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Spike

EM-Scenarios

Functional Design Specification for Manufacturing Control
System

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1. EM-Scenarios

1.1. Unit

Unit Name	Diagram	Process Cell
Bio101	SmallFermenter	fermentation

1.2. Control Modules

Name
Ag-Bio101-1
FV-Bio101-052
FV-Bio101-054
FV-Bio101-049
FV-Bio101-144
FV-Bio101-142
FV-Bio101-042
FV-Bio101-045
FV-Bio101-030
FV-Bio101-034

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Name		
PT-Bio101-1		
LT-Bio101-1		

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1.3. Commands

1.3.1.1. Isolate

```
#####
# S88 EM1: EM-Scenarios
# Command: Isolate
#####

def main():
    """Main Function"""

    # Command code...
    opc('FV-Bio101-052').CmdClose()
    opc('FV-Bio101-054').CmdClose()
    opc('FV-Bio101-049').CmdClose()
    opc('FV-Bio101-144').CmdClose()
    opc('FV-Bio101-142').CmdClose()
    opc('FV-Bio101-045').CmdClose()
    opc('FV-Bio101-042').CmdClose()
    opc('FV-Bio101-030').CmdClose()
    opc('FV-Bio101-034').CmdClose()
```

1.3.1.2. fill

```
#####
# S88 EM1: EM-Scenarios
# Command: fill
#####

def main():
    """Main Function"""

    # Command code...
    opc('FV-Bio101-034').CmdOpen();
    opc('FV-Bio101-030').CmdOpen();
    opc('FV-Bio101-042').CmdOpen();
    opc('FV-Bio101-045').CmdOpen();
    opc('FV-Bio101-054').CmdOpen();
```

1.3.1.3. RndOverPr

```
#####
# S88 EM1: EM-Scenarios
# Command: RndOverPr
#####

def main():
    """Main Function"""

    # anything over 3 causes alarm
    myrandomoverpressure = randDouble(2.5, 4.5)
```

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```
opc('PT-Bio101-1').IsInSimulate = True

opc('PT-Bio101-1').Simulate(myrandomoverpressure)
```

1.3.1.4. RndOverFil

```
#####
# S88 EM1: EM-Scenarios
# Command: RndOverFil
#####

def main():
    """Main Function"""

    # random tank level. anything over 90 causes alarm..

    myrndlevel = randDouble(60, 99)

    opc('LT-Bio101-1').IsInSimulate = True

    opc('LT-Bio101-1').Simulate(myrndlevel)
```

1.3.1.5. RndVlvFail

```
#####
# S88 EM1: EM-Scenarios
# Command: RndVlvFail
#####

def main():
    """Main Function"""

    # pick a number between 1 and 9

    myrandomnumber = randInt(1, 9)

    info('random number is:' + str(myrandomnumber))

    if myrandomnumber == 1:
        opc('FV-Bio101-054').Alarms.FailToOpen = True
    if myrandomnumber == 2:
        opc('FV-Bio101-052').Alarms.FailToOpen = True
    if myrandomnumber == 3:
        opc('FV-Bio101-049').Alarms.FailToClose = True
    if myrandomnumber == 4:
        opc('FV-Bio101-144').Alarms.FailToClose = True
    if myrandomnumber == 5:
        opc('FV-Bio101-142').Alarms.FailToClose = True
    if myrandomnumber == 6:
        opc('FV-Bio101-042').Alarms.FailToClose = True
    if myrandomnumber == 7:
        opc('FV-Bio101-045').Alarms.FailToClose = True
```

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```

if myrandomnumber == 8:
    opc('FV-Bio101-030').Alarms.FailToClose = True
if myrandomnumber == 9:
    opc('FV-Bio101-034').Alarms.FailToClose = True

```

1.3.1.6. ResetVlves

```

#####
# S88 EM1: EM-Scenarios
# Command: ResetVlves
#####

def main():
    """Main Function"""
    #
    opc('FV-Bio101-054').Alarms.FailToOpen = False
    opc('FV-Bio101-052').Alarms.FailToOpen = False
    opc('FV-Bio101-049').Alarms.FailToClose = False
    opc('FV-Bio101-144').Alarms.FailToClose = False
    opc('FV-Bio101-142').Alarms.FailToClose = False
    opc('FV-Bio101-042').Alarms.FailToClose = False
    opc('FV-Bio101-045').Alarms.FailToClose = False
    opc('FV-Bio101-030').Alarms.FailToClose = False
    opc('FV-Bio101-034').Alarms.FailToClose = False

```

1.3.1.7. AllOn

```

#####
# S88 EM1: EM-Scenarios
# Command: AllOn
#####

def main():
    """Main Function"""

    # turn everything on...
    opc('FV-Bio101-052').CmdOpen();
    opc('FV-Bio101-054').CmdOpen();
    opc('FV-Bio101-049').CmdOpen();
    opc('FV-Bio101-144').CmdOpen();
    opc('FV-Bio101-142').CmdOpen();
    opc('FV-Bio101-045').CmdOpen();
    opc('FV-Bio101-042').CmdOpen();
    opc('FV-Bio101-030').CmdOpen();
    opc('FV-Bio101-034').CmdOpen();

```

1.3.1.8. RndIntLock

```

#####
# S88 EM1: EM-Scenarios
# Command: RndIntLock
#####

def main():
    """Main Function"""

```

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```

# pick a number between 1 and 5

myrandomnumber = randint(1, 5)

info('random number is:' + str(myrandomnumber))

# random interlock..
if myrandomnumber == 1:
    overfill = opc('FV-Bio101-034').GetInterlock('overfill');
    overfill.Fire();
#
if myrandomnumber == 2:
    overfill = opc('FV-Bio101-030').GetInterlock('overfill');
    overfill.Fire();
#
if myrandomnumber == 3:
    overfill = opc('FV-Bio101-042').GetInterlock('overfill');
    overfill.Fire();
#
if myrandomnumber == 4:
    overfill = opc('FV-Bio101-045').GetInterlock('overfill');
#
if myrandomnumber == 5:
    overfill = opc('FV-Bio101-045').GetInterlock('overfill');
    overfill.Fire();

```

1.3.1.9. IntLockRes

```

#####
# S88 EM1: EM-Scenarios
# Command: IntLockRes
#####

def main():
    """Main Function"""

    # reset...

    overfill = opc('FV-Bio101-034').GetInterlock('overfill');
    overfill.Reset()
    #
    overfill = opc('FV-Bio101-030').GetInterlock('overfill');
    overfill.Reset()
    #
    overfill = opc('FV-Bio101-042').GetInterlock('overfill');
    overfill.Reset()
    #
    overfill = opc('FV-Bio101-045').GetInterlock('overfill');
    overfill.Reset()
    #
    overfill = opc('FV-Bio101-045').GetInterlock('overfill');
    overfill.Reset()
    #
    overpressure = opc('FV-Bio101-142').GetInterlock('overpressure');
    overpressure.Reset();

```


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```

overpressure = opc('FV-Bio101-144').GetInterlock('overpressure');
overpressure.Reset();
overpressure = opc('FV-Bio101-049').GetInterlock('overpressure');
overpressure.Reset();

```

1.3.1.10. Agienable

```

#####
# S88 EM1: EM-Scenarios
# Command: Agienable
#####

def main():
    """Main Function"""

    # enable agi control

    em.UpdateParameter('agictrlenab', True)

```

1.3.1.11. Agidisable

```

#####
# S88 EM1: EM-Scenarios
# Command: Agidisable
#####

def main():
    """Main Function"""

    # disable agi control

    em.UpdateParameter('agictrlenab', False)

```

1.3.1.12. Sparge

```

#####
# S88 EM1: EM-Scenarios
# Command: Sparge
#####

def main():
    """Main Function"""

    # open sparge line...
    opc('FV-Bio101-049').CmdOpen();
    opc('FV-Bio101-144').CmdOpen();
    opc('FV-Bio101-142').CmdOpen();

```

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1.4. Continuous Function Block Code

```

#####
# CFB: EM-Scenarios/CFB
#####

def main():
    """Main Function"""

    # em parameters..

    myagicutoutsp = em.PullParameter('agicutoutsp')
    myagictrlenab = em.PullParameter('agictrlenab')

    # current agi level

    myagilevel = opc('LT-Bio101-1').Value

    #agi control

    if myagictrlenab.Value == True and myagilevel > myagicutoutsp.Value:
        opc('Ag-Bio101-1').CmdOn()

    if myagictrlenab.Value == True and myagilevel < myagicutoutsp.Value:
        opc('Ag-Bio101-1').CmdOff()

    if myagictrlenab.Value == False:
        opc('Ag-Bio101-1').CmdOff()

```

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1.5. Parameters

Name	Description	Units	Value
agicutoutsp		perC	20
agictrlenab		Null	True