

**Dissertation Release**

**11.11.2021**

## **Competitive steam locomotive is not a mere utopia**

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| <b>Title of the dissertation</b>                | UTOPIA OR OPPORTUNITY?<br>Predicted performance of 21 <sup>st</sup> Century Steam Locomotives  |
| <b>Contents of the dissertation</b>             | The aim of the study has been configuring a biofuel burning steam locomotive with energy efficiency and operating properties comparable with those of diesel-electric locomotives. A piston steam engine has been considered as the prime mover. A virtual pattern locomotive has been designed, assessing of its properties being based on calculational methods. The superstructure of the locomotive deviates from the traditional one and includes several innovations. These are based on proven technology at least on the component level. Pyrolysis oil made of forest residue has been selected for fuel as the carbon dioxide released in its combustion will return to the natural circulation. The results of the study predict a maximum efficiency of up to 35 %, <i>i.e.</i> , the level of diesel-electric locomotives, in assignments involving frequent braking and acceleration. Shunting duties on track yards are an example of such assignments. |
| <b>Field of the dissertation, key words</b>     | Energy Technology<br>piston steam engine, locomotive, biofuels, efficiency, electric transmission, regenerative braking  |
| <b>Doctoral candidate</b>                       | Iiro Hirvensalo, M.Sc. (Tech.), born 4 <sup>th</sup> June 1942 in Rauma, Finland   |
| <b>Time of the defence</b>                      | 10 <sup>th</sup> December 2021 at 12:00 hours  |
| <b>Place of the defence</b>                     | Aalto University School of Engineering, Department of Mechanical Engineering, Otakaari 4, 02150 Espoo, Finland, Auditorium K216  |
| <b>Opponents</b>                                | Professor Esa Vakkilainen, University of Lappeenranta, Finland<br>Assistant Professor Tatiana Minav, University of Tampere, Finland  |
| <b>Supervisor</b>                               | Professor Martti Larmi, School of Engineering, Aalto University, Finland   |
| <b>Electronic dissertation</b>                  | <a href="https://aaltodoc.aalto.fi/handle/123456789/49">https://aaltodoc.aalto.fi/handle/123456789/49</a>  |
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