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## СЦЕНАРИЙ 3: «ТЕХНОЛОГИЧЕСКИЙ РЫВОК 2026»

```
clear all; close all; clc;
```

### ПАРАМЕТРЫ

```
R = 10; k = 0.3; gamma0 = 0.02; gamma_new = 0.005;  
T = 120; dt = 0.05; t = 0:dt:T; N = length(t);  
t_rush = 60; rush_duration = 10; rush_cost = 0.3; rush_D_reduction = 0.7;
```

### РАСЧЕТ

```
V = zeros(N,1); D = zeros(N,1); gamma = gamma0 * ones(N,1);  
V(1) = 0.1; D(1) = 0;  
  
for i = 2:N  
    if abs(t(i) - t_rush) < dt/2  
        D(i) = D(i-1) * (1 - rush_D_reduction);  
        gamma(i) = gamma_new;  
        V(i) = V(i-1) * (1 - rush_cost);  
        continue;  
    end  
  
    is_rush = (t(i) >= t_rush && t(i) < t_rush + rush_duration);  
  
    if ~is_rush  
        gamma(i) = gamma(i-1);  
        dDdt = k * R - gamma(i) * D(i-1)^1.2;  
  
        if t(i) > t_rush + rush_duration  
            eff = 1.3 - 0.3 * (1 - 2./(1 + exp(2*0.03*D(i-1))));  
        else  
            eff = 1 - 0.3 * (1 - 2./(1 + exp(2*0.1*D(i-1))));  
        end  
        dVdt = R * eff;  
    else  
        % Rush period logic (already handled by the first if block)  
    end  
end
```

---

```

        dDdt = 0.05 * k * R;
        dVdt = 0.3 * R;
    end

    D(i) = D(i-1) + dt * dDdt;
    V(i) = V(i-1) + dt * dVdt;
end

```

## СГЛАЖИВАНИЕ ДАННЫХ (заменяем smooth)

```

window = 10;
eff_smooth = zeros(N,1);
for i = 1:N
    start_idx = max(1, i-floor(window/2));
    end_idx = min(N, i+floor(window/2));
    eff_smooth(i) = mean(V(start_idx:end_idx));
end
eff_smooth = eff_smooth / max(eff_smooth) * 0.8 + 0.2;

ratio = D ./ (V + 0.1);

```

## ВИЗУАЛИЗАЦИЯ

```

figure('Position', [100, 100, 1600, 900], 'Color', [0.05 0.05 0.08]);

% Основной 3D график
ax_main = subplot(2,3,[1 2 4 5]);
set(ax_main, 'Color', [0.08 0.08 0.12], 'GridColor', [0.3 0.3 0.4]);
hold on;

% Фоновая сетка
[Xg, Yg] = meshgrid(linspace(0,T,15), linspace(0,max(V),10));
Zg = zeros(size(Xg));
surf(Xg, Yg, Zg, 'FaceColor', [0.2 0.2 0.3], 'EdgeColor', [0.4 0.4 0.5],
'FaceAlpha', 0.1);

% 3D траектории
h_traj = plot3(t, V, D, 'w-', 'LineWidth', 4);
V_no_rush = R * t .* (1 - 0.3 * (1 - 2./(1 + exp(2*0.1*R*t*0.1))));
h_compare = plot3(t, V_no_rush, zeros(size(t)), 'g--', 'LineWidth', 2);

% Зона рывка
[x_rush, y_rush] = meshgrid([t_rush-2, t_rush+rush_duration+2], [0,
max(V)*1.1]);
z_rush = zeros(2);
surf(x_rush, y_rush, z_rush, 'FaceColor', [1 0.8 0], 'EdgeColor', 'none',
'FaceAlpha', 0.08);

% Линия рывка
plot3([t_rush t_rush], [0 max(V)*1.1], [0 0], 'y--', 'LineWidth', 3);

% Точка
h_point = plot3(t(1), V(1), D(1), 'o', 'MarkerSize', 25, ...

```

---

```

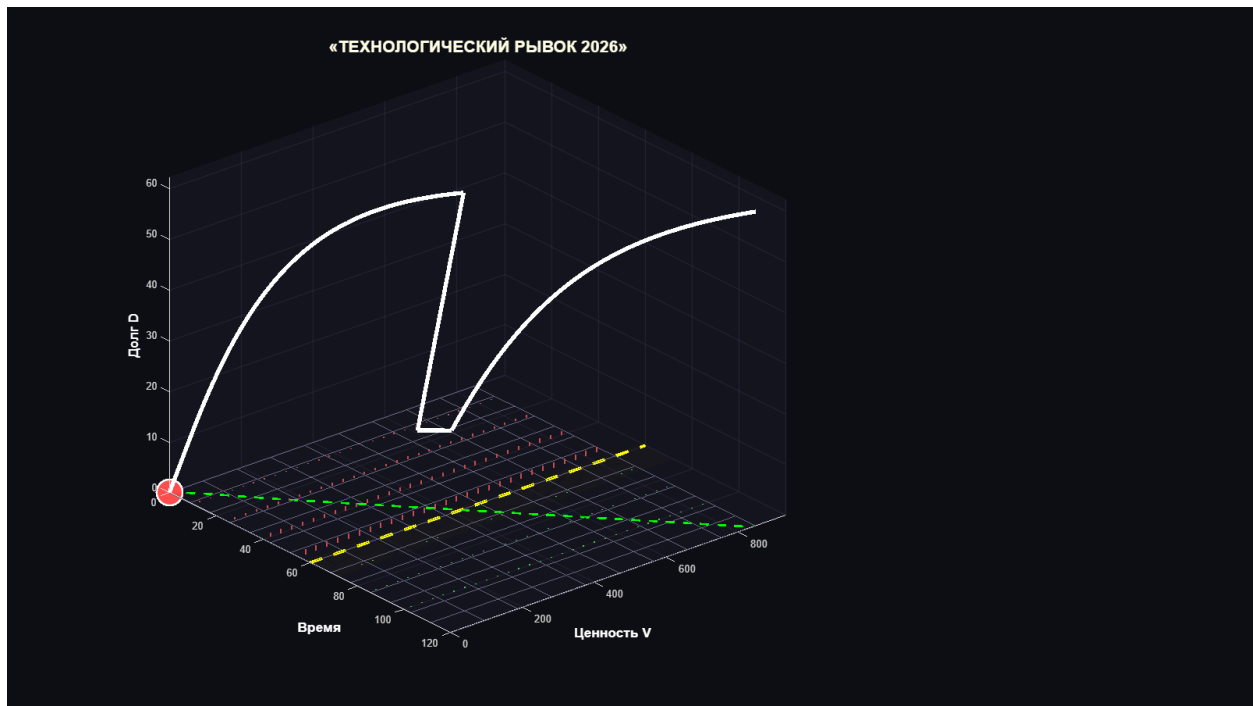
        'MarkerFaceColor', [1 0.3 0.3], 'MarkerEdgeColor', [1 1 1],
        'LineWidth', 2);

% Векторы на поверхности
[xv, yv] = meshgrid(10:15:T-10, 20:30:max(V)-10);
for xi = 1:size(xv,1)
    for yi = 1:size(xv,2)
        tx = xv(xi,yi); vy = yv(xi,yi);
        if tx < t_rush
            dz = 0.02 * tx;
            color = [0.8 0.3 0.3];
        else
            dz = 0.005 * (tx - t_rush);
            color = [0.3 0.8 0.3];
        end
        plot3([tx tx], [vy vy], [0 dz], 'Color', color, 'LineWidth', 1.5);
    end
end

% Настройка
view(50, 30); grid on; axis tight;
xlabel('Время', 'FontSize', 13, 'Color', 'w', 'FontWeight', 'bold');
ylabel('Ценность V', 'FontSize', 13, 'Color', 'w', 'FontWeight', 'bold');
zlabel('Долг D', 'FontSize', 13, 'Color', 'w', 'FontWeight', 'bold');
title('«ТЕХНОЛОГИЧЕСКИЙ РЫВОК 2026»', 'FontSize', 16, 'Color', [1 1 0.9],
'FontWeight', 'bold');

light('Position', [T, max(V), max(D)], 'Style', 'infinite');
lighting gouraud;

```



---

# ДОПОЛНИТЕЛЬНЫЕ ГРАФИКИ

## 1. График эффективности

```
ax1 = subplot(2,3,3);
set(ax1, 'Color', [0.08 0.08 0.12], 'XColor', 'w', 'YColor', 'w');

h_eff = plot(t, eff_smooth, 'c-', 'LineWidth', 2.5);
hold on;
plot([t_rush t_rush], [0 1.2], 'y--', 'LineWidth', 2);
plot([t_rush+rush_duration t_rush+rush_duration], [0 1.2], 'y--',
'LineWidth', 1);

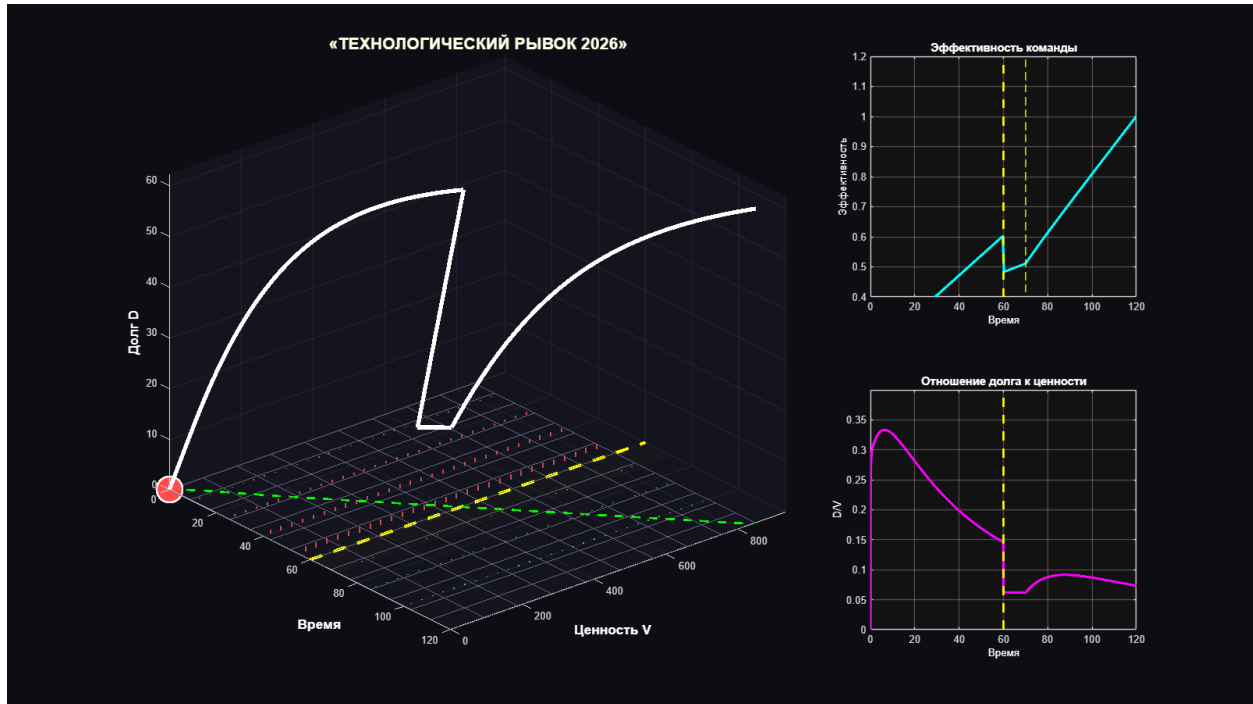
grid on; xlim([0 T]); ylim([0.4 1.2]);
xlabel('Время', 'FontSize', 10, 'Color', 'w');
ylabel('Эффективность', 'FontSize', 10, 'Color', 'w');
title('Эффективность команды', 'FontSize', 11, 'Color', 'w', 'FontWeight',
'bold');
```

## % 2. График отношения D/V

```
ax2 = subplot(2,3,6);
set(ax2, 'Color', [0.08 0.08 0.12], 'XColor', 'w', 'YColor', 'w');

h_ratio = plot(t, ratio, 'm-', 'LineWidth', 2.5);
hold on;
plot([t_rush t_rush], [0 max(ratio)*1.2], 'y--', 'LineWidth', 2);
plot([0 T], [0.5 0.5], 'r--', 'LineWidth', 1.5);

grid on; xlim([0 T]); ylim([0 max(ratio)*1.2]);
xlabel('Время', 'FontSize', 10, 'Color', 'w');
ylabel('D/V', 'FontSize', 10, 'Color', 'w');
title('Отношение долга к ценности', 'FontSize', 11, 'Color', 'w',
'FontWeight', 'bold');
```



## АНИМАЦИЯ

```
fprintf('Запуск анимации...\n');
pause(2);

% Точка окупаемости
payback_idx = [];
for i = 1:N
    if t(i) > t_rush + rush_duration && V(i) > V_no_rush(i)
        payback_idx = i;
        break;
    end
end

if ~isempty(payback_idx)
    payback_t = t(payback_idx);
    payback_V = V(payback_idx);
    payback_D = D(payback_idx);
end

skip = 4;
explosion_drawn = false;
rush_idx = find(t >= t_rush, 1);

for i = 1:skip:N
    % Обновление траектории
    set(h_traj, 'XData', t(1:i), 'YData', V(1:i), 'ZData', D(1:i));

    % Пульсация точки
    if t(i) < t_rush
```

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```

        pulse = 25 + 8*sin(i/10);
        color = [1 0.3 0.3];
elseif t(i) < t_rush + rush_duration
    pulse = 22 + 10*sin(i/6);
    color = [1 0.8 0];
else
    pulse = 28 + 5*sin(i/15);
    color = [0.3 0.8 0.3];
end

set(h_point, 'XData', t(i), 'YData', V(i), 'ZData', D(i), ...
    'MarkerSize', pulse, 'MarkerFaceColor', color);

% Эффект взрыва
if t(i) >= t_rush && ~explosion_drawn
    % Большой взрыв
    n_spheres = 20;
    for s = 1:n_spheres
        [xs, ys, zs] = sphere(6);
        scale = 1 + rand()*3;
        xs = xs * scale + t_rush + (rand()-0.5)*8;
        ys = ys * scale + V(rush_idx) + (rand()-0.5)*max(V)/10;
        zs = zs * scale + D(rush_idx)*(1-rush_D_reduction)/2;

        col = [1, 0.5+rand()*0.5, 0];

    end

    % Искры
    for spark = 1:50
        ang = rand()*2*pi;
        dist = rand()*5;
        x_spark = t_rush + cos(ang)*dist;
        y_spark = V(rush_idx) + sin(ang)*dist;
        z_spark = rand()*max(D)/2;
        plot3(ax_main, [t_rush x_spark], [V(rush_idx) y_spark], ...
            [D(rush_idx)*(1-rush_D_reduction) z_spark], ...
            'Color', [1 0.8 0], 'LineWidth', 1, 'LineStyle', '-');
    end

    % Текст взрыва
    text(ax_main, t_rush, max(V)*0.7, max(D)*0.8, 'ВЗРЫВ АРХИТЕКТУРЫ!',
    ...
        'FontSize', 18, 'Color', [1 0.8 0], 'FontWeight', 'bold', ...
        'HorizontalAlignment', 'center', 'Rotation', 15);

    explosion_drawn = true;
end

% Динамическая камера
if t(i) < t_rush
    view_az = 50 + 10*sin(i/80);
    view_el = 30 + 5*cos(i/60);

```

---

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```

elseif t(i) < t_rush + rush_duration
    shake = 5*sin(i/5);
    view_az = 50 + shake;
    view_el = 30 + shake*0.5;
else
    view_az = 50 + 8*sin(i/40);
    view_el = 30 + 3*cos(i/50);
end

if ~isempty(payback_idx) && i == payback_idx
    view_az = 70;
    view_el = 20;
    campos([payback_t*1.5, payback_V*0.7, max(D)*2]);
else
    view(view_az, view_el);
end

% Обновление графиков
set(h_eff, 'XData', t(1:i), 'YData', eff_smooth(1:i));
set(h_ratio, 'XData', t(1:i), 'YData', ratio(1:i));

% Эффект окупаемости
if ~isempty(payback_idx) && abs(t(i) - payback_t) < dt*2
    % Круг окупаемости
    theta = linspace(0, 2*pi, 50);
    r = 2;
    x_circle = payback_t + r*cos(theta);
    y_circle = payback_V + r*sin(theta)*max(V)/50;
    z_circle = payback_D + zeros(size(theta));

    plot3(ax_main, x_circle, y_circle, z_circle, ...
        'Color', [0 1 0.5], 'LineWidth', 3, 'LineStyle', '-');

    text(ax_main, payback_t, payback_V*1.15, payback_D, '✓ ОКУПАЕМОСТЬ',
        ...
        'FontSize', 14, 'Color', [0 1 0.5], 'FontWeight', 'bold');
end

% Эффект ускорения
if t(i) > t_rush + rush_duration && mod(i,20)==0
    dV = diff(V(max(1,i-10):i));
    if ~isempty(dV) && mean(dV) > R*1.1
        scatter3(ax_main, t(i), V(i), D(i), 50, ...
            'o', 'MarkerFaceColor', [0.3 0.8 1], ...
            'MarkerEdgeColor', 'none');
    end
end

drawnow;

% Скорость анимации
if t(i) < t_rush
    pause(0.025);
elseif t(i) < t_rush + rush_duration

```

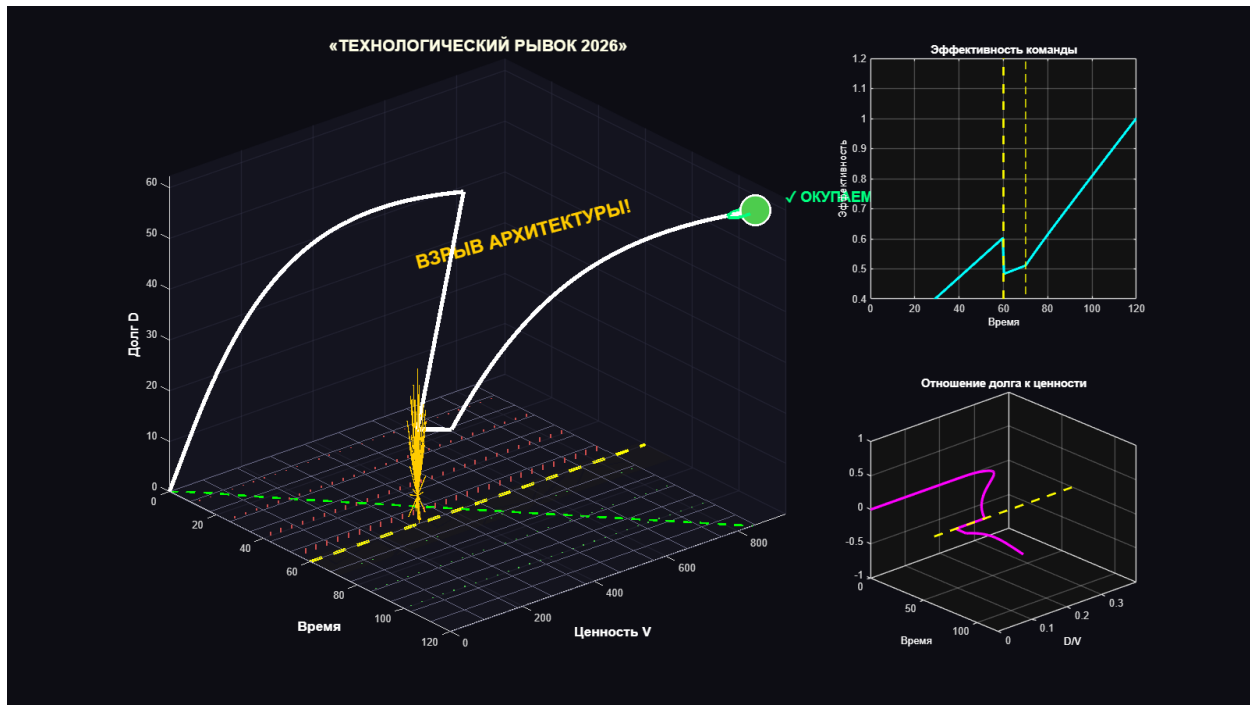
---

```

        pause(0.015);
    else
        pause(0.01);
    end
end

```

Запуск анимации...



## ФИНАЛЬНЫЙ КАДР

```
figure('Position', [200, 200, 1200, 500], 'Color', [0.05 0.05 0.08]);
```

```
% Сравнение
```

```
subplot(1,2,1);
```

```
hold on;
```

```
if ~isempty(payback_idx)
```

```
    idx_start = find(t >= t_rush, 1);
```

```
    idx_end = payback_idx;
```

```
    t_fill = t(idx_start:idx_end);
```

```
    V_fill = V(idx_start:idx_end);
```

```
    Vnr_fill = zeros(size(t_fill));
```

```
    for j = 1:length(t_fill)
```

```
        [~, closest_idx] = min(abs(t - t_fill(j)));
```

```
        Vnr_fill(j) = V_no_rush(closest_idx);
```

```
    end
```



---

```

end

plot(t, V, 'b-', 'LineWidth', 4);
plot(t, V_no_rush, 'g--', 'LineWidth', 2.5);
plot([t_rush t_rush], [0 max(V)*1.1], 'y--', 'LineWidth', 3);

if ~isempty(payback_idx)
    plot([payback_t payback_t], [0 max(V)*1.1], 'm-', 'LineWidth', 2.5);
    scatter(payback_t, payback_V, 120, 'mo', 'filled', 'LineWidth', 2);
    text(payback_t, payback_V*0.9, sprintf('t=%.0f', payback_t), ...
        'Color', 'm', 'FontSize', 11, 'FontWeight', 'bold');
end

scatter(t_rush, V(rush_idx), 100, 'yo', 'filled', 'LineWidth', 2);

grid on; xlabel('Время'); ylabel('Ценность');
title('Точка окупаемости технологического рывка', 'Color', 'w', 'FontSize',
13);
set(gca, 'Color', [0.1 0.1 0.15], 'XColor', 'w', 'YColor', 'w');

% 3D финальная траектория
subplot(1,2,2);
hold on;

% Голограмма
[Xh, Yh] = meshgrid(linspace(0,T,20), linspace(0,max(V),15));
Zh = zeros(size(Xh));
for xi = 1:size(Xh,1)
    for yi = 1:size(Xh,2)
        if Xh(xi,yi) < t_rush
            Zh(xi,yi) = 0.02 * Xh(xi,yi);
        else
            Zh(xi,yi) = 0.005 * (Xh(xi,yi) - t_rush);
        end
    end
end

surf(Xh, Yh, Zh, 'FaceColor', [0.3 0.7 0.9], 'EdgeColor', 'none',
'FaceAlpha', 0.15);

plot3(t, V, D, 'w-', 'LineWidth', 4);
plot3(t, V_no_rush, zeros(size(t)), 'g--', 'LineWidth', 2);
plot3([t_rush t_rush], [0 max(V)*1.2], [0 0], 'y--', 'LineWidth', 3);

if ~isempty(payback_idx)
    scatter3(payback_t, payback_V, payback_D, 150, ...
        'mo', 'filled', 'LineWidth', 2, 'MarkerEdgeColor', 'w');
end

scatter3(t_rush, V(rush_idx), D(rush_idx), 120, ...
    'yo', 'filled', 'LineWidth', 2, 'MarkerEdgeColor', 'w');

view(60, 25); grid on; xlabel('Время'); ylabel('Ценность'); zlabel('Долг');
title('Финальная 3D траектория', 'Color', 'w', 'FontSize', 13);
set(gca, 'Color', [0.08 0.08 0.12], 'GridColor', [0.3 0.3 0.4]);

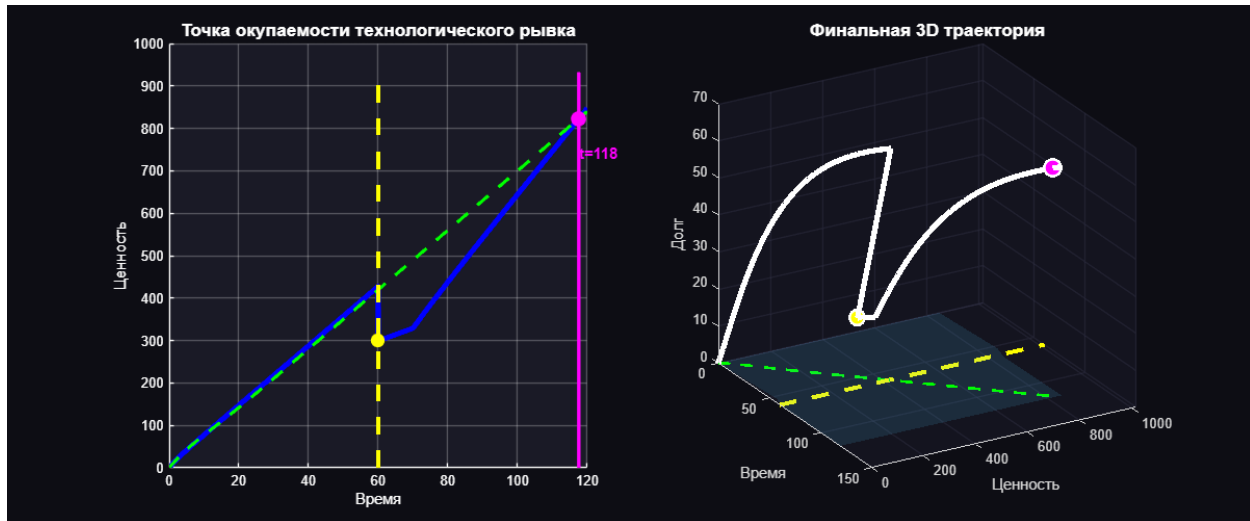
```

---

---

```
fprintf('\nТехнологический рывок завершен!\n');
```

*Технологический рывок завершен!*



*Published with MATLAB® R2025b*