Aanmeldingen EWF prijs 2021

Sake Teelings (supervisor Ron van der Plas / Halmos)

Comparison of the annual energy use of the Earth Wind and Fire system and a conventional system for heating ventilation and air conditioning integrated in the MFO-2 building (Rotterdam)
Internship report 1-2-2020 - master Energy Science Universiteit Utrecht

Femke de Gooijer - Quantification of the purifying effect of the Climate Cascade on ventilated air

Universiteit Twente / Master Werktuigbouwkunde / stage Halmos zomer 2019

Yamini Patidar – Housing refurbishment using the Eart, Wind & Fire system

Graduation report, Delft UT Faculty of Architecture 2021

Shriya Balakrishnan, Refurbishment of office buildings using EWF

Graduation report, Delft UT Faculty of Architecture 2021

Puji Nata Djaja: Naturally Tokyo P5rev
A case study of Dutch Eart, Wind and Fire system integration in an office building in Tokyo

Graduation report, Delft UT Faculty of Architecture and the 2021

Cynthia van der Pasch en Gianni Nieland: De Meelfabriek

Bij de planontwikkeling voor de transformatie van “Het Meelpakhuis” in Leiden tot een wellness-, sport- en recreatiecentrum zijn de mogelijkheden voor toepassing van het EWF concept onderzocht.
Afstudeer rapport HBO Bouwkunde, Hogeschool Windesheim, Zwolle 2021

Daan Bruggink: basisschool De Verwondering (opening 8 april 2021)
“Natuurlijk waar het kan, technisch waar het moet!”
Klimaatluiken in de gevel - dakventilatie in de centrale ruimte - groene binnenwanden reinigen en bevochtigen op een natuurlijke wijze de binnenlucht - openluchtlokaal.

Zie op de bladzijden hierna de samenvattingen van de rapporten.

Kees van der Linden
V4_210924

ABSTRACTS

Sake Teelings – MFO-2 building

To improve the energy performance of buildings, it is important to decrease the energy demand of heating, ventilation and air conditioning (HVAC) systems. This research aims to assess the potential of the Earth Wind & Fire (EWF) concept in contributing to this by determining the annual energy demand of the EWF system when implemented in the MFO-2 building in Rotterdam and compare this to a conventional system with an air handling unit. Thermal energy for both systems is delivered by a thermal energy storage combined with a heat pump.
Qualitative data is collected from literature to analyze all flows of energy in the EWF system and conventional system. Quantitative data on hourly weather during the year and data specific for the location and characteristics of the building is collected and prepared. For both systems a Python model is constructed to determine the hourly energy demand of the different components of the systems. All hourly data is accumulated per component and the coefficients of performance of the heat pump and thermal energy storage are used to determine the electric energy demand for delivering the thermal energy in the heat exchangers.
The annual electric energy demand of the EWF system combined with a thermal energy storage and heat pump in the MFO-2 building is 86.98 MWh. The annual electric energy demand of the These results show that the EWF system demands 44% less energy over the year compared to the conventional system when combined with a thermal energy storage and heat pump is 154.90 MWh. conventional system. Although further research is needed and results are not generalizable due to the specificity of the building, the EWF concept for HVAC shows potential in terms of improving the energy performance of buildings.

Hoofdrapport 54 blz. / bijlagen: Handleiding Python en EWF model en DataRotterdamRA2018EN
Stage bij Halmos

Femke de Gooijer: Quantification of the purifying effect of the Climate Cascade on ventilated air

The Earth Wind and Fire (EWF) concept is a promising ventilation concept that is able to ventilate buildings in a natural way. By doing so, no mechanical ventilation installations are needed, and therefore contaminating air filters are absent. The EWF concept consists of a so called Climate Cascade in which droplets fall down to heat or cool, dry or humidify incoming air and create pressure drag such that an air flow through the building is created. It is stated that this Climate Cascade has a purifying effect on the ventilated air. This statement is being quantified by comparing the Cascade with natural rain to apply the well-studied phenomena called bellow-cloud scavenging. Using the mathematical model presented by Bronsema and findings in literature, relations to determine the purification efficiency of the Climate Cascade are found. To discuss the results of the found purification, it is defined what is considered as clean air. The findings are applied to a specific case, project RS, at which the current quality of air is considered as moderate. The Climate Cascade does affect the concentrations of atmospheric pollutants in a positive way, although this improvement is not significant enough to conclude that the quality of indoor air is improved compared to the outdoor air quality at location RS.

Artikel 9 blz. / October 2019 / Stage bij ABT

Yamini Patidar – Housing refurbishment using the Eart, Wind & Fire system

In the Netherlands, the residential buildings consume the highest percentage of primary energy among the various building sectors. With around 80% of the Dutch housing built before 1995 a huge portion of the energy share is tapped in the old housing stock. While new housing constructions had to be nearly energy neutral as of 2020, a large portion of the existing housing stock has a higher relative energy consumption. The old housing stock thus needs urgent energy-retrofitting that is instrumental in reaching the goals targeted by the Dutch government by 2050. The Earth, Wind & Fire (EWF) system developed by Dr. Ben Bronsema (2013) during his PhD research can play an effective role in this aspect. Therefore, the research focussed on investigating the applicability of the Earth, Wind & Fire system for the Housing buildings in terms of energy-efficiency and thermal comfort potential. A case study building is selected to carry out the said investigation. Several design strategies were incorporated for the case study building to design the EWF system with highest technical performance. The study also incorporated dynamic simulations to evaluate the energy performance of the building after installing the EWF system. The study concluded that the integration of the Earth, Wind & Fire system has a great potential to reduce the energy consumption of the apartment buildings and improve the indoor comfort of the building and thus is a highly effective energy-retrofitting system for the housing buildings. The efficiency of the EWF system in improving the performance of the apartment buildings is thus highlighted. The effectives of the EWF system in reducing the energy consumption is dependent on the existing façade of the apartments and thus it is essential to refurbish the poor-performing façade to maximise the benefit. Thus, the study also concluded that apart from the installation of the EWF system several more improvements are needed in the existing buildings to achieve the goal of a nearly energy-neutral design.

Graduation report, Delft UT 2021, 155 blz. Supervision Regina Bokel et al.

Shriya Balakrishnan – Refurbishment of office buildings using EWF

The built environment is the largest energy consumer in the European Union in which the non-domestic sector accounts for 13% of the total energy consumption and the office buildings account for 50% of the energy consumption. The office buildings in the Netherlands exhibit poor energy performance and thermal comfort. There is an urgent need to rectify this problem by renovation or refurbishment by utilizing renewable sources of energy. Therefore, this research focuses on improving the energy consumption of an office building in the Netherlands by implementing the Earth, Wind and Fire system which utilizes the environmental energy of earth mass, wind and sun to generate and supply energy throughout the building by eliminating the use of HVAC systems. The research adopted basic and dynamic simulation models to evaluate the energy performance of the building with EWF system and ATG method to evaluate the Thermal comfort. The research concluded that the EWF system is an efficient way to reduce the energy performance of the Provinciehuis Utrecht building and by refurbishing the façade and adding PV panels, the energy consumption of the building can reduce further.

Graduation report, Delft UT 2021, 118 blz. Supervision Regina Bokel et al.

Puji Nata Djaja – Naturally Tokyo P5rev
A case study of Dutch Eart, Wind and Fire system integration in an office building in Tokyo.

Earth, Wind, and Fire (EWF) is a natural ventilation system developed by Dr Ben Bronsema for office buildings in the Western European climate. Powered by nature: ground temperature & gravity for cooling, wind for energy generation & ventilation, and sun for the heat and natural draft, this system claims not only to use little energy but also naturally purifies while humidify/dehumidify the air. No study has been done to see the performance of the system in a warmer climate, such as Tokyo. This thesis intends to answer that question.
The dynamic duo of EWF: air supply system called Climate Cascade (CC) and air exhaust system called Solar Chimney (SC) are sized and calculated using 2 separate Excel models, from which the key parameters are identified, and design choices can be made. It was clear that as Tokyo's temperature is warmer than Amsterdam's, the focus needs to be given to cooling rather than heating. The challenge: space is limited in Tokyo hence the proposal of making SC a plug & play unitized system.
Armed with a case study integrating EWF into a relatively new 10-story medium-sized office building in Tokyo, the study explored and compared 4 different systems: the existing energy-conscious VRF system, conventional VAV system, EWF with a chilled ceiling, and EWF through chilled beams.
In conclusion, EWF can contribute to energy reduction (40%) without compromising thermal comfort in comparison to the conventional VAV. Regarding VRF, further research needs to be done to properly simulate EWF with HR in the dynamic simulation software used. Moreover, EWF contributed to ventilation energy reduction in all cases evaluated, as well as improving thermal comfort.

Graduation report, Delft UT 2021, 134 blz. Supervision Regina Bokel et al.

Cynthia van der Pasch en Gianni Nieland: De Meelfabriek

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Daan Bruggink: basisschool De Verwondering

De daken worden voorzien van een energiedak. De warmte wordt gebufferd in een innovatief ijsbuffersysteem. Deze zit in een groot vat in de grond en maakt gebruik van de fase-overgang tussen water en ijs om de schommelingen in natuurlijke energie tussen de warme en koude seizoenen te bufferen.
Verder wordt de energievraag beperkt door een daglichtgestuurd verlichtingsysteem dat de intensiteit (en dus de energiebehoefte) bijschakelt aan de hand van de hoeveelheid daglicht.
Hemelwater dat op de gebouwen landt loopt deels via spuwers en bassins over het schoolplein, maar wordt ook deels gebruikt voor toiletspoeling via een grijswatersysteem.
Een low tech natuurlijk ventilatie systeem zal voor frisse lucht gaan zorgen in het gebouw. In de lokalen komen grote klimaatluiken, dat zijn geïsoleerde luiken die dag en nacht open kunnen staan.
Het dak van de centrale ruimte wordt voorzien van natuurlijk afzuiging voor de gebruikte lucht, waardoor de hele school geventileerd wordt. Overdag, maar ook zeker (zomer-)nachtventilatie.
Zo kunnen de leraren en leerlingen iedere ochtend weer plaatsnemen in frisse lokalen. Ook overdag kan er gebruik gemaakt worden van de klimaatluiken wat met name in de schouderseizoenen veel natuurlijke ventilatie geeft.

Beschrijving met tekeningen in 4 documenten + begeleidend stukje