Salt Partners

Chloralkali Feedstock Dynamics, Trends and Forecasts

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I.C.I.S. Tecnon OrbiChem Virtual Chloralkali Conference, 21-22 October 2020

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Welcome!

In January 2020, Tecnon OrbiChem asked us whether we would make a presentation at the 24th World Chloralkali Conference in Singapore.

We said, yes.

In the meantime, the Corona virus changed the plans.

So, welcome to this virtual recording.

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Contents

What is the chloralkali feedstock dynamics?

- Chloralkali feedstock is salt (NaCl);
- Dynamics is the development with time;
- It is the understanding of the driving forces;
- And finally, it is the prediction of future supply / demand and production / consumption of salt.

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How did the world salt production develop?

World salt production 1970 – 2020:

	1970	1980	1990
World total (tons)	146'600'000	172’800'000	187’200'000

	2000	2010	2020e
World total (tons)	216’600'000	282’600'000	338’000'000

Sources: USGS (Ref. 1), BGS, Roskill, Salt Partners

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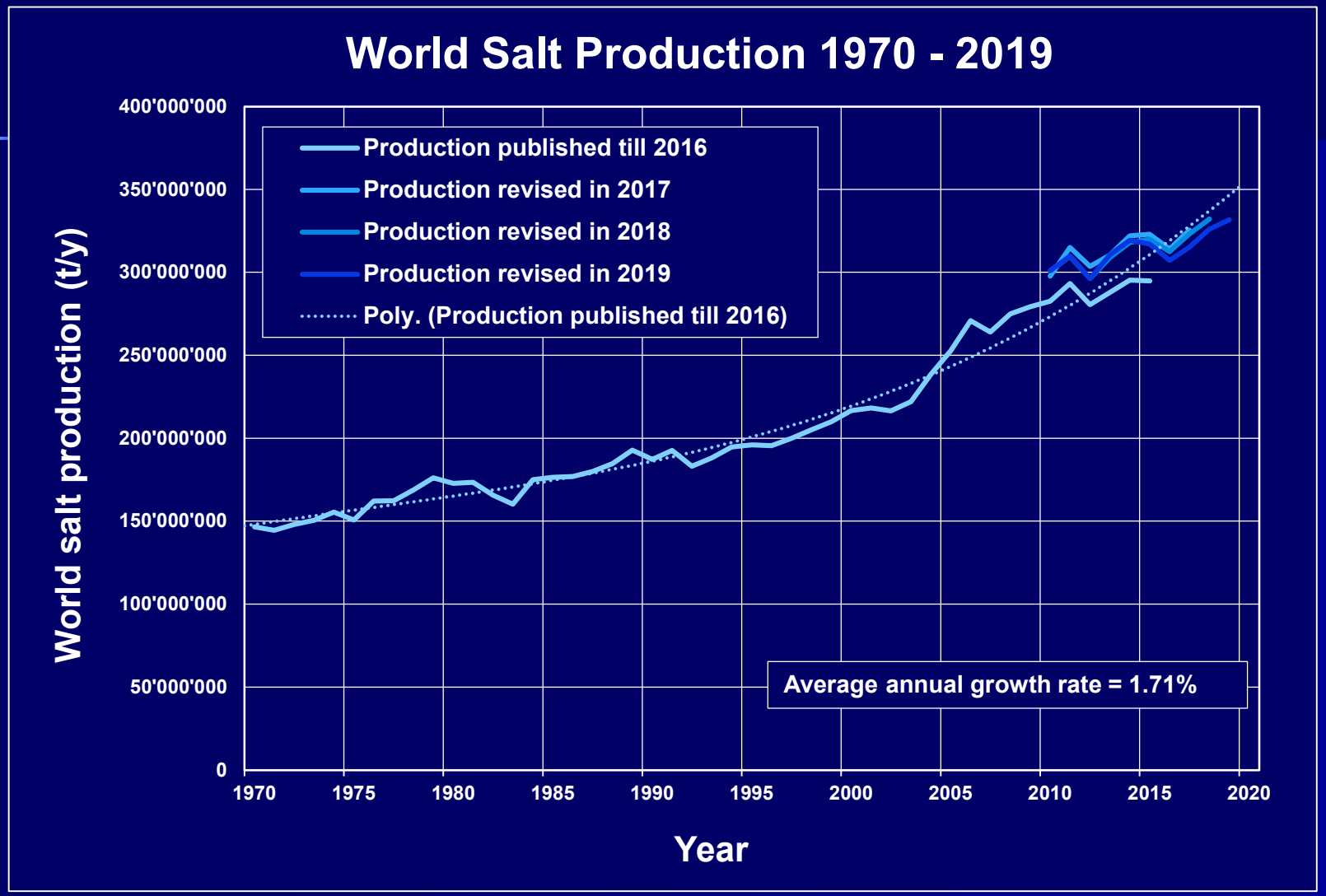

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How was the world salt production consumed?

Between 1970 – 2020

- The world salt production grew from 100% to 231%;
- The average annual growth rate was 1.71%;
- Almost 40% was consumed for chlorine production;
- Almost 20% was consumed for production of soda ash;
- The rest was consumed for other purposes.

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What was the driving force behind the growth?

Between 1970 – 2020

The world population grew:

- **from: 3’701’000’000 in 1970**
- **to: 7’808’000’000 in 2020 or,**

- **from: 100% in 1970**
- **to: 211% in 2020**

- **The average annual growth rate was 1.41%**

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How did the salt consumption per capita develop?

World per capita salt consumption 1970 – 2020:

	1970	1980	1990
Consumption (g/person/day)	109	106	96

	2000	2010	2020e
Consumption (g/person/day)	97	111	118

Sources: USGS (Ref. 1), UN DESA Population Division (Ref. 2)

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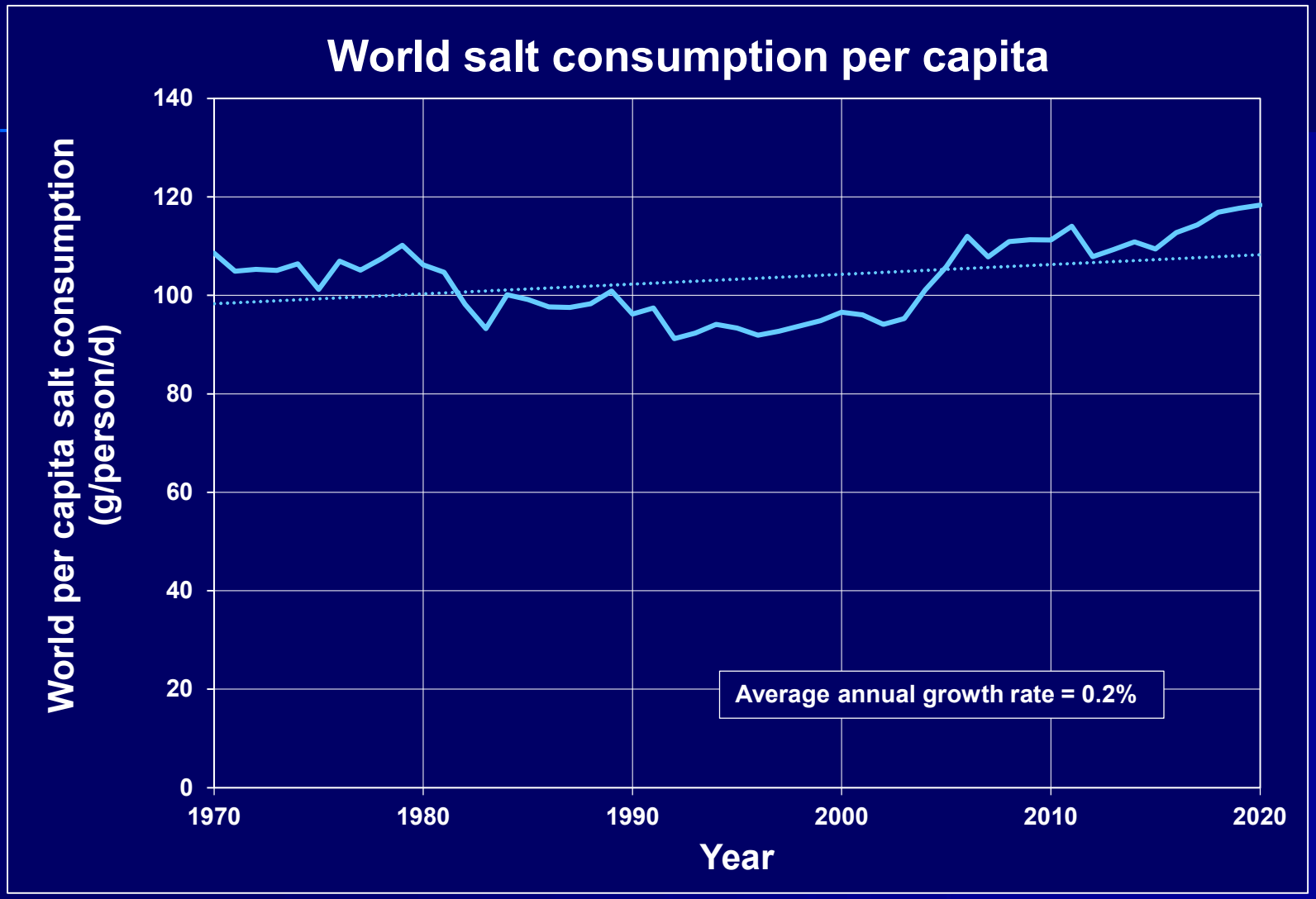

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Driving force behind salt production growth

Between 1970 – 2020 the salt consumption per capita

- **Fluctuated between 90 and 120 g/person/day;**
- **Grew by 0.2% per annum – was almost constant;**
- **Generaly, physiological salt intake is 5 g/person/day;**
- **95% was consumed for chloralkali and other purposes.**

Conclusion: Driving force behind the salt production growth is the population growth.

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What will be the salt requirement in 2029?

Provided that

- **Population growth rate will not change significantly;**
- **Chlorine consumption per ton of PVC will not change;**
- **Caustic consumption per ton of aluminium will not change;**
- **Soda ash consumption per ton of glass will not change,**

the salt requirement in 2029 will be 400’000’000 tpa, 82’000’000 tons more than today, which will need to be produced.

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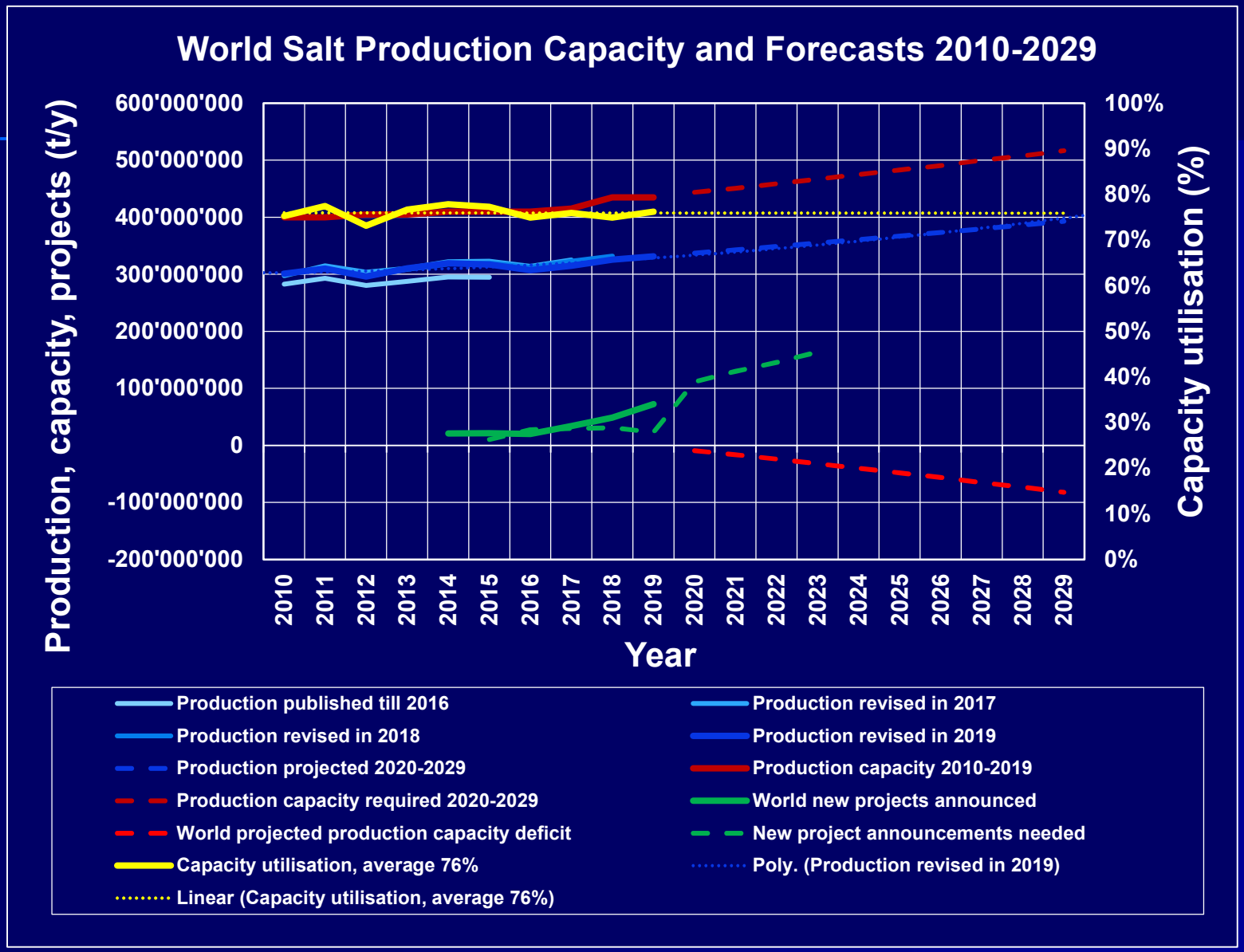

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What new salt projects have been announced?

New salt projects announced 2014 – 2019

	2014	2015	2016
Total announced (t/y)	20’000’000	22’000’000	20’000’000

	2017	2018	2019
Total announced (t/y)	34’000’000	48’000’000	72’000’000

Sources: Roskill, Salt Partners, private communication

Announced salt projects are shown as full green line on the forecast chart.

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What must be done to satisfy the growing demand?

Assuming that

- **Salt production capacity utilisation rate is 76%;**
- **Salt projects take 6 years from announcement to production;**
- **50% of announced projects will be actually implemented,**

significantly more additional salt projects will have to be initiated than has been announced to date.

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How much more salt production capacity is needed?

In addition to the projects announced up to 2019, the following new projects need to be initiated to satisfy future demand:

	2015	2016	2017
Additions needed (t/y)	10’000’000	28’000’000	30’000’000

	2018	2019	2020
Additions needed (t/y)	32’000’000	24’000’000	112’000’000

	2021	2022	2023
Additions needed (t/y)	130’000’000	146’000’000	164’000’000

Required additional projects are shown as dotted green line on the forecast chart.

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How will salt prices develop?

Our view is that

- **Insufficient salt production capacity leads to salt shortage;**
- **Shortage increases profitability of salt production;**
- **Higher profitability attracts investments;**
- **New capacities facilitate higher production.**

Present forecasts predict that only minimum salt price changes will occur, just in line with inflation.

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What are the salt prices today?

Prices are the best guarded secrets. However:

- **Salt in solution mined brine is least expensive at USD 6/t;**
- **Rock salt cost USD 10-15/t at mine, FOT (free on truck);**
- **High quality solar salt from Australia cost USD 18-25/t FOB;**
- **Vacuum salt in bulk prices are between USD 60-90/t FOT;**
- **Dry packaged salt is much more expensive;**
- **Suprapure®, >99.999 NaCl cost almost USD 1'000/kg**

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How to increase salt production capacity?

There are three basic options:

- **Build a new grass roots plant. Most expensive. See Ref. 3;**
- **Expand existing capacity. Brown roots is less expensive;**
- **Increase productivity. Least expensive and most effective.**

HYDROSAL-XP® technology can increase productivity by 14-17% and improve quality.

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100 t/h industrial HYDROSAL-F rock salt upgrading plant in Spain

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40 t/h THERMOSAL recrystallised rock salt upgrading plant in Portugal producing purest industrial salt in Europe

		Performance test
Ca	ppm	0.6
Mg	ppm	0.2
SO4	ppm	53

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References

Ref. 1: US Geological Survey:
https://minerals.usgs.gov/minerals/pubs/commodity/salt/;

Ref. 2: World population:
https://esa.un.org/unpd/wpp/

Ref. 3: Mardie salt and potash project:
http://clients3.weblink.com.au/pdf/BCI/02250069.pdf.

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How to secure salt availability and cost?

Follow Ernst Solvay's advice, valid since 1863!

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Ernst Solvay's Scientific Council

Metropole, Brussels, 1911: Planck, Solvay, Lorentz, Poincare, de Broglie, Currie, Rutherford, Einstein, Langevin, & Co.

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What was Ernst Solvay's advice?

Secure your raw material supplies and control your costs!

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Why not turn your salt into gold?

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