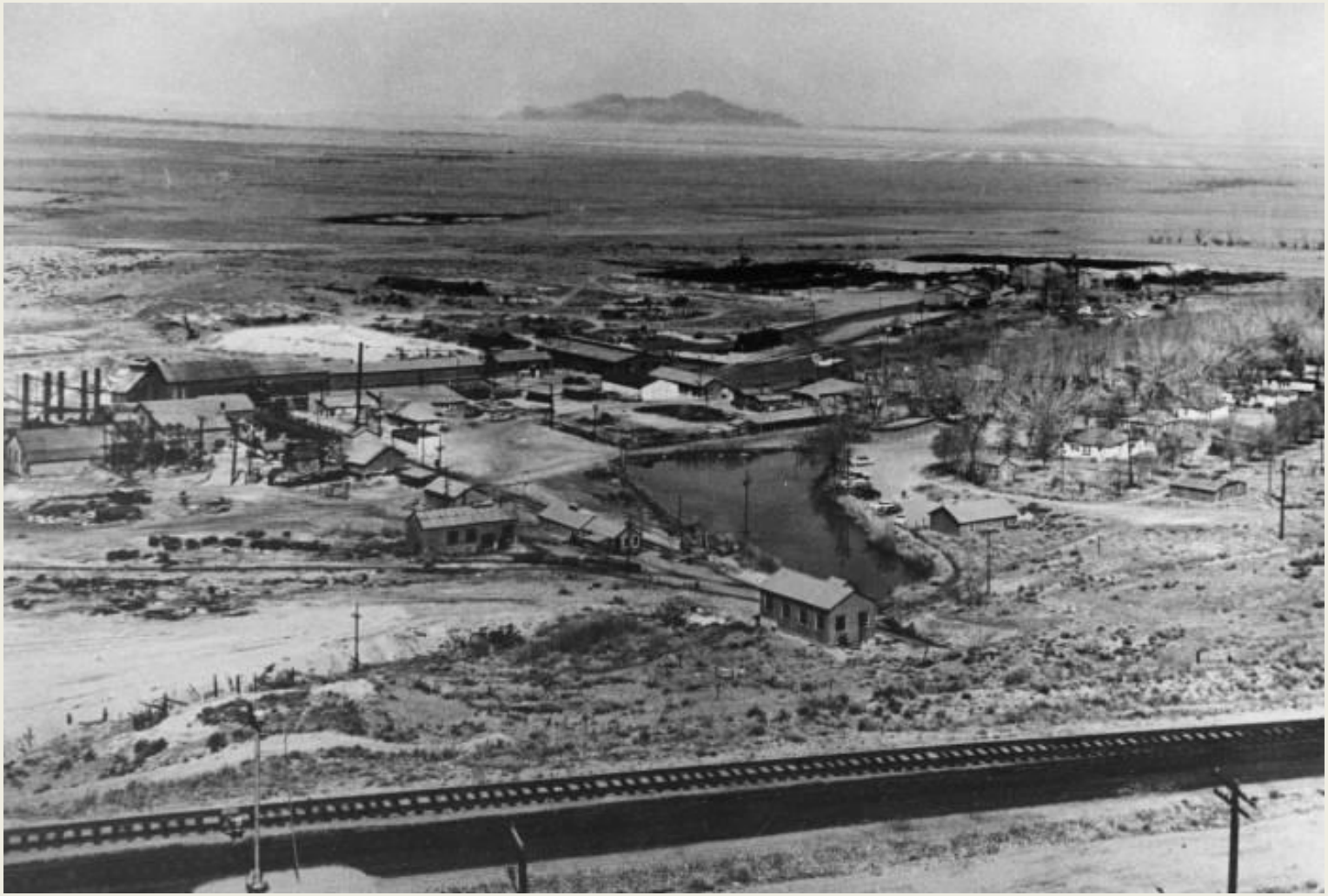
Tales from Four Mills



Combined Metals Reduction Co. Bauer Mill, Stockton, Utah



Combined Metals Reduction Co.
Bauer Mill, Stockton, Utah

Combined Metals Reduction Co. Bauer Mill, Stockton, Utah

- The mill processed lead-zinc ore from more than 100 mills each year.
- Each day, the plant metallurgist came at 6 A.M. and walked through the mill to see how it was running.
- By 10 A.M. he was in the lab, testing flotation responses of various ore blends.
- By 4 P.M. he would prepare instructions for the next day's operations, specifying the ore blend, the flotation reagent regimen, etc.

The Alaska-Juneau Mill

The Alaska-Juneau Mill

- The mill processed a gold ore comprising numerous, gold-bearing quartz veins, each about 1 cm across.
- The mill was not profitable until the management imported Filipino laborers to sort the ore by hand, based on its color.
- The Filipino laborers were paid enough to live in Juneau, but not enough to allow them to return to the Phillipines.

The Alaska-Juneau Mill

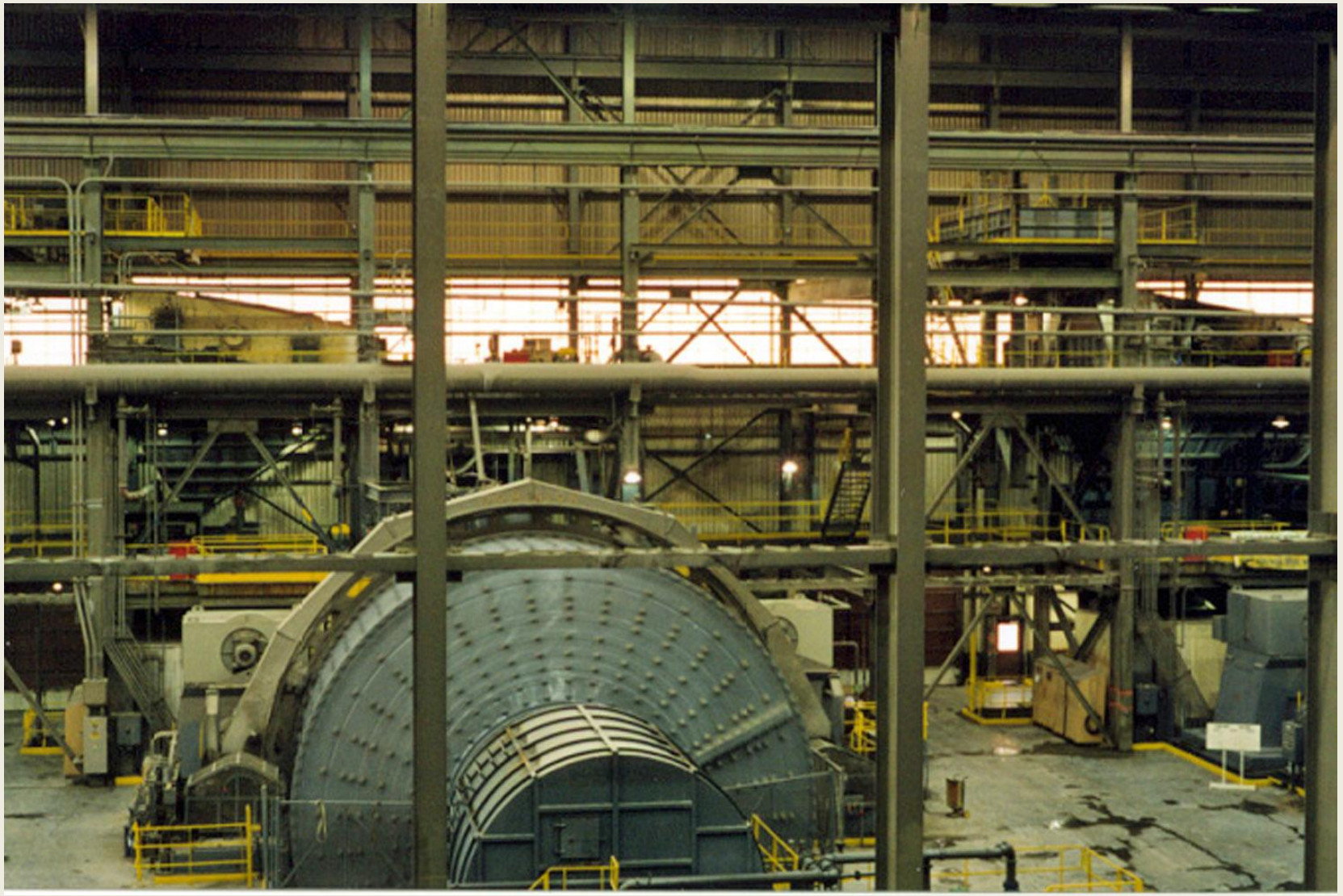
Barrick Gold Cortez Mill

Cortez Gold, Nevada U.S.A.

- The author visited the mind and mill in 2002. The mine proudly described its automated mining system, in which mine data system “knew” exactly when each ore block (located by GPS) was mined.
- The mill described its expert control system for the SAG mills, which was said to work well except when the ore type changed, at which time the expert rule base had to be re-programmed.
- Almost all the information gathered in exploration and mining was somehow lost somewhere in the ore stockpiles.

Cortez Gold, Nevada U.S.A.

Kennecott Copper Co.
Copperton Concentrator



Kennecott Copper Co. Copperton Concentrator

- During a time of high copper prices, mill throughput was increased significantly. Although recovery decreased, the amount of copper recovered increased, resulting in higher revenues.
- The increased throughput resulted in several problems in the mill, including:
  - increased oversize in the SAG mill discharge, requiring addition of a pebble crusher
  - buildup of oversize material in the flotation cells, causing poor cell performance and damage to cell components.

Kennecott Copper Co.
Copperton Concentrator

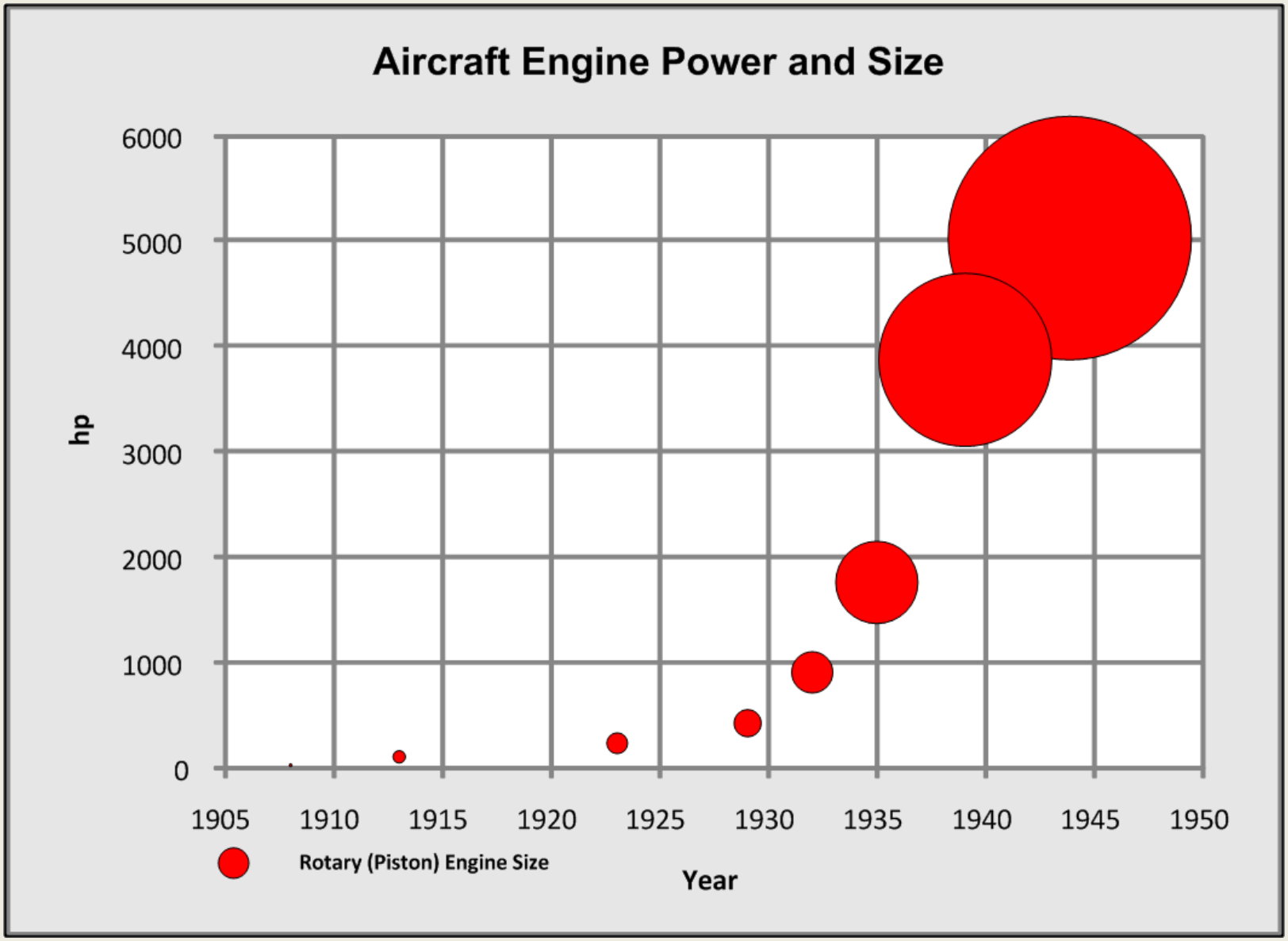
Kennecott Copper Co.
Copperton Concentrator

Innovation is the creation of better or more effective products, processes, technologies, or ideas that affect markets, governments, and society.

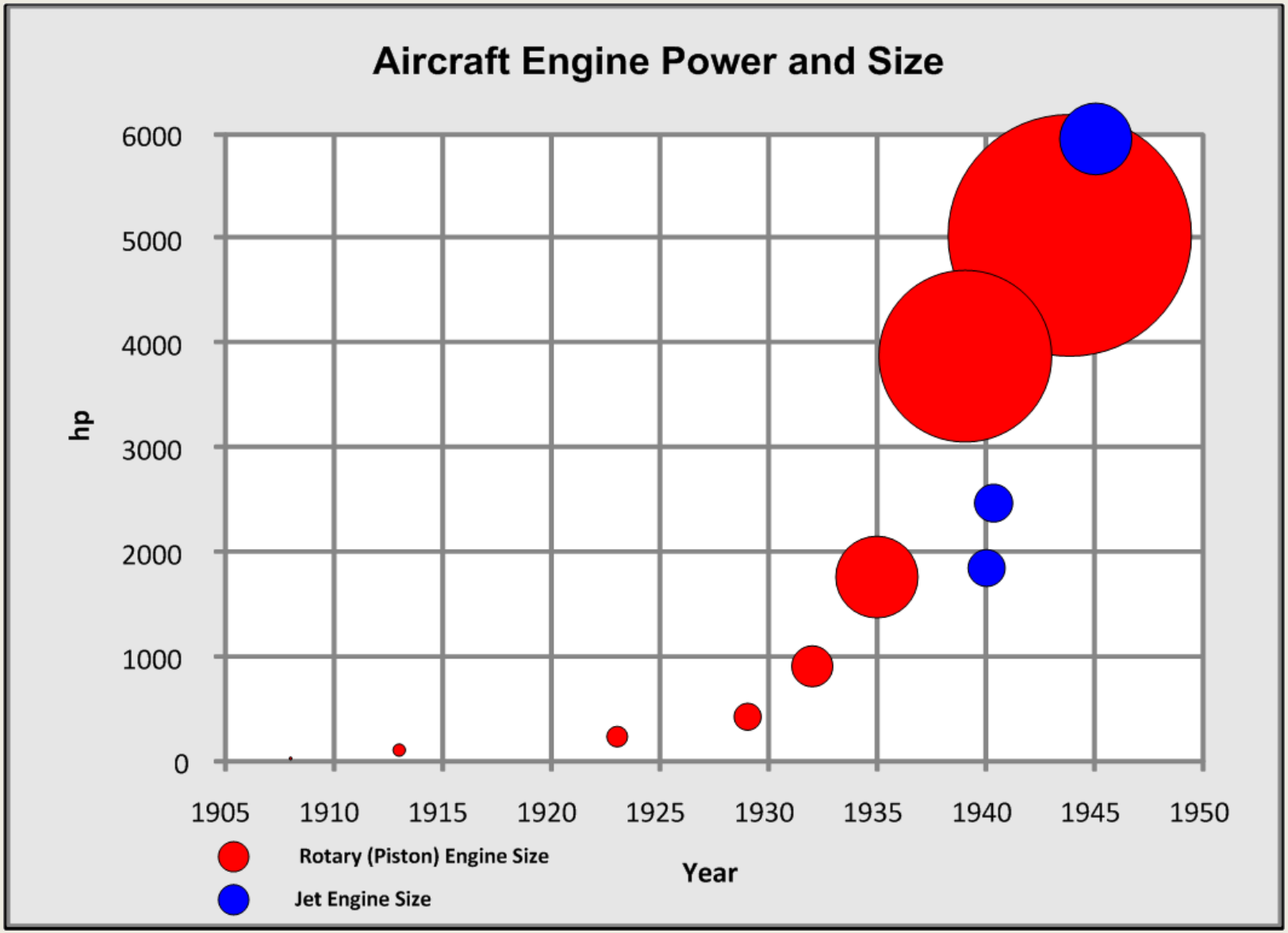
"I'll be happy to give you innovative thinking. What are the guidelines?"

Innovation differs from invention or renovation in that innovation generally signifies a substantial change compared to entirely new or incremental changes.

Innovation


Aircraft Engine Power and Size
6000
5000
4000
3000
2000
1000
0
hp
1905
1910
1915
1920
1925
1930
1935
1940
1945
1950
Rotary (Piston) Engine Size
Year

Innovation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Jet Engine Size

Flotation

- **Sulfide flotation by adhesion**
- **Concentration in a froth**
- **Aeration and froth formation by agitation**
- **Product stream retreatment**
- **Multi-cell rows**
- **Air addition**
- **Level control**

→ **1903 - 1914**

- Special impellers and stators
- Standpipes and draft tubes
- Hydrodynamic design
- Bigger cells
- Improved feed and discharge systems

Flotation

- Sulfide flotation by adhesion
- Concentration in a froth
- Aeration and froth formation by agitation
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- Multi-cell rows
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- Automatic pulp level control
- Special impellers and stators
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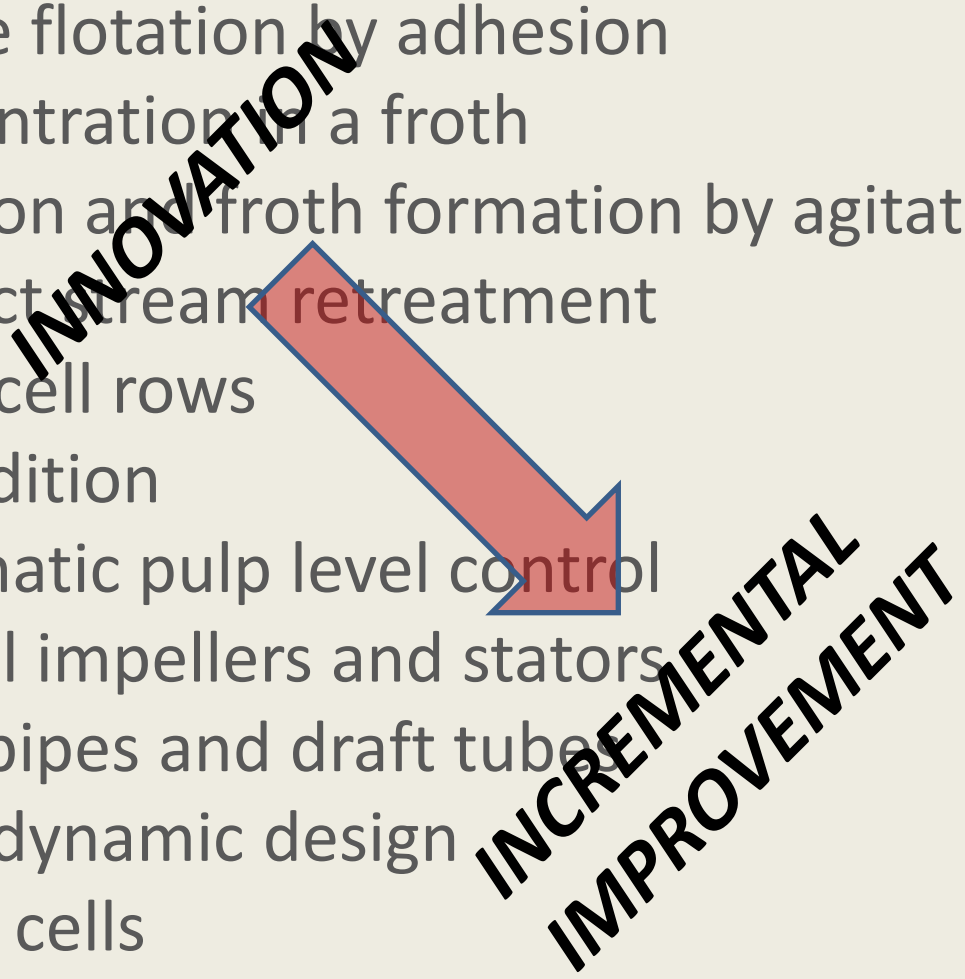


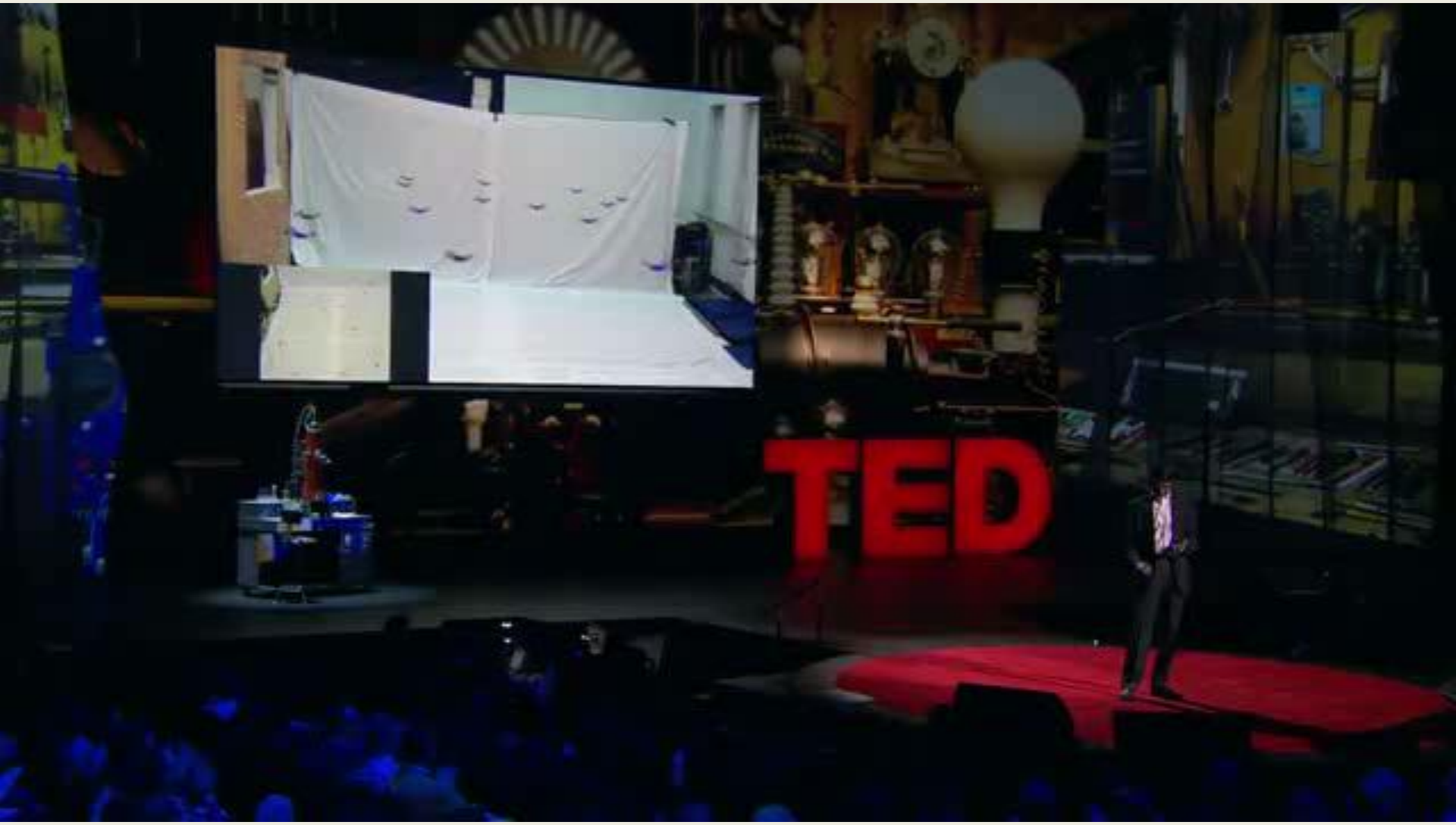
Innovation – why?

Flotation, 1900-1920

- Widespread interest in mining
- High demand for products
- Motivation: large, unrecoverable resources
- Available funding and test sites
- The right people

Aircraft engines, 1935-1950

- Widespread interest in aviation
- Motivation: war
- Rapid accumulation of technical understanding
- The right people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