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Provisional Application for Patent Cover Sheet
 This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c)

Inventor(s)

Inventor 1

Given Name	Middle Name	Family Name	City	State	Country j
Richard		Christie	Sugar Land	TX	US

Inventor 2

Given Name	Middle Name	Family Name	City	State	Country j
Florence		Binet	Sugar Land	TX	US

All Inventors Must Be Listed – Additional Inventor Information blocks may be generated within this form by selecting the **Add** button.

Title of Invention Coordinated Pumping Operations

Attorney Docket Number (if applicable) IS19.0176-US-PSP

Correspondence Address

Direct all correspondence to (select one):

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The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

- No.
- Yes, the invention was made by an agency of the United States Government. The U.S. Government agency name is:
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Entity Status

Applicant asserts small entity status under 37 CFR 1.27 or applicant certifies micro entity status under 37 CFR 1.29

- Applicant asserts small entity status under 37 CFR 1.27
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Signature	Cathy Hewitt/		Date (YYYY-MM-DD)	2019-07-24
First Name	Cathy	Last Name	Hewitt	Registration Number (If appropriate)
				62001

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Coordinated Pumping Operations

Background of the Disclosure

[0001] A wellbore stimulation job utilizes several well service systems at a wellsite. A stimulation job for a horizontal wellbore may include dividing the wellbore into numerous individual operations or stages. For example, a wellbore stimulation job may be divided into sixty or more individual stimulation operations or stages. The process utilizes individual pumping and wireline operations (*e.g.*, pump-down and perforating operations) between each stimulation stage (*e.g.*, hydraulic fracturing) to isolate the wellbore and perforate a casing. Such pumping and wireline operations are also coordinated with wellhead fluid control valves associated with the wellbore.

[0002] The above-described operations and systems utilize different well services that are executed independently, each focusing on different objectives without knowledge or consideration of status of other well services. For example, each well service is conducted by corresponding equipment that is manually coordinated by different companies and/or crews, with little to no automation or communication between the well services. Coordination across these well services may include implementing check lists, manual hands-signals, and voice communication via radios in order to execute each consecutive well service. A completion job becomes even more challenging as multi-well pads are constructed to permit multiple wellbores to be stimulated in parallel with the same suite of well servicing equipment. Lack of coordination and communication between the well services results in inefficiencies, resulting in just 12-16 hours of active pumping per day.

Summary of the Disclosure

[0003] This summary is provided to introduce a selection of concepts that are further described below in the detailed description. This summary is not intended to identify indispensable features of the claimed subject matter, nor is it intended for use as an aid in limiting the scope of the claimed subject matter.

[0004] The present disclosure introduces an apparatus including a treatment fluid system, a pump-down system, a fluid valve system, and a controller. The treatment fluid system is operable to pump a treatment fluid into a wellbore extending into a subterranean formation from a surface of an oil/gas wellsite. The pump-down system is operable to pump a pump-down fluid into the wellbore to convey a perforating tool within the wellbore. The fluid valve system is operable to selectively fluidly connect and disconnect the treatment fluid

system and pump-down system with and from the wellbore. The controller includes a processor and a memory storing a computer program code, and is communicatively connected with the treatment fluid system, the pump-down system, and the fluid valve system. The controller is operable to monitor operational status of the treatment fluid system, the pump-down system, and the fluid valve system. The controller is also operable to control operations of the treatment fluid system, the pump-down system, and the fluid valve system based on the operational status of the treatment fluid system, the pump-down system, and the fluid valve system.

[0005] The present disclosure also introduces an apparatus including a treatment fluid system, a pump-down system, a fluid valve system, and a controller comprising a processor and a memory storing a computer program code. The treatment fluid system is operable to perform well treatment operations by pumping a treatment fluid into a wellbore extending into a subterranean formation from a surface of an oil and gas wellsite. The pump-down system is operable to perform pump-down operations by pumping a pump-down fluid into the wellbore to convey a perforating tool within the wellbore. The fluid valve system is operable to fluidly connect the treatment fluid system with the wellbore during the well treatment operations and the pump-down system with the wellbore during the pump-down operations. The controller is communicatively connected with the treatment fluid system, the pump-down system, and the fluid valve system. The controller is operable to, after the well treatment fluid is pumped into the wellbore, operate the fluid valve system to fluidly disconnect the treatment fluid system from the wellbore, operate the fluid valve system to fluidly connect the pump-down system with the wellbore, and perform the pump-down operations by operating the pump-down system to pump the pump-down fluid into the wellbore to convey the perforating tool within the wellbore. The controller is also operable to, after the pump-down fluid is pumped into the wellbore and the perforating tool is retrieved from the wellbore, operate the fluid valve system to fluidly disconnect the pump-down system from the wellbore, operate the fluid valve system to fluidly connect the treatment fluid system with the wellbore, and perform the well treatment operations by operating the treatment fluid system to pump the treatment fluid into the wellbore.

[0006] The present disclosure also introduces an apparatus including a treatment fluid system, a pump-down system, a fluid valve system, and a controller comprising a processor and a memory storing a computer program code. The treatment fluid system is operable to perform well treatment operations by pumping a treatment fluid into a first wellbore or a second wellbore extending into a subterranean formation from a surface of an oil and gas

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