ASX Announcement

5 February 2024

HydroMOR Patent Granted – Canada

Highlights:

- **HydroMOR Innovation:**
  - HydroMOR (Hydrogen-based Metal Oxide Reduction) is an innovative hydrogen-based iron-making process that can reduce CO_2 emissions by ~30%.
  - Utilises abundant and cost-effective lignite, replacing high-cost coking coal or natural gas.
  - Utilises lower-cost iron ore fines, replacing high-cost premium iron ore.
- **Global Patent Achievements:** Canadian patent secured, patents already granted in Australia, the EU, and Russia
- **Decarbonisation Option:** HydroMOR, scalable, cost-effective decarbonisation solution for the steelmaking industry.

Environmental Clean Technologies Limited (ASX: **ECT**) ("**ECT**" or "**Company**") is pleased to report the patent for its HydroMOR process has been granted in Canada, adding to existing patents in Australia[i], the EU, Hong Kong[ii] and Russia[iii].

HydroMOR Process Overview

The HydroMOR process offers a low-carbon alternative to traditional, CO_2-intensive blast furnace steelmaking. By utilising cost-effective lignite instead of the expensive, high CO_2-emitting coking coal, HydroMOR employs a distinctive hydrogen-based chemical reaction via a proprietary furnace design. This results in a more cost-effective production method, contributing to a metal production process with approximately 30% lower emissions.


Brevet canadien / Canadian Patent

3,043,483
Numéro de brevet
Patent number

REDUCTION DIRECTE A BASSE TEMPERATURE D'OXYDES METALLIQUES PAR PRODUCTION IN SITU DE GAZ REDUCTEUR

LOW TEMPERATURE DIRECT REDUCTION OF METAL OXIDES VIA THE IN SITU PRODUCTION OF REDUCING GAS

ENVIRONMENTAL CLEAN TECHNOLOGIES LIMITED

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2023-11-28

2017-11-22

2018-05-31

Le commissaire aux brevets a accordé un brevet pour l'invention décrite dans le mémoire descriptif portant le numéro de brevet susmentionné. Le mémoire descriptif est accessible dans la Base de données sur les brevets canadiens sur le site Web de l'Office de la propriété intellectuelle du Canada.

The Commissioner of Patents has granted a patent for the invention described in the specification under the above-noted patent number. The specification is accessible in the Canadian Patents Database on the website of the Canadian Intellectual Property Office.

Commissaire aux brevets
Commissioner of Patents

PATENT OFFICE · BUREAU DES BREVETS · CANADA

Canada

Threefold Benefits of the HydroMOR Process

Economic Benefits[iv]:

- Lower capital cost: save 30% - 40%
- Lower operating cost: save 10% - 15%
- Lower raw material cost: save up to 70%

Environmental Benefits:

- Reduced emissions by ~30%
- Utilisation of low-grade waste resources, reducing tailings and fines

Energy & Resource Benefits:

- Lower temperature, reducing energy required by up to 60%
- Utilises alternative, low-cost resources, diversifying raw material options and monetising waste

Background: Battling Steelmaking Emissions with a New Approach

The steel industry contributes approximately 8% of global CO_2 emissions.

The conventional carbon-based process creates high CO_2 emissions, which are difficult and costly to abate. HydroMOR, with its unique method for hydrogen-based reduction of iron ore, offers a scalable and cost-effective solution.

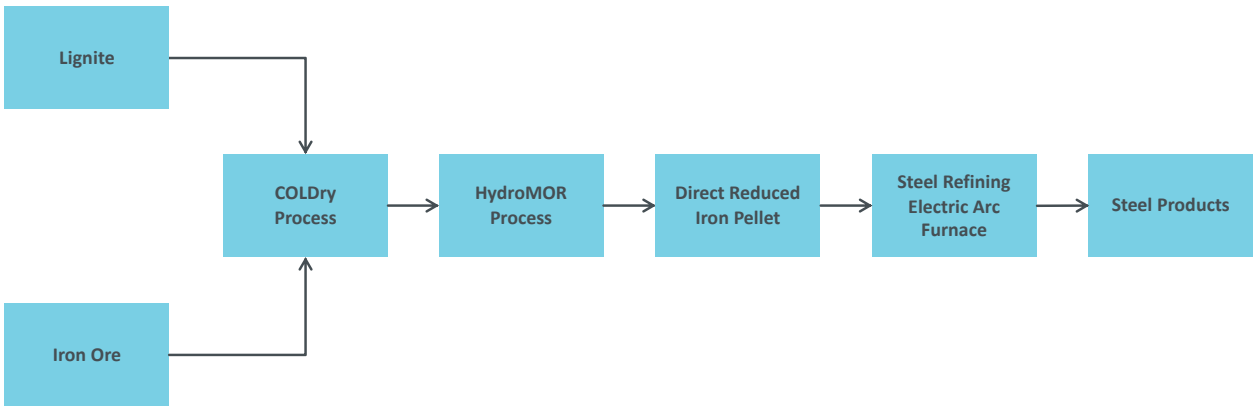
Transitioning from Carbon to Hydrogen Chemistry in Steel Production

Using hydrogen for iron ore reduction isn't novel; however, there has been resistance to adopting this process due to the relative cost advantage of coal over hydrogen, the absence of carbon emission regulations and controls and the cost of the infrastructure upgrades required to facilitate hydrogen-based direct-reduced iron (DRI).

"Green" steel, produced with "green" hydrogen from wind and solar power, aiming to decarbonise the industry, remains energy-intensive and cost-prohibitive.

HydroMOR provides a solution that competes with blast furnaces in terms of cost and achieves approximately 30% lower CO_2 intensity.

The HydroMOR Process



Unique Economic Advantages of HydroMOR

1. **Alternative Raw Material Opportunity:**
   - Utilisation of low-cost, abundant lignite instead of expensive coking coal or natural gas
   - Efficient utilisation of iron ore fines, slimes, and industrial wastes.
2. **Lower Plant Cost:**
   - Up to 40% less capital-intensive than equivalent blast furnaces or coal-based DRI plants.
   - Reduced land area requirements, low maintenance, and low water consumption.

Next Steps for HydroMOR

ECT is presently in early discussions with partners of projects that are considering utilising HydroMOR for DRI.

Patent Status

The table below outlines the status of the various international patent applications for HydroMOR.

International Patent Application Status - HydroMOR

Case Ref.	Country	Case Status
35519103	India	Response to Exam Report Filed
35526602	Australia	Granted
35526603	Canada	Granted
35526604	China	Response to Exam Report Filed
35526605	European Patent Office	Granted
35526606	Russian Federation	Granted
35526607	United States of America	Application Published
35527133	Indonesia	Response to Exam Report Filed
35540529	Hong Kong	Granted

This announcement is authorised for release to the ASX by the Board.

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[i] See ASX announcement 31 January 2023
[ii] See ASX announcement 26 April 2023
[iii] See ASX announcement 29 April 2022
[iv] Based on internal technoeconomic analysis